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INVESTMENT OPPORTUNITIES
In The
OILSEED SECTOR OF PAKISTAN

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AGRIBUSINESS CELL
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EXECUTIVE SUMMARY

1.0 The Current Status of the Oilseed Sector in Pakistan

Pakistan's deficit of edible oil and livestock feed production is large and growing. The primary raw material for locally produced edible oil is cottonseed, a by-product of Pakistan's major cotton textile industry. Given agronomic limits, only marginal increases in cotton production are likely in the foreseeable future.

The cultivation of sunflower seed, some in rotation with cotton, was introduced in Pakistan about a decade ago. For agronomic reasons, it is the only non-traditional oilseed that has shown significant promise for large scale commercial production.

The production of sunflower increased for several years, but has stagnated in recent years due to the lack of private sector investment in modern oilseed processing plants and non-traditional oilseed crop production technologies and systems. These limitations have severely constrained local market demand for and, thus, the cultivation of sunflower seed.

This study concludes that the market demand for oilseed products and the technical constraints that impede sunflower production constitute major investment and market development opportunities in the farm input supply, oilseed processing, livestock feed sectors and commodity marketing sectors.

2.0 The Edible Oil Market

Pakistan now imports some one million tons of edible oil, of which 300,000 tons are costly, high value soft oils. Edible oil imports overall are rising some 13% a year. Ghee consumption is increasing at 5% per year, but demand for high value cooking oils, like sunflower and cottonseed oil, is increasing at a rate of at least 15% per year. Locally produced high quality cooking oil competes favorably with imported soya oil.

Given product and market diversification, cooking oil products do not compete with imported palm oil based products like ghee in the market place. However, due to the limited volume of non-traditional oilseed raw materials being produced in Pakistan, oilseed processing companies are not able to meet the growing market demand for cooking oil. This study concludes that current and projected demand for high value edible oils provides an immediate incentive to establish large-scale oilseed processing plants linked to non-traditional oilseed farmers.

3.0 The Livestock Feed and Oilseed Meal Market

In Pakistan, the primary by-product of solvent oilseed processing is feed meal. In 1990, Pakistan produced about 2.5 million tons of oilseed feed meal and cake, 2.3 million tons of which was cottonseed meal/cake used primarily in our cattle colonies. Livestock production other than poultry is increasing at an annual rate of about 5%, and an estimated 47 million units were produced in 1990.

The current supply of feed to the poultry industry exceeds one million tons, much of it poor quality due primarily to the lack of feed inputs and production of nutritionally balanced feed products. No one knows what the effective demand for good quality poultry feed would be, if it were available.

Poultry production has increased an average of 12.5% per year since 1980. An estimated 180 million units of poultry were produced in 1990. Poultry production is conservatively estimated to grow an average 10% per year through 1996. Due to the shortage of oilseed and other protein meals produced in Pakistan, the poultry feed industry currently uses wheat and other cereals as ineffective and, thus, costly substitutes for protein meal. With respect to imported feed meal, imports of soyabean meal were less than 40,000 tons for the two year period 1989 and 1990, and Pakistan produced less than 30,000 tons of sunflower and soyabean meal.

Given the growth of the poultry sector alone, the current and long term demand for oilseed based protein meals, provides an excellent incentive to investors to establish operations in the oilseed and livestock feed sectors.

4.0 The Parameters of the Model Oilseed Processing Company

The establishment of a 500 Mt/day solvent extraction plant, complete with the ancillary equipment required to produce basic and fully refined edible oil and high quality feed meal, is assumed and analyzed in detail in this study. The plant would be located in the cotton and sunflower belt near Multan, Province of Punjab, where ample irrigated land, power, water transport and labor are available.

The total fixed and working capital investment required to establish the model company is estimated at Rs. 430 million (US $18 million). At full production, the model plant would process 154,000 tons of cottonseed and sunflower seed to produce 37,000 tons of high-value edible oil and 60,500 tons of high protein feed meal annually. The plant would operate 330 days a year, processing cottonseed for 210 days and sunflower seed for 120 days. Annual gross revenue is projected to increase from Rs. 800 million (US $33 million) in year 3 to Rs. 2 billion (US $ 83 million) in year 5.

For illustrative and foreign investment promotion purposes, the proposed capital structure for the venture assumes that a financially solid foreign corporation undertakes the project. An equity stake of $8 million provides 49% of the initial capitalization, with local and foreign loans

providing the remaining $10 million or 51% of the capital required. The internal rate of return is estimated at 31%. Investors can expect complete capital recovery by the end of year 4 of operation, and tax free annual earnings of $22 million are projected by year 5.

5.0 Oilseed Production and Procurement

Raw materials to be processed by the model company include cottonseed and sunflower seed. Cottonseed is readily available in the market from cotton ginners. Increased farm production focuses on sunflower production in the cotton belt in the spring and early summer. Annual cultivation of some 25,000 hectares of sunflower is projected to supply the model processing plant.

Sunflower seed will be supplied by farmers under contract to the company. Hybrid seed and other inputs, land preparation, harvesting and extension services will be provided to contract growers by company production and procurement unit personnel. The cost of inputs will be deducted from the gross proceeds payable to the farmers. This direct support to company contract growers would be established and tested the year preceding the start-up of the processing plant.

The sunflower production implementation plan resolves farm production constraints, thereby unleashing the latent farm potential to produce sunflower seed for the processing plant. With an assured market and provision for appropriate agronomic technology at the farm level, returns to sunflower growers will substantially surpass those of lower yielding and lower priced crop alternatives.

The oilseed procurement system will include the assembly, cleaning, drying and storage of seed in bulk form, rather than the traditional bagging and collection system now used in Pakistan. This process will ensure efficient handling, preservation and storage of the large volume of sunflower seed to be supplied during the 45-day sunflower harvesting period.

The main procurement and storage center will be located at the site of the processing plant. A second procurement center will also be established in the sunflower growing area. Company supervised harvesting services and purchasing agents will be available at each procurement center to assure the efficient harvest and collection of sunflower seed raw material.

6.0 The Potential Scope and Impact of Investments in the Oilseed Commodity System

Given current and projected domestic demand and price trends for high quality refined edible oil and feed meal, as well as the potential to export these products, ACSCA analysts have concluded that some 10 oilseed processing companies, of the scale proposed, could be viably established in Pakistan in the medium term. Export market development is also a realistic prospect. Pakistan's geographic location in South Asia offers edible oil and feed producers a significant marketing opportunity in the rapidly expanding economies of South East Asia.

The establishment of 10 of these model companies would create a major new commodity system within the agricultural economy of Pakistan. Given current sunflower prices and yields being realized under adverse conditions on irrigated farms, the projected cultivation of 250,000 hectares of sunflower is an attainable farm production target. At this scale of sunflower production, oilseed processors would be able to produce some 200,000 tons of high value sunflower oil and 220,000 tons of high quality sunflower meal annually for domestic and export markets.

In addition to generating new investment of Rs. 4.3 billion (US $180 million) in modern oilseed processing plants, the major increase in oilseed production, processing and marketing would also create significant new agribusiness investment and market development opportunities in farm input supply, livestock feed and other processing agro-industry sectors.

Major investment in such agribusiness sectors will significantly increase employment and income in rural Pakistan. Increased income for the rural population would, in itself, significantly increase domestic market demand for the expanding supply of agro-based products and services resulting from the dynamic growth of the oilseed commodity system.

The Pakistan Oilseed Commodity System

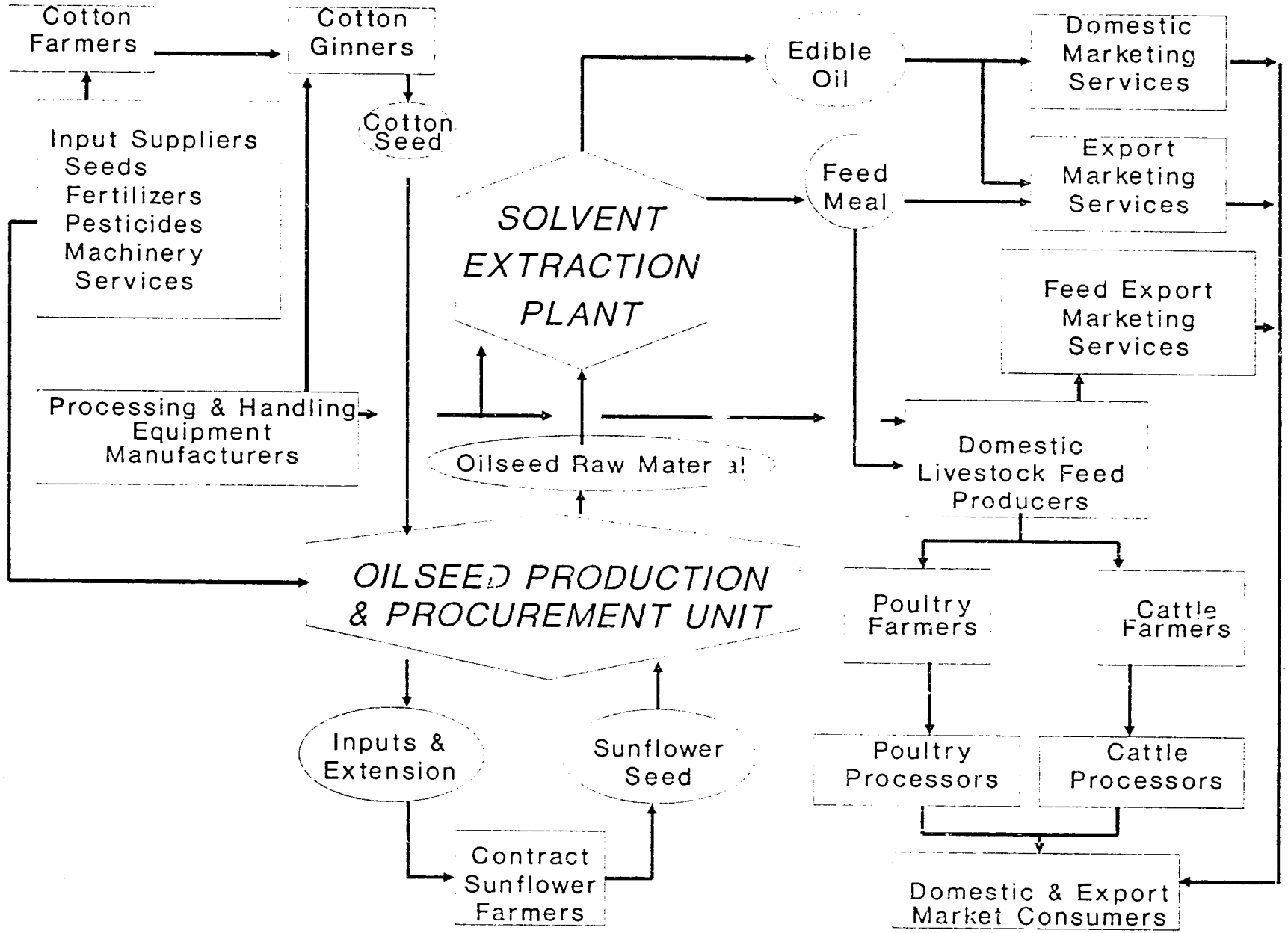

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TABLE OF CONTENTS

	Page #
EXECUTIVE SUMMARY	i
SECTION A - OILSEED PRODUCTION AND PROCUREMENT UNIT	
NON-TRADITIONAL OILSEED PRODUCTION IN PAKISTAN	1
I. THE FORWARD LINKAGE	3
1. OILSEED PROCUREMENT PROGRAM	3
1.1 Role of the Procurement Division	3
1.2 The Procurement Center	4
1.3 Sunflower Seed Requirement, Procurement Period and Cost Estimate	5
1.4 Oilseed Handling and Storage System	6
1.5 Cottonseed Requirement, Procurement Period and Cost Estimate	7
1.6 Procurement System for Cottonseed	7
2. PRODUCTION INPUT SUPPLY STRATEGY & FORWARD CONTRACT	9
2.1 Role of the Project	9
2.2 Registered Grower Contract	9
2.3 Projected Sunflower Yields	13
2.4 Supply of Production Inputs	14
2.5 Village Oilseed Worker: VOW for Distribution of Production Inputs	15
3. EXTENSION AND DEVELOPMENT PROGRAM FOR SUNFLOWER	16
3.1 Strategy	16
3.2 Pre-operational Phase and Training of the Extension Personnel	17
3.3 Adaptive Research	17
3.4 Identification and Selection of Areas of Operation	17
3.5 Selection of Villages and Identification of Potential Growers	18
3.6 Recruitment and Selection of Village Oilseed Workers	19
3.7 Initiation of a Development Program	19
II. TECHNICAL REQUIREMENTS	
1. TECHNICAL REQUIREMENTS OF THE PROCUREMENT DIVISION, DESCRIPTION AND FIXED INVESTMENT	22
1.1 Oilseed Bulk Handling and Storage System	22
1.2 Farm Machinery and Equipment Required for the Extension Program	25

2. ANNUAL REQUIREMENT AND COST OF SUNFLOWER PRODUCTION INPUTS 29

III. PERSONNEL REQUIREMENTS

1. PERSONNEL REQUIREMENTS FOR THE PROCUREMENT DIVISION . . 30

2. TECHNICAL ASSISTANCE AND TRAINING OF PERSONNEL 31

SECTION B - TECHNICAL FEASIBILITY ANALYSIS FOR A SOLVENT EXTRACTION PLANT

I. TECHNICAL REQUIREMENTS

1. PLANT CAPACITY 48
   1.1 Justification for a Rated Capacity of 500 mt/d as Daily Seed Intake . 48
   1.2 Processing Plant Capacity and Other Parameters. 49
   1.3 Refinery Plant Capacity 50

2. PLANT SITE LOCATION AND COST OF LAND 52
   2.1 Proposed Plant Site Location and Rationale. 52
   2.2 Acreage Required for the Plant and Cost Estimate 55
   2.3 Environmental Constraints 55

3. SITE PREPARATION AND BUILDING AND COST ESTIMATE 56

4. PRODUCTION PROGRAM 57

5. TECHNOLOGY AND EQUIPMENT 67
   5.1 Selected Technology and Alternatives 67
   5.2 Imported Plant Machinery Specifications and Cost Estimate 70
   5.3 Locally Manufactured Plant Equipment and Cost Estimate 71
   5.4 Erection, Installation and Commissioning 71
   5.5 Miscellaneous Equipment. 72
   5.6 Spare Parts for Repair and Maintenance 72

6. AUXILIARY INPUTS (EXCEPT COTTONSEED AND SUNFLOWER SEED) 73
   6.1 Hexane 73
   6.2 Caustic Soda 73
   6.3 Bleaching Earth 74
   6.4 Plastic (P.E.T.) 74

7. UTILITIES 76
   7.1 Steam 76
   7.2 Water 77
   7.3 Electricity 77

II. PLANT ORGANIZATION MANAGEMENT AND TECHNICAL PERSONNEL

1. MANAGEMENT AND TECHNICAL PERSONNEL 79
   1.1 Production and Technical Personnel 79
   1.2 Managerial and Administrative Personnel 81

2. PREPRODUCTION PHASE AND TRAINING PROGRAM 82
2.1 Pre-production Phase 82
2.2 Training of the Personnel during the Operational Phase 82

SECTION C - MARKET, SALES AND DISTRIBUTION

I. SUNFLOWER AND COTTONSEED OIL MARKET

1. EVOLUTION OF THE EDIBLE OIL MARKET IN PAKISTAN 97
   1.1 The Traditional Pattern 97
   1.2 The Introduction of Ghee 97
   1.3 Consequences of GOP Intervention 98
   1.4 Smuggling of Ghee 98
   1.5 State of the Industry 99

2. DOMESTIC OILSEED PRODUCTION 99
   2.1 Oilseed Production 99
   2.2 Impact of GOP Policy on Oilseeds 100
   2.3 Impact of GOP Policy on the Solvent Extraction Industry 101

3. THE EDIBLE OIL MARKET IN PAKISTAN 102
   3.1 Market Size 102
   3.2 Product Differentiation 102
   3.3 Price Trends 106
   3.4 Edible Oil Imports 106

4. MARKETING STRATEGY 109
   4.1 Plant Output 109
   4.2 Marketing Requirements 110
   4.3 Marketing Strategy 110
      4.3.1 Bulk Sunflower and Cottonseed oil 112
      4.3.2 Sunflower and Cotton meal 112
   4.4 Refined Sunflower and Cottonseed oil 112
      4.4.1 Pricing Policy 113
   4.5 Procurement Related Promotional Activities 116
   4.6 Other Oilseeds 116
      4.6.1 Peanuts 116
      4.6.2 Safflower 117
      4.6.3 Canola 117
   4.7 Exports Markets 117

5. MARKETING, MANAGEMENT, STRUCTURE AND COSTS 118
   5.1 Personnel 118
   5.2 Marketing Costs 119

II. SUNFLOWER MEAL AND COTTONSEED MEAL MARKET

1. POULTRY AND CATTLE FEED MARKET 122
   1.1 Poultry Feed Requirements 122
   1.2 Poultry Feed Production and Market 125
   1.3 Major Constraints to the Development of the Feed Industry 128
   1.4 Cattle Feed Market 129

2. MARKET AND PROJECTED PENETRATION 130
   2.1 Meal Quality 130
   2.2 Local Market Development Opportunities for Sunflower Meal 131
   2.3 Sunflower Meal Export Market Opportunities and Constraints 134
   2.4 Cottonseed Meal Market 135
   2.5 Projected Market Penetration for the Oilseed Commodity System 135

3. MARKETING STRATEGY, SALES AND DISTRIBUTION 137
   3.1 Marketing Strategy 137
   3.2 Sales Revenues 139
   3.3 Marketing and Sales Cost 139

SECTION D - FINANCIAL ASSUMPTIONS AND ANALYSIS

I. THE MODEL OILSEED PROCESSING COMPANY

1. GENERAL OPERATIONS AND ANALYSIS ASSUMPTIONS 143
   1.1 143
   1.2 143
   1.3 143
   1.4 143
   1.5 143
   1.6 144
   1.7 144
   1.8 144
   1.9 144
   1.10 144

2. PROPOSED CAPITAL STRUCTURE ASSUMPTIONS 145
   2.1 145
   2.2 145
      2.3.1 145
      2.3.2 145
      2.3.3 145
      2.3.4 146
      2.3.5 146
   2.4 146
   2.5 146
      2.6.1 147
      2.6.2 147
      2.6.3 147

3. BALANCE SHEET ASSUMPTIONS 148
   3.1 148
   3.2 148
   3.3 148
   3.4 148
   3.5 148

4. INCOME STATEMENT ASSUMPTIONS 149
   4.1 149
   4.2 149
      4.3.1 149
      4.3.2 149

4.4.1 149
4.4.2 149
4.5.1 150
4.5.2 150
4.6.1 150
4.6.2 150
4.6.3 150
4.7 150
4.8.1 150
4.8.2 151
4.8.3 151
4.9 151
4.10 151

5. RATIO ANALYSIS ASSUMPTIONS 152
5.1 152
5.2 152
5.3 152
5.4 152
5.5 152
5.6 152

6. CONCLUSIONS 154
6.1 154
6.2 154
6.3 154
6.4 154
6.5 155

LIST OF TABLES

For Section A

Table A-1	Annual and Daily Requirements and Costs of Raw Materials	32
Table A-2	Projected Yields and Number of Villages Required as per Requirements of the Procurement and Extension Programs.	33
Table A-3	Procurement Centers/Fixed Investment, Phases 1 & 2	34
Table A-4	Daily Quantities of Seeds to be Shipped as per Requirement of the Procurement Program and Number of 20 ton Trucks Required	36
Table A-5	Maximum Storage Requirements for Cottonseed and Sunflower Seed . .	37
Table A-6	Annual Requirement and Cost of Sunflower Hybrid Seed	38
Table A-7	Annual Requirement and Cost of Fertilizer: DAP	38
Table A-8	Annual Requirement and Cost of Fertilizer: Urea	38
Table A-9	Annual Requirement and Cost of Fertilizer: SOP	38
Table A-10	Annual Cost of Pesticides and Weedicides	39
Table A-11	Annual Cost of Production Inputs	39
Table A-12	Procurement Cost of Sunflower Seed	39
Table A-13	Procurement and Extension Personnel Salaries and Wages	40
Table A-14	Illustrative Sunflower Crop Farm Budget	42

For Section B

Table B-1	Building Cost Estimate, Phases 1 & 2	84
Table B-2	Targeted Production Days for a 6-Year Production Program	60
Table B-3	6-Year Production Program on a Monthly Basis	61
Table B-4	Annual Cottonseed Intake	62
Table B-5	Annual Sunflower Seed Intake	62
Table B-6	Output Percentage Recovery	62
Table B-7	Material Balance for Cottonseed	63
Table B-8	Material Balance for Sunflower Seed	63
Table B-9	6-Year Production Program for a 500 mt/d Rated Plant Capacity . . .	64
Table B-10	Daily Cottonseed Oil Production	65
Table B-11	Daily Sunflower Oil Production	65
Table B-12	Annual Targeted Production of Fully Refined Oil Year 4 to Year 6 . . .	65
Table B-13	3-Year Oil Production Program	66
Table B-14	Specification & Cost of Imported Machinery for the 500 mt/d Plant . . .	85
& B-14bis	Phases 1 & 2	86
Table B-15	Daily Hexane Consumption & Cost Estimate	87
Table B-16	Daily Caustic Soda Consumption & Cost Estimate	88
Table B-17	Daily Bleaching Earth Consumption & Cost Estimate	89
Table B-18	Daily Plastic (P.E.T.) Consumption & Cost Estimate	90
Table B-19	Daily Gas Requirements & Cost Estimate for Steam Production	91
Table B-20	Daily Gas Consumption & Cost Estimate for Electricity Generation . . .	92

Table B-21 Production & Technical Personnel Base Salaries 93
Table B-22 Managerial & Administrative Personnel Base Salaries 94
Table B-23 Management and Technical Personnel Requirement . . . . . during the Preproduction Phase 95
Table B-24 Foreign Technical Assistance during the Production Phase 96

Chart B-I Technical Personnel Required Per Type of Operation and. . . . . Per Shift 80

For Section C

Table C-1 Oilseed Production and Potential Edible Oil in Pakistan (1989-90) . . . 100
Table C-2 Edible Oil Market Structure - 1990-91 103
Table C-3 Edible Oils - Projected Growth Rates 103
Table C-4 Comparative Edible Oil Prices 105
Table C-5 Volume of Imported Oils 107
Table C-6 Edible Oil Imports 108
Table C-7 Oil and Meal Output 110
Table C-8 Retailer Margins - GCP and Levers 114
Table C-9 Provision for Marketing and Distribution 115
Table C-10 Salary and Benefit Costs - Marketing Division 120
Table C-11 Commercial Poultry Farms Feed Requirements in 1989 124
Table C-12 Poultry Feed Industry in 1989 125
Table C-13 Estimated 1989 Poultry Feed Total and Commercial Volumes . . . . . Respective Gross Values 127
Table C-14 Cottonseed and Sunflower Meal - Targeted Quality 131
Table C-15 1989/90 Production and Supply of Meals in Pakistan 131
Table C-16 Oilseed Commodity System - Projected Market Penetration . . . . . for Cottonseed Meal and Sunflower Meal 136
Table C-17 Comparative Unit Costs of Crude Protein for Sunflower and Soybean Meals Currently Available in Pakistan 138
Table C-18 Per Capita Annual Consumption of Major Food Items in Pakistan 1979 to 1995-96 (Selected years) 141
Table C-19 Actual and Projected Estimates Relating to Livestock . . . . . and Crop Sub-sectors in Pakistan, 1980-81 to 1995-96 142

For Section D

Table D-1 Proposed Capital Structure 156
Table D-2 Balance Sheet Assumptions - Fully Refined Oil Plant 157
Table D-3 Income Statement Assumptions - Fully Refined Oil Plant 158
Table D-4 Ratio Analysis Assumptions - Fully Refined Oil Plant 159
Table D-5 Statement of Changes in Financial Position 160
Table D-6 Breakeven Analysis - Fully Refined Oil Plant 161
Table D-7 Summary Funds Flow Schedule 162

Table D-8 Summary Investment Phase 1 163
Table D-9 Summary Investment Phase 2 165
Table D-10 Land Requirements and Costs - Investment Phases 1 & 2 166
Table D-11 Building Requirements and Construction Costs 167
Table D-12 Equipment & Machinery Requirements & Costs 169
Table D-13 Sales Revenues Schedule 174
Table D-14 Fund Flow Schedule 175
Table D-15 Amortization Tables 181
Table D-16 Depreciation Schedules 201
Table D-17 Auxiliary Inputs 213
Table D-18 Staffing Requirements 219

LIST OF ANNEXES

For Section A

Annex A-1 Utilization, Classification and Distribution of Land in Pakistan
Annex A-2 Hutchinson Mass-Ter Movers & Mass-Ter Flow (Specifications)
Annex A-3 Kice - Portable Multi-Aspirator (Specifications)
Annex A-4 Hutchinson Grain Pump (Specifications)
Annex A-5 Thermo-Flex Small Capacity Air Supported Structure for Grain Storage
Annex A-6 Thermo-Flex Large Capacity Air Supported Structure for Grain Storage
Annex A-7 Muskogee Type Building for Oilseed Storage
Annex A-8 Drying and Storing Sunflowers
Annex A-9 Technical Specifications for Sunflower Cultivation
Annex A-10 Estimated Cost of Production of Sunflower 1991 Crop
Annex A-11 Cost of Farm Implements Suitable for Sunflower Cultivation and Harvest

For Section B

Annex B-1 Rural Industrialization Policy / SRO 1284
Annex B-2 Map of Punjab
Annex B-3 Foreign Equipment Manufacturers of Oilseed Processing Plants, Refining Plants, Packaging Plants and Power Generating Units
Annex B-4 500 mt/d Plant Production Process and Product Input/Output
Annex B-5 Calculation of Steam Requirements for Oilseed Processing and Oil Refining Year 1 to 6
Annex B-6 Calculation of Electricity Requirements for Oilseed Processing and Oil Refining Year 1 to 6

For Section C

Annex C-1 Estimated Market Demand for Sunflower Meal in the Livestock and Poultry Feed Industry in Pakistan
Annex C-2 International Sunflower Meal Trade Overview and Market Opportunities and Constraints for Pakistani Sunflower Meal

NON-TRADITIONAL OILSEED PRODUCTION IN PAKISTAN

This component of the Oilseed Commodity System analysis focuses primarily on the requirements to be met to significantly increase the production of non-traditional oilseeds in Pakistan. For agronomic and raw materials supply reasons, sunflower is the crop targeted to be the primary non-traditional raw material for processing.

Sunflower was introduced to Pakistan as a "non-traditional" oilseed crop over a decade ago. It is suitable for cultivation in the majority of agro-ecological zones of Pakistan, and has proved to be the most successful of the non-traditional oilseeds. However, its cultivation has not expanded to the extent necessary to make an impact on Pakistan's need to reduce its dependency on imported edible oil.

The main reasons for this stagnant growth are the lack of market infrastructure for sunflower and appropriate technology along with the lack of necessary production inputs to grow sunflower. As a result, the total production of sunflower seed in Pakistan in the peak year of 1989 was only 54,000 tons.

In Pakistan, the marketability of commodities at the farm gate is often difficult, especially for the small and medium farmers who constitute more than 60% of the producers in the farmed area of Pakistan (see Annex A-1 - Utilization, Classification and Distribution of land in Pakistan). Sunflower production has also been hampered by the traditional use of imported soya and palm oil in locally manufactured edible oil products.

The ACSCA analysis of the Oilseed Commodity System identifies the following major constraints to increased sunflower production:

- Lack of marketing and production linkages between sunflower seed growers and oilseed processing plants.
- Lack of appropriate land preparation, planting and harvesting technology at the farm level.
- Lack of timely availability and use of appropriate farm inputs, such as hybrid seed, fertilizer, and plant protection materials.
- Lack of technical know-how and extension services being provided to farmers by input supply agro-industries to maximize sunflower yields and provide the incentive needed by farmers to grow sunflower.

While these are serious constraints at the farm level, they constitute major investment and market development opportunities in the farm input supply and oilseed processing sectors. This analysis proposes pragmatic solutions to these constraints within the operational framework of a large scale oilseed processing company.

A. OILSEED PRODUCTION AND PROCUREMENT UNIT

I. THE FORWARD LINKAGE

1. OILSEED PROCUREMENT PROGRAM

1.1 Role of the Procurement Division

Because sunflower cultivation is not expanding in the Pakistani traditional technical and economic environment, the 500 mt/d oilseed processing plant described in section B of this concept paper can not rely on the existing market to meet its annual sunflower seed requirement. Therefore, the project plans to set up a procurement division which will play a major role in fostering the development of sunflower production by establishing a forward linkage between farm production and the solvent extraction plant.

When planning the procurement program, the procurement division will have to correct or bypass the existing deficiencies in the system insofar as it affects the procurement needs of the plant. Therefore a full-scale effort incorporating forward purchasing of contracts with farmers, hybrid seed and other farm input supply programs, assured availability of critical farm machinery and extension services, will have to be put in place to assist in expanding sunflower growing in key areas, as has been already accomplished by the sugar industry in Pakistan.

The role of the procurement division is as follows:

- Purchase all the raw materials required by the processing plant with reference to oilseeds.

- Operate and manage procurement centers for the duration of procurement of raw materials (cottonseed/sunflower seed).

- Effect and execute all forward contract agreements of purchases and ensure timely supply of production inputs as required for sunflower contract growers.

- Establish quality control standards for procurement at the farm/village level and at the project procurement center.

- Develop the production potential of sunflower through a comprehensive extension service to increase the number of contract growers and hectarage placed under the sunflower crop, per village.

- Select, recruit and train oilseed workers at the village level for field procurement operation and development of sunflower.

- Provide all technical assistance to the growers to facilitate introduction and transfer of modern technology for oilseed development.

- Introduce a bulk handling system for all seed intake.

The procurement division will operate through units called procurement centers.

An extension program described hereafter (Chapter 3), will run in support of the procurement division.

1.2. The Procurement Center

The procurement center has the following functions:

- Service a procurement zone, with a primary focus on the areas closest to it within an approximate distance of 50km (this distance can vary with ease of communications, average production within sub-units of the zone, etc.) within which it has the capacity to handle a given number of villages for the supply of sunflower seed.

- Serve as the base from which extension activities are provided to farmers within the procurement zone.

- Purchase sunflower seed from contract growers in bulk, and re-ship to the plant in bulk form.

The maximum number of villages that can be efficiently handled from one procurement center is about 80. This is dependent on the number of extension teams operating under a procurement center jurisdiction. It is assumed that an initial 100 ha per village is planted with sunflower seed in year 1, with this area being increased annually by 10 ha. Therefore, the minimum number of villages required to supply the exact volume of sunflower seed as per requirement of the production program will be 164 in year 6 of plant operation (see Chapter 3, Extension program and Table A-2). This can be met with one procurement center at the plant site (the 'plant procurement center') and one center in the field (the 'field procurement center').

In addition to sunflower seed, the plant procurement center also receives cottonseed. The field procurement center would be located towards the northeast of Multan where sunflower is the more prominent crop, just off a major local cross road for ease of accessibility on 5 acres of land.

In this concept paper, two procurement centers, one at the plant and one on the field, will be installed to meet the total sunflower seed requirement of the plant. However, a third center could be installed in the field, for instance in a southerly direction towards Rahimyar Khan: this is a possibility that can be left open pending results of actual operation.

The equipment required for the procurement centers is described in part II. For the fixed investment costs of phases 1 and 2, see Table A-3. For the personnel requirements, salaries and wages of the procurement centers, see part III and Table A-13.

1.3 Sunflower Seed Requirement, Procurement Period and Estimated Cost

See Table A-1: Annual and Daily Requirements and Costs of Raw Materials.

The annual requirement of sunflower seed ranges from 18,000 tons in the first year of operation to 54,000 tons in the sixth year.

The extent of area needed to grow the above quantities along with constraints imposed by crop rotation cycles dictate a considerable geographical spread in terms of procurement effort, spanning the present wheat-cotton and wheat-rice zones. This would be accomplished by the procurement centers.

Procurement activities including forward contracting, production input supply and extension will need to commence one year (hereafter called 'year 0') before the first year of operation of the plant, to ensure an adequate supply of seed in the first year of plant operation.

To meet the annual requirement of the production program (refer to section B, part I, chapter 4), daily quantities ranging from 400 mt (year 1) to 665 mt (year 6) in a 45-day procurement schedule are needed. This is not only to cover the operation of the plant during this period, but also to build up inventories for processing beyond the procurement period. In the model built for this concept paper, the procurement period for sunflower seed starts on May 16th and ends by June 29th.

For the purpose of the project, the total procurement of sunflower seed is derived from the spring crop as at present, over 80% of the total sunflower seed production in the country is derived from the spring harvest. The spring crop bears good yields and is adaptable in the existent cropping pattern.

However, the agro-ecological conditions in Punjab allow the possibility of growing a winter sunflower crop. The plantation dates are following the monsoon in August and the crop is ready for harvest by early November. The major constraints discouraging the winter sunflower are,

poor marketability and inadequate seed storage facilities, the latter causing heavy losses due to high moisture percentage of the seed. With proper storage facilities, this problem can be circumvented and with an assured marketing channel, the winter crop can be developed. The project extension staff could certainly encourage this potential to the point where it will be possible for the plant to operate two sunflower crushing periods, thereby maximizing its revenue.

The cost estimate (Rs.6,000, see Table A-1) for sunflower seed delivered at the plant is based on average 1990 data. Transportation charges are estimated to about Rs.200 per ton (see part II, Bulk handling system, phase-III).

1.4 Oilseed Handling and Storage System

The major constraint of purchasing 400 to 665 mt/day is related to the physical handling/storage of this daily volume. Traditional handling of raw material is done in 50-100 kg jute bags which are manually loaded and unloaded either from transport vehicles or into storage bins. This is a cumbersome, time consuming and expensive exercise, giving rise to all manners of risk of damages for all concerned.

The required tonnages dictate that procurement will have to take place over large areas and that bulk handling will become necessary as the raw materials are to be moved expeditiously.

Therefore, the procurement division faces a major challenge of purchasing, handling and transporting large volumes of oilseeds, particularly sunflower seed, never before attempted in Pakistan.

In this respect, a new technology for bulk handling will be introduced and adapted to local conditions under the procurement strategy outlined in this concept. The bulk handling system includes four phases :

- Phase I - Introduction of a bulk handling system at the farm/village level, and transportation of the sunflower seed to the nearest procurement center.
- Phase II - Introduction of bulk handling technology at the procurement center.
- Phase III - Transportation of daily volumes of seed in bulk from the procurement center (sunflower seed) or from ginning factories (cottonseed) to the plant.
- Phase IV - Reception, cleaning and final bulk storage of the raw materials.

A detailed description of the oilseed handling and storage system is found in part II, along with a list of equipment required and fixed costs (see Table A-3).

1.5 Cottonseed Requirement, Procurement Period and Estimated Cost

See Table A-1: Annual and Daily Requirements and Costs of Raw Materials.

The annual requirement of cottonseed for the 500 mt/d plant ranges from 78,750 mt (year 1) up to 104,500 mt (peak production for cottonseed oil is year 5) with a daily purchase ranging from 525 mt per day (year 1), to 697 mt per day (year 5) in a 150-day procurement schedule. Cottonseed is available only during 150 days (from early November to the end of March) and inventories must be built up for processing beyond the procurement period (see Production program, section B, part I, chapter 4).

The price per ton of cottonseed is quoted on the stock exchange. The price varies seasonally from Rs. 2,250 per mt to Rs. 3,875 per mt. The cost estimate (Rs.2,750, see Table A-1) for cottonseed delivered at the plant is based on average 1990-1991 prices. Transportation charges for the cottonseed are estimated to Rs.150 per ton (see Part II, Bulk Handling System, phase-III).

Cottonseed is utilized as a major raw material input in the first six years of operation. This is mainly due to the abundant availability of cottonseed as a by-product of the textile industry. It is by no means considered a high value oil seed due to the low percentage of edible oil content present in the seed (17% versus 37% for sunflower seed).

Note : In this concept paper, the production program is based on an average cotton oil content of 17% that can be obtained from seeds procured from November to April. However, the best quality seeds are available from November to January and a higher oil content (superior to 17%) can be expected from raw materials procured during these three months.

1.6 Procurement System for Cottonseed

Cottonseed is a by-product of the cotton staple/textile industry. It is normally supplied/distributed through arthis (brokers) from the cotton ginning factories to the prospective buyer.

Out of 9 million bales of cotton produced annually in Pakistan, the ginning factories are able to process approximately 3.2 million tons of cottonseed. Setting aside the requirement for certified seed for germination, there are more than 2.5 million tons of cottonseed available as potential

raw material for the edible oil industrial sector.

The available production of the ginning factories in Punjab is sufficient for the annual requirement of the Oilseed Commodity System Project, which is less than 5% of the total annual production of cottonseed available for purchase from the open market.

Cotton ginning factories located near Multan Division can readily supply a sufficient quantity of cottonseed since there is an existing and established network of supply to fulfill the requirement of the plant.

The point of interest is that because the ginning factories are at close proximity to the proposed site of the processing plant, it will be possible to initiate bulk handling of the cottonseed directly from the ginning factories to the procurement and storage facilities located at the plant site (refer to part II for a description of the oilseed handling and storage system). The procurement center located at the plant site will be responsible for the purchase and the delivery c. cottonseed.

2. PRODUCTION INPUT SUPPLY STRATEGY AND FORWARD CONTRACT

2.1 Role of the Project

A major problem faced by all farmers in Pakistan is the non-availability of farm inputs when required. This alone causes tremendous hinderance for the farming community, to achieve the full production potential of any crop. Once crop yields are diminished, so are the hopes of the farmers to overcome the rising costs of production, resulting in poor margin from the revenues derived from the crop.

The following prevalent conditions are a constraint to future growth and development:

- Lack of quality hybrid seed adapted to local conditions,
- Lack of proper implements and farm mechanization for seed bed preparation and harvesting,
- Non available credit from banks for production inputs since sunflower/N.T.O are not classified as cash crops,
- Lack of availability of production inputs (seed, fertilizer, pesticide etc.),
- Lack of technical knowledge for optimum utilization of production inputs for maximum yield/ha,
- Insufficient irrigation water available due to insufficient distribution,
- Lack of markets and marketing infrastructure available.

To overcome the prevalent constraints of production input supply and to achieve the desired objectives of the production program, the procurement division will effect forward contracts with private growers. The procurement division will organize the supply of input and technical assistance required for efficient and economically viable sunflower production at the farm level. The cost of the inputs would be deducted from the sale income payable to the farmer.

The forward contract would serve as a reciprocal arrangement whereby the farmers are ensured a guaranteed market and market price and the project is assured a regular supply of raw material for the processing plant.

The project will recruit, train and employ a team of professional personnel to launch a comprehensive oilseed cultivation program. The primary task of an extension team will be to

identify potential growers and to encourage them to produce sunflower on contract for the project (see Chapter 3).

2.2 Registered Grower Contract

The project will enable contract growers to receive essentially needed production inputs to achieve optimum yields of sunflower, such as hybrid sunflower seed, fertilizer, plant protection chemicals (pesticides, weedicides), farm implements & harvester on a rental/lease basis, technical assistance & extension, at the appropriate time following their contractual agreement to produce sunflower exclusively for sale to the project.

The value of the inputs required and utilized by each contract grower would be capitalized in the form of a short term loan extending over the growing period of the sunflower crop.

The terms and conditions of the proposed contract follow:

FARMER CONTRACT AS REGISTERED GROWER

This agreement reached today dated ----- 19--, between Mr.----------, son of ----------,

N.I.D.#----------, resident of ----------, Tehsil ----------, District----------,

heretofore named Registered Grower (R.G. # --------),

and

the Integrated Commodity System Project, with the registered office at ---------address----------

----------, heretofore named the Procurement Division (P.D.).

TERMS & CONDITIONS

1. The R.G. should be a bonafide farmer actively involved in crop production as a means of livelihood.

A. OILSEED PRODUCTION AND PROCUREMENT UNIT

2. The Registered Grower (R.G.) agrees to grow and produce sunflower seed on contract at his premises on the acreage specified herein in clause 2A, and the Procurement Division (P.D.) agrees to buy the total production of sunflower supplied by the Registered Grower (R.G.), thereby guaranteeing a market and minimum market price, provided all the stipulated conditions listed below are fulfilled.

   2A. The R.G. hereby declares --------, the hectarage/acreage of land owned or operated by him for the 19-- Kharif/Rabi season to be placed under production of sunflower, to be exclusively grown for the P.D..

3. The R.G. is bound by this agreement to sell his total crop production of sunflower to the P.D..

4. The P.D. agrees to provide the production inputs so as to enable the R.G. to complete the crop production requirements for sunflower. The P.D., upon receiving the written request along with a signed copy of this contract will issue an approval for the timely supply of the production inputs detailed below in Clause 5.

5. The P.D. hereby extends a short term loan to the R.G. in the form of the following production inputs quantified below to assist the grower in producing high yielding varieties of sunflower:

   i. Seed
      Type ---: ---kg/ha @ Rs.---/kg

   ii. Fertilizer
      DAP : ---kg/ha or SSP : ---kg/ha @ Rs.---/kg
      Urea: ---kg/ha or AS/CAN: ---kg/ha @ Rs.---/kg
      SOP : ---kg/ha @ Rs.---/kg

   iii. Pesticide/Weedicide
      Type ---: ---l/ha @ Rs.---/kg
      ---: ---l/ha @ Rs.---/kg
      ---: ---l/ha @ Rs.---/kg

   iv. Mechanization
      Implement rental @ Rs.---/h, hours : ---
      Combine Harvester @ Rs.---/ha, acreage: ---

   v. Technical Assistance
      --- Man Hrs @ Rs.---/Man Hrs

6. The R.G. will be responsible for the correct application and use of the farm inputs defined in clause 5 for the purpose of sunflower crop production as per recommendations of the P.D..

7. The R.G. will be responsible for sunflower crop management, in accordance with the recommendations of the P.D. for optimum production.

8. The R.G. is responsible for the timely harvest and delivery of sunflower seed to the nearest procurement center representative indicated hereunder: Mr. ------, resident of------

9. Dried and clean sunflower seed must be delivered by the R.G and must pass all quality standards specified by the P.D. and as laid down hereunder:

Moisture content	below 10 %
Foreign matter content	below 2 %
Damaged seed content	below 2 %

10. If the quality specifications for sunflower seed in Clause 9 are not adhered to by the R.G., the P.D. reserves the right to reject any part of the consignment delivered, or to revise the price guaranteed in clause 13 according to a quality chart proposed by the P.D. and on which both parties will agree before signing this agreement.

11. The value of production inputs stipulated in clause 5 shall be treated as an interest free loan to the R.G. till the date of sale to the P.D., following which the P.D. shall deduct the value of the loan from the amount payable as per quantity supplied.

12. The P.D. is bound by this agreement to buy the total crop production of sunflower offered for sale by the R.G. to the P.D., provided the sunflower seed meets the quality standards stipulated by the P.D. in Clause 9.

13. The minimum market price guaranteed to the R.G. by the P.D. will be Rs._____/mt.

14. The R.G. will be entitled to receive payment for the quantity of sunflower seed approved for supply less the deduction for the value of production inputs.

15. The P.D. on receipt of sunflower seed supplied by the R.G., shall make a payment vide cash cheque payable within 15 days of the date.

16. In case a difference arises between the R.G. and the P.D. the Chief Executive of the

P.D., Mr._____, will serve as a sole arbitrator and his decision will be binding on all parties concerned.

17. In case of crop damage or failure, the R.G. will be responsible to cover the total value of production inputs to be repaid within 6 months from the date of expiration of this contract.

18. To cover crop damage and failure, the P.D. proposes to draw up a crop insurance at the time of agreement amounting to 3% of the total value of production inputs payable by R.G.

19. All the terms and conditions stipulated in this contract must be fulfilled within 120 days from this day of ------ to this day----19--, following which this contract agreement will stand concluded.

20. This agreement is heretofore signed and acknowledged by both parties listed below with intent to uphold all the terms and conditions mentioned above.

SIGNED, SEALED, AND ACKNOWLEDGED WITH ATTESTED SIGNATURES OF BOTH PARTIES AND WITNESSES TO THE AFOREMENTIONED AGREEMENT.

Comment:

Clause 9: Quality standards selected in this contract are indicative moisture, foreign matter and damaged seed percentages recommended by companies like Pioneer or GCP. One of the main challenges of the extension teams will be to make the farmer field dry the sunflower seed before delivery and adhere to the quality standards.

Clause 8: The farmer will deliver the sunflower seed to a procurement center representative at the village level known hereafter as the Village Oilseed Worker (see chapter 2.5).

Clause 10: A quality chart defining the price of the sunflower seed according to its quality must be designed by the procurement division and signed by both parties.

2.3 Projected Sunflower Yields

Sunflower yields have shown considerable variation even under relatively controlled field conditions, ranging from 1.1 mt/ha to 2.6 mt/ha (Ref: CIMMYT Farm Surveys).

The targeted yields for the project have been estimated at 1.6 ton/ha for year 0 gradually increasing to 2.2 ton/ha in the 6th year (see table A-2).

It can safely be presumed that with the availability of necessary technical and production inputs, along with the intensive agro-cropping practices followed by farmers in the Punjab, the average yields per hectare can be easily achieved if not exceed the highest yields of 2.2 metric tons/ha to 2.6 metric tons/ha (derived from the CIMMYT seed trials in 1989).

If the yields actually derived in the production zone meet or exceed the CIMMYT trial achievements of 2.2 to 2.6 mt/ha then the annual hectarage required would be reduced considerably along with the cost and time taken to achieve the desired results.

In this case one option would then be to reduce all operating and production input costs for sunflower development by reducing the targeted hectarage. The second option would be to maintain the development program and achieve the targeted hectarage by supplying the required production inputs to the contract growers thereby increasing the yearly production and intake tonnage of sunflower seed. The production program could be modified accordingly and the plant could process a higher quantity of sunflower seed. This second option would greatly enhance the economic viability of the Integrated Commodity System gaining maximum returns from the sunflower, which efficiently produces a higher quality marketable oil compared to cottonseed.

Note: it is assumed that the total quantity of seed derived from the targeted yields (Table A-2) meet the exact requirement of the production program. It is assumed that losses encountered during handling and transportation of seeds do not have a significant impact on the production program.

2.4. Supply of Production Inputs

The annual quantity and quality specifications of the production inputs to be delivered by the procurement division to the farmers so as to help them to achieve the projected yields are defined in part II (Tables A-6 to A-11). The farm implements required for sunflower cultivation are also described in part II.

Supply of production inputs for growing sunflower with a targeted yield of 1.6 ton/ha will start one year before the processing plant comes into production to try the procurement system (year 0). The sunflower seed will be sold on the open market.

2.5 Village Oilseed Worker: VOW for Distribution of Production Inputs

The supply of production inputs to the farmer growers at the village level can be made possible by utilizing services of a self employed village worker who would serve as a intermediary between the production input supply program and the farmers. The village oilseed worker 'VOW' following recruitment/selection would have to undergo a comprehensive training program so as to learn the correct application and utility of the specified production inputs required, to get optimum yields for sunflower as characterized practically by the farmers' demonstration plots. In this way he receives theoretical as well as practical training for production of sunflower seed. The village worker could earn remuneration for his services through a commission built into the cost price of each production input.

The primary role of the VOW is to act as a village intermediary for the supply of production inputs and the purchase of sunflower seed produced by the contract growers. The VOW must introduce the utility of the specified production inputs to the individual farmers. Following which, the VOW must encourage the correct application of these inputs by the contract growers to gain maximum yields per hectare. Due to the fact that the village VOW worker will be a resident of the community and derives part of his livelihood from the sale/supply of the production inputs, he will be far more effective then a salaried salesman. The VOW will be achievement-oriented because by expanding his supply network, his margin derived from commissions will progressively increase his total revenue:

Production inputs:	Commission per Unit
Hybrid sunflower seed	Rs. 5/kg
Fertilizer	Rs. 1/bag
Pesticide or weedicide	Rs. 4/liter

3. EXTENSION AND DEVELOPMENT PROGRAM FOR SUNFLOWER

3.1. Strategy

The extension and development program will run in support of the procurement program and it will:

- Provide technical advice to farmers re: crop inputs, land preparation and deep tillage operations, crop management, pest control, harvesting and post harvesting handling, field drying and seed storage.

- Supervise at least one acre per plot per village with optimum input application to serve as a demonstration for sunflower production.

- Carry out farmer training programs for selected farmers in activities enumerated above. The possibility of extending farmer training at government, adaptive research farms and institutes must be explored.

- Liaise with agricultural machinery, harvesting, seed and pesticide companies, Department of Agriculture extension personnel, seed research institutions, adaptive research farms and other concerned bodies with a view to extending the application of research to contract growers effectively.

In addition to the personnel required for the procurement operation, the project proposes to recruit and train extension staff for a comprehensive extension service which operates from the two procurement centers.

There will be two extension teams per procurement center, each of which will consist of the following personnel possessing a rural background:

Extension Agronomist	Ag. Economist/Agronomist	2
Extension Assistant	Agri.Graduate	2
Purchase Officer	Commerce Graduate	2

The four teams will be supervised by the Development Manager who is the administrative head of the procurement division. Each team will be assisted at the village level by the resident Village Oilseed Worker (VOW).

Extension staff will be highly mobile and will be expected to visit contract farmers according to a prepared schedule.

3.2. Pre-operational Phase and Training of the Extension Personnel

To ensure production and supply of sunflower before the processing plant comes into production, the Extension & Development service of the project must begin its activities at least 12 months prior to the plant production (year 0).

This initial pre-operational period will be used for building up confidence and creating awareness amongst the farming community towards the production of sunflower.

In year O, two extension teams will be recruited and trained to provide technical assistance based at each procurement center. Their first task will be to identify and select areas of operation where sunflower can be included in the cropping pattern. The training will be carried out with the help of experts under a technical assistance program.

Since the procurement division is attempting to introduce new initiatives, it will be necessary to acquire the technology by employing the services of foreign experts well versed in their technical disciplines. It is also more economical and useful to have the expert operating under a Pakistani environment while training several co-workers.

The description and cost of the extension personnel and technical assistance required for this pre-operational phase is found in part III and Table A-13.

3.3 Adaptive Research

The procurement division must launch an adaptive research program for appropriate transfer of technology for optimum utilization of production inputs and introduction of hybrid seed varieties suitable under local conditions. All research should be carried out at farmer fields or demonstration plots for economic reasons. Secondly, the farmer confidence and acceptability is also greater for himself as well.

Each team will be equipped with a tractor and implements recommended for the sunflower crop, so as to carry out the demonstrations and train farmers. Cost and specifications for the equipment needed for extension purposes are found in part II of this report (see also Table A-3).

3.4 Identification and Selection of Areas of Operation

The location of the processing plant has been selected to in the proximity of Multan, specifically on the Multan-Kabirwala main road. This site was selected because it is in the heart of the

cotton production zone with existing cropping patterns of sunflower on its north-eastern flank. This site is most suitable for acquiring both cottonseed and sunflower seed, with the existing availability of large tracts of land lying fallow after cotton. It is anticipated that gradually farmers can be expected to plant sunflower on this available resource, making full utilization of their production potential.

Sunflower is currently being grown extensively in the Okara, Depalpur, Chichawatni and Sahiwal area. The available soil conditions, environment and agrarian system is highly suitable for sunflower production. However, due to lack of marketing channels and infrastructure, the growth potential of sunflower has not been sufficiently exploited. This area alone could meet the raw material requirements for several oilseed processing plants.

The Multan Division also has sizeable potential of arable land lying fallow. However, deficiency in irrigation water for spring sunflower crop creates a limitation for extensive cropping. The short period following the sunflower harvest, to plant cotton is another constraint. Moreover, cotton farmers are apprehensive to plant sunflower in their traditional crop rotation pattern fearing the transfer effect of stem-rot and subsequent lower yields for their cotton crop.

However, the extensive hectarage is substantive enough to constitute a resource potential for expansion of oilseed production. In short, the plains of south central Punjab form a natural production zone for sunflower in the Rabi and Kharif seasons. The most suitable area of operation for procurement could be a site near Mian Channu. This site is favorably located for accessibility to both cottonseed as well as sunflower seed. Multan and Mian Channu would serve as suitable locations for the establishment of two procurement centers respectively.

3.5 Selection of Villages and Identification of Potential Growers

See Table A-2: Projected Yields and Number of Villages Required as per Requirements of the Procurement and Extension Programs.

Based on the production program, the project will require by year 6, a minimum of 164 villages to be encompassed under the procurement program. Each village should initially (year 1) allocate a minimum crop production area of 100 hectares, annually increased to the target of 150 hectares per village by year 6.

The targeted hectarage under sunflower crop per village is an average estimate based on combined data related to the available cultivable land and the existing cropping pattern in the villages of the areas hereabove identified.

The initial task of the extension team will be to identify and select suitable villages, with a favorable response from potential growers to crop sunflower. This criteria for selection of villages and potential growers, would be essential to determine the future success of the oilseed development program, whereby every selected village and contract grower would serve as a demonstration for others to follow the success of the initiative.

3.6 Recruitment and Selection of Village Oilseed Workers

In support of the development initiative, it is necessary to establish a close working relationship and link with the grower. This can be achieved by employing the services of a Village Oilseed Worker (VOW) who will act in support of the procurement and extension staff.

The role of the VOW will be as follows:

- The VOW will be self-employed, receiving remuneration through a commission payable for the services he renders (see Part I, Chapter 2, hereabove).
- The VOW would serve as a resident representative of the project, providing essentially needed production inputs for sale to the contract growers.
- At the time of procurement, the VOW would provide the service as a village collection station operator for oilseed on behalf of the project (see Chapter 2, the Grower Contract).
- The VOW would facilitate the procurement system by receiving and handling the seed, and be responsible for transporting the oilseed in bulk to the nearest procurement center.
- The VOW procurement center would also serve as the first quality control check point to ensure that the quality standard for moisture, foreign matters and damaged seeds are adhered to.

3.7 Initiation of a Development Program

The development program to be launched by the extension teams is to be carried out in three phases consisting of:

- Awareness

- Acceptance
- Implementation

The Development program has an annual time constraint limited to approximately 28 weeks. This time frame is based on the following:

a. Available free time during the calendar cropping year to receive and respond to new ideas: 6 to 8 weeks,
b. Available time to plan the next cropping calendar: 4 to 8 weeks.
c. Available time for implementation after receipt of income from sales of previous crop: 4 to 8 weeks.

During these 28 weeks, farmers are available to receive and respond to external stimuli. The remaining time, the farming communities are involved in their traditional obligations and routine chores.

Awareness: 6-8 weeks. Available Free time during calendar cropping.

Each extension team can only utilize this period to introduce new ideas and expect the farmers to respond favorably. Rural communities in the Punjab generally need a gestation period of approximately 6 weekly visits to receive and digest the awareness program.

Acceptance: 4-8 weeks.Available time to plan next cropping calendar following plantation.

Following which, one can expect to begin the cumbersome phase of acceptance. This is based on experiences derived from rural development projects dealing with rural communities in central Punjab. The acceptance phase may last from 2 weeks to 12 weeks, depending on the economic profile of that community. Financially strong communities have a raised acceptability.

Implementation: 4-8 weeks. Time immediately following receipt of income from sale of crop.

The extension initiative is exclusively launched through two extension teams operating at each procurement center.

Based on the time constraint of 28 weeks available for development activities, it is not logistically possible to develop more than 20 villages per year per team. Therefore, year 0 beginning with a total of 41 villages and one team per center, the number of villages is increased according to the requirements of the procurement program (see Table A-2). The second extension team begins its assignment in year 1, it is also used for the monitoring evaluation and

procurement operation started by the spearhead extension team. A total of four teams (two per center) should be operational in year 1.

II. TECHNICAL REQUIREMENTS

1. EQUIPMENT REQUIREMENT OF THE PROCUREMENT DIVISION

See Table A-3 : Fixed Investment Cost for Phase 1 and Phase 2.

1.1 Oilseed Bulk Handling and Storage System

Phase-I: Introduction of a bulk handling system at the farm/village level and transportation of sunflower seed to the nearest procurement center.

The VOW can receive the sunflower seed in bulk from each farmer and, with the use of grain conveyers, load the seed on box bedded tractor trollies readily available in the rural areas.

The grain conveyers which have been introduced by Hutchinson through the 'Kansas State Grain Handling Project' are portable and tractor-driven and can transfer seed at the rate of 40-60 tons per hour (see Annex A-2). Where mechanical combine harvesters are used, tractor driven grain conveyers could easily be used in the farmer fields. This equipment will be purchased by the procurement division and can be moved from one village to another.

Each village will annually produce between 170 tons (year 1 = 100 ha per village x 1.7 t/ha) and 330 tons (year 6 = 150 ha per village x 2.2 t/ha) of sunflower seed (see Table A-2). The transportation of the bulk seed to the nearest procurement center will be the responsibility of the VOW who can be remunerated for the service rendered by a commission based on the volume delivered. A proposed commission is Rs.50/ton. This commission is included in the cost structure of sunflower seed (see Table A-1).

Phase-II: Introduction of bulk handling technology at the procurement center

It is anticipated that daily quantities ranging from 200 to 600 mt of seeds (see Table A-4) will need to be received, handled, aerated and re-shipped from the field procurement center to the main processing plant.

To begin with, all tractor trollies/trucks loaded with bulk seed would be unloaded at the reception area using a hydraulic lift truck/trolley dumper. Following the bulk reception, grain conveyers with a capacity of 100 tons/h would be used along with aspirators, for the purpose of continuous cleaning and loading into storage silos (see Annexes A-2, A-3, A-4 and A-5). The designed capacity at the procurement center for seed storage is approximately 200 tons/Thermo-

Flex silo (see phase-IV hereafter for a description of the Thermo-Flex storage system), with a holding capacity of approximately 200 to 400 mt/day. Even though the storage holding capacity is low, the objective here is to transport sunflower seed as early as possible to the processing plant storage, for final cleaning and storage. This entails a high loading and unloading capacity for the grain handling equipment. A point of note when selecting such equipment is to ensure that friction and drag will not cause seed temperature to rapidly rise creating hot spots which are highly combustible. For this purpose, low-friction grain conveyers must be selected. All seed silos' have built-in aeration systems to safeguard against inflammability.

The procurement area is located in South Central Punjab where the environmental temperatures are extremely high (in excess of 45^0 celsius) with excessively low humidity levels during the months of May and June, the period for sunflower seed procurement. The seed moisture levels are below 13%, and till such time, as spring sunflower procurement is the main season of supply, no drying facilities are necessary at the procurement center (see Annex A-8).

Except from a truck dumper and 100 ton conveyor that can also be used in the villages with a 40 ton conveyor, no such facility as described hereabove will be available at the plant procurement center where the seed, delivered by the VOWs will be unloaded, cleaned by the machines, installed at the plant for this purpose and directly lifted into big silos for final storage. (There are no phases II and III for the sunflower seed delivered at the plant procurement center).

Phase-III: Transportation of daily volumes of seed in bulk from the field procurement center (sunflower seed) or from ginning factories (cottonseed) to the plant.

As mentioned in the first part of this section (chapter 1, Procurement program), daily tonnages of cottonseed ranging from 525 to 697 tons (see Table A-4) will have to be shipped from ginning factories to the plant during a 150-day procurement period. Similarly, daily quantities of sunflower seed ranging from 200 tons up to 584 tons will be transferred from the field procurement center to the main site of the plant during a 45-day procurement period.

For bulk transportation, 20 ton-trucks (NLC type) will be used on a rental basis. Assuming that a maximum of five hours are required for a return trip between the procurement center or the ginning factory and the plant site, including loading and unloading, the same truck can do two trips per day. Therefore, for the procurement of cottonseed, from 14 (year 1) to 18 trucks (year 5) will be required on a daily basis during 150 days. For the procurement of sunflower seed, 5 (year 1) to 15 trucks (year 6) will be required during 45 days (see Table A-4).

It is important that the procurement division arranges a contract with a shipping company owning 20 ton trucks which are less common than 10 ton trucks but more appropriate for the

transportation of such volumes in bulk form. Trucks will be loaded with seed conveyors and unloaded with a truck-dumper available at the plant procurement center.

The cost of transportation from the field procurement center or from the ginning factory to the plant site is roughly estimated to be Rs.150 per ton of seed, including octroi charges, provided that the ginning factories and the area where the field procurement center will be located are selected according to the recommendations made hereabove (see part I, chapter 3 and also section B of the concept paper). The cost estimate of raw materials (see Table A-1) includes shipment to the plant. To be conservative when calculating the net cost of sunflower seed (see Table A-12), one would deduct, in addition to the cost of input for sunflower cultivation, Rs.200 per ton (Rs.50 for the commission of the VOW and Rs.150 for the main shipment) from the cost of the total volume of sunflower seed procured, despite the fact that about half of the seed is delivered at the plant site by the VOWs and does not have to be re-shipped by trucks.

Phase-IV: Reception, cleaning and final bulk storage of the raw material.

The final phase of bulk handling is at the plant procurement center where a bulk storage facility is installed for all the oilseed procured.

The rate of flow of oilseed (cotton/sunflower) must be of a high capacity. Similar to the equipment available at the procurement center, a high-load capability hydraulic lift-truck dumper of 50 tons/hr capacity will be installed at the seed reception area. Grain conveyors of 150-200 mt per hour, along with continuous flow aspirators, will be used to load the oilseed into seed silos.

Traditionally all oilseeds are stored in bags in fixed storage structures throughout Pakistan. The project will initiate bulk storage of oilseeds. The Thermo-Flex system is selected in this concept paper because of a good quality/price ratio.

The Thermo-Flex storage system consists of an air supported structure, the diameter of which can vary to accommodate different storage requirements. This system, depending on the capacity, operates with two or three phase 2 HP-10 HP motors for blowers to act as an inflator and also for aeration. Complete technical specifications for the Thermo-Flex system are given in Annexes A-5 and A-6.

The Thermo-Flex seed house will be fully fitted with grain conveyers for rapid movement of cotton/sunflower seed to avoid hot spots within the storage area. The major energy is consumed by the bulk grain handling equipment which requires a 15 HP motor per conveyor. Therefore, the storage system will be equipped with a stand-by power generator at the field procurement

center to ensure non-stop procurement and storage operation. This is not necessary at the plant procurement center as energy is produced on the plant site (see section B).

A small capacity version of 200 tons is available for approximately US$ 60,000 and will be used at the field procurement center (see phase-II hereabove). Final storage will be done in domes with a grain storage capacity ranging from 18,000 mt to 33,000 mt. This wide range capacity for a dome depends on whether the structure is attached to the ground or an 8 foot stub wall. The storage requirements for cottonseed and sunflower seed from year 1 to year 6 are defined in table A-5. The density of sunflower seed is twice the one of cottonseed and it is estimated that 2 seed houses will be required during the first phase of operation and a third one will be needed for the second phase, provided the maximum capacity of one air supported structure is used.

The cost of one large seed house is estimated at US$ 338,700 CIF Karachi. It includes the structure, the aeration system, a powered roof vent, the grain loading equipment and aeration PVC lines.

To ensure safety and minimum risk, all seed silos will be installed with temperature/humidity controllers automatically connected to the aeration system of the seed silos (cost estimate US$ 45,500, see also Table A-3).

The argument against inflatable Thermo-Flex storage is the constant requirement for energy to sustain its structure, although the total energy requirements are relatively low. An alternative to the Thermo-Flex structure is the Muskogee type building which is described in Annex A-7.

Note:
To maintain the quality of the oilseed until the processing stage, it is recommended to clean them before final storage as foreign matters may affect their quality during the storage period. However, it is not possible to estimate the cost of cleaning equipment in this section because the main world supplier of seed cleaning equipment is also manufacturing delinting and dehulling machines and only a global estimate for cleaning-delinting-dehulling equipment for a 500 mt plant was available. Therefore, the cost estimate of the cleaning machines will be found in section B of this report along with the cost of processing equipment. Moreover, it must be noted that the cleaning capacity required before final storage is higher than the capacity needed if the oilseeds are to be cleaned just before processing. This is because the daily quantity procured is higher than the daily quantity processed.

1.2 Farm Machinery and Equipment Required for the Extension Program

It is reported that sunflower is mainly cultivated on medium to large farms (greater than 10 ha,

PARC/CIMMYT Paper 90-8). The average economic size of holding in the areas where the procurement centers will operate, was an important criteria when elaborating the rationale for the location of the plant (see section B, part I, chapter 2), as mechanized cultivation is most likely to be found on medium to large farms. Therefore it is assumed that tractors will be available on most of the farms selected for a contract with the procurement division of the project.

The use of proper farm implements for sunflower cultivation must be encouraged by the extension teams. For demonstration plots, each team will be equipped with the following implements (see a description of farm machinery hereafter, see also Annex A-11 and Table A-3 for the cost of implements):

- Tractor
- Chisel plough
- Ridger
- Offset disk harrow
- Moldboard plough
- Sunflower harvesting kit

On the basis of results obtained in the demonstration plots, the procurement division could assist any farmer willing to rent any implement.

The farm machinery required for sunflower cultivation falls into four categories:

- Land Preparation
- Planting
- Interculture
- Harvesting

Tillage

The basic tractor-drawn tiliage implement in Pakistan is the cultivator. Its constant use as the primary tillage implement commonly results in the formation of a plough-pan at a depth of approximately four inches, that is difficult for plant roots and moisture to penetrate. This is of particular importance for deep-rooted crops such as sunflower which require deep ploughing in any case. While deep ploughing implements will vary with type of soil, the ones most closely adapted to the types of soil in the project area are moldboard and chisel ploughs that can reach to depths of 6-13 inches, respectively. This type of ploughing is essential but does not need to be repeated annually, only once every two or three years. In other years, disc ploughs and even the ubiquitous cultivator can be used to good effect.

Planting

In order to optimize crop density and maintain the regular distances necessary for mechanical interculture and harvesting, mechanical planters are indispensable. Mechanical planters have rapidly gained ground in Pakistan, especially for the major crops of wheat and cotton. These two types of planters are also used, with varying degrees of efficiency for a variety of other crops. Sunflower seed however, is not well suited for use in wheat or cotton planters.

Dedicated sunflower planters of local manufacture, with fertilizer application capability are now available. While it may not be possible for most farmers to purchase one, leasing or hiring equipment would bring these within reach of the average sunflower grower.

Interculture

The main interculture operation required is ridging, at a stage when the plants are between one to two feet high. This raises the seed bed, facilitating more efficient water use, controls weeds and reduces lodging. A number of cotton farmers already use ridgers for the cotton crop; thus, the implement is familiar and present in the area even if it is not widely prevalent.

Harvesting

An increasing shortage of labor at harvest time has led to an increase in mechanical harvesting of major crops with combine harvesters. Sunflower is a difficult crop to harvest manually and threshing presents further problems.

The procurement division would like to encourage mechanical harvesting firstly, because it saves time and secondly, because it will enable the possibility of introducing bulk handling at the village/farm level.

Since custom combine harvesting operation has been introduced in Pakistan, the project plans to use the existent service. The time of sunflower harvesting follows wheat harvest time. This is favorable as it does not coincide or compete with any other traditional crop and the combine harvesting operators are relatively free to provide the service. The limitation is that most harvesting companies do not possess the sunflower harvesting kit which is an essential attachment to perform the job.

It is recommended that to encourage the cause and demonstrate their economic viability, sunflower harvesting kits which cost Rs. 22,000, be purchased by the project and leased to the

local harvesting operator. Once this operation clearly demonstrates its feasibility within a harvesting season, the custom operators can buy and run them at their own cost.

Machine Station

Furthermore, the combine harvesting companies can also fulfill the role of the custom farm implement rental service on behalf of the project, to meet the land tillage requirements of the contract growers.

The hourly rental rate can either be charged directly to the farmer in cash at the time of job completion, or the machine station custom rental service can be assured payment from the procurement division when the registered grower sells his contracted sunflower crop.

In addition to the farm implements listed hereabove, the extension teams will need vehicles for transport and field equipment for communication and awareness programs and seed quality control (moisture testers, etc.).

2. ANNUAL REQUIREMENT AND COST OF SUNFLOWER PRODUCTION INPUTS

Based on the optimum technical requirements for cultivation of sunflower (see Annex A-9), it is essential that production inputs are provided to enable the farmer to derive highest yields and income from sunflower. The targeted yields should increase incrementally every year from 1.6 mt/ha to 2.2 mt/ha. Such results are only possible through correct application of production inputs with appropriate technical knowledge.

The following production inputs are needed to achieve optimum results:

1. Hybrid sunflower seed

   7.5 kg/ha or 3.0 kg/acre

2. Fertilizer

   DAP 125.0 kg/ha or 50.0 kg/acre
   Urea 187.5 kg/ha or 75.0 kg/acre
   SOP 62.5 kg/ha or 25.0 kg/acre

3. Pesticide & weedicide

   BHC 125.0 kg/ha or 5.0 kg/acre
   Methyl Parathion 1500 ML/ha or 600 ML/acre
   Dysiston 17.5 kg/ha or 7.0 kg/acre

Source: technical specifications for sunflower cultivation derived from Pioneer and GCP recommendations, Annex A-9.

The annual requirements and cost of hybrid seed, fertilizer and pesticide are defined in Tables A-6 to A-10. These quantities will be purchased in December directly by the procurement division from the manufacturers at wholesale prices and distributed via the Village Oilseed Worker to the contract growers. The total annual cost of production inputs is found in Table A-11.

The unit cost estimate of the various production inputs is based on IBRD's projected price for 1990 and on the RONCO/ACSCA Industry Case Studies. For pesticides and weedicides, the cost estimate per hectare is derived from GCP field results for 1991 (see Annex A-10). Cost variations for 1990-1991 and the recommended commission for the VOW are taken into account in the cost structure.

III. PERSONNEL

1. PERSONNEL REQUIREMENT OF THE PROCUREMENT DIVISION

Procurement and extension personnel required are listed in Table A-13, along with base salaries and wages.

The development manager is a key figure in the success of the program. He is responsible for the sunflower seed purchases and must ensure that sunflower is developed as a major crop in his procurement area.

The purchase manager and the extension manager are both responsible to the development manager for their respective programs. All three are expected to be highly mobile within the plant's overall procurement area.

The purchase manager is responsible for purchases from contracted farmers from whom his section is also responsible for recovery of funds advanced in the form of production inputs.

The rest of the staff will be divided between the two procurement centers. The labor is to be hired at daily rates during the procurement period for both cottonseed and sunflower.

The personnel in charge of seed handling and storage is increased in year 4, to face the increasing oilseed requirement of the procurement program (see Table A-13).

2. TECHNICAL ASSISTANCE AND TRAINING OF PERSONNEL

Personnel requirements stipulated under the technical assistance program consists of expatriate advisors for training and transfer of technology:

Extension Expert: 1 Man * 12 Months
With extension and communication skills including audio-visual media techniques for a farmer awareness program.

Oilseed Agronomist: 1 * 12 Man Months
For transfer of appropriate technology to grow high yielding varieties of sunflower under local conditions, and training local co-workers as trainers for the contract growers.

These two foreign experts are expected to train the personnel during the pre-operational phase (year 0).

Additional technical assistance is required in years 1 and 2, for transfer of technology in the field of oilseed storage and handling:

Storage & Grain Handling Experts: 2 Men * 3 Months / Year

The cost of training is roughly estimated at US$ 10,000 per man per month, whatever the qualification of the expert is.

Provision for training of the procurement and extension staff beyond year 2 will be available (see the synthesis note on training of personnel for the Oilseed Commodity System Project).

TABLE A-1 ANNUAL AND DAILY REQUIREMENTS AND COSTS OF RAW MATERIALS

	RAW MATERIAL	ANNUAL REQUIREMENTS (MT) (1)	DAILY REQUIREMENTS (MT) (2)	COST/MT (Rs.) (3)	DAILY COST (Rs.)
YEAR 1	COTTONSEED	78,750	525	2,750	1,443,750
	SUNFLOWER SEED	18,000	400	6,000	2,400,000
YEAR 2	COTTONSEED	88,000	587	2,888	1,694,293
	SUNFLOWER SEED	22,750	506	6,300	3,185,000
YEAR 3	COTTONSEED	99,000	660	3,032	2,001,120
	SUNFLOWER SEED	28,000	622	6,615	4,116,000
YEAR 4	COTTONSEED	104,500	697	3,184	2,218,187
	SUNFLOWER SEED	33,750	750	6,946	5,209,500
	BASIC REFINED CS OIL	15,235	69	16,207	1,122,335
	BASIC REFINED SUN OIL	1,012	11	19,101	214,695
YEAR 5	COTTONSEED	104,500	697	3,343	2,328,957
	SUNFLOWER SEED	40,000	889	7,293	6,482,667
	BASIC REFINED CS OIL	19,635	89	17,017	1,518,798
	BASIC REFINED SUN OIL	2,200	22	20,056	441,233
YEAR 6	COTTONSEED	99,750	665	3,343	2,223,095
	SUNFLOWER SEED	54,000	1,200	7,293	8,751,600
	BASIC REFINED CS OIL	22,942	109	17,017	1,859,145
	BASIC REFINED SUN OIL	2,820	24	20,056	471,317

(1) See the production program, section B, part I, chapter 4
(2) Procurement period:
- for cottonseed = 150 days
- for sunflower seed = 45 days
- Cottonseed and sunflower oils are purchased on a daily basis and their procurement periods are as the period of oil production (see the production program, section B, part I, chapter 4, table 11)

(3) Cost of raw materials delivered at the plant: team estimate based on 1990-1991 average prices
- Cottonseed = Rs. 2,750/ton
- Sunflower seed = Rs. 6,000/ton
- Basic refined cottonseed oil = Rs. 14,000/ton
- Basic refined sunflower seed oil = Rs. 16,500/ton

TABLE A-2 PROJECTED YIELDS AND NUMBER OF VILLAGES REQUIRED
AS PER REQUIREMENTS OF THE PROCUREMENT AND EXTENSION PROGRAMS

	MT SEEDS REQUIRED (1)	YIELD TON/HA (2)	TOTAL HA REQUIRED	HECTARAGE / VILLAGE (3)	NO VILLAGES REQUIRED	VILLAGES PLANT / FIELD (4)		PROJECTED ANNUAL PROD. PER VILLAGE (TON) (5)
YEAR 0	5,200	1.6	3,250	80	41	21	20	128
YEAR 1	18,000	1.7	10,588	100	106	53	53	170
YEAR 2	22,750	1.8	12,639	110	115	60	55	198
YEAR 3	28,000	1.9	14,737	120	123	65	58	228
YEAR 4	33,750	2.0	16,875	130	130	70	60	260
YEAR 5	40,000	2.1	19,048	140	136	75	61	294
YEAR 6	54,000	2.2	24,545	150	164	84	80	330

(1) As per requirement of the procurement program year 1 to year 6, except for year 0 = pre-operational phase
(2) Projected Sunflower Yield
(3) Projected hectarage under sunflower crop per village
(4) Number of villages depending on the procurement and extension centers installed at the plant site/in the field
(5) Projected annual production of sunflower seeds per village

TABLE A-3 PHASE 1 / PROCUREMENT CENTERS / FIXED INVESTMENT

(see the footnote for each item)	NO OF UNIT PER PROCUREMENT CENTER		UNIT COST		INVESTMENT COST IN RUPEES	
	Plant Center	Field Center	Imported	Local	Plant Center	Field Center
LAND						
1 . Land	footnote	5		100,000		500,000
IMPORTED EQUIPMENT						
2 . Cleaning equipment	footnote					
3 . Thermo-Flex struc./large capa.	2		338,700		15,580,200	
4 . Temp. & hum. control system	2		45,500		2,093,000	
5 . Thermoflex struc./small capa.		2	60,000			2,760,000
6 . Truck Dumper	1	1	36,400		837,200	837,200
7 . Conveyor (40 ton)	8	8	6,000		1,104,000	1,104,000
8 . Conveyor (100 ton)	4	4	9,000		828,000	828,000
9 . Aspirator		2	15,000			690,000
LOCAL EQUIPMENT FOR PROCUREMENT PURPOSES						
10 . Vehicule / car	1	1		500,000	500,000	500,000
11 . Vehicule / motorbike	1	1		30,000	30,000	30,000
12 . Weighbridge	1	1		30,000	30,000	30,000
13 . Generator		1		425,000		425,000
14 . Conveyor and aeration		lumpsum		200,000		200,000
15 . Office equipment & Air cond.	lumpsum	lumpsum		200,000	200,000	200,000
LOCAL EQUIPMENT FOR EXTENSION PURPOSES						
16 . Vehicule / car	2	2		500,000	1,000,000	1,000,000
17 . Vehicule / motorbike	2	2		30,000	60,000	60,000
18 . Tractor	2	2		240,000	480,000	480,000
19 . Implements	2	2		64,000	128,000	128,000
20 . Sunflower harvesting kit	8	8		22,000	176,000	176,000
21 . Field equipment	2	2		50,000	100,000	100,000
INSTALLATION / BUILDING DESIGNATION						
22 . Administration and store	1,500	1,500		300	450,000	450,000
23 . Unloading bay and ramp	1	1		250,000	250,000	250,000
24 . Parking area	2,000	2,000		150	300,000	300,000
25 . Boundry wall		1,850		12		22,200
26 . Electricity installation		lumpsum		200,000		200,000
TOTAL INVESTMENT					24,146,400	11,270,400

TABLE A-3 (bis) - PHASE 2 / PROCUREMENT CENTERS / FIXED INVESTMENT

see the footnote for each item)	NO OF UNIT PER PROCUREMENT CENTER		UNIT COST		INVESTMENT COST IN RUPEES	
	Plant Center	Field Center	Imported (US $)	Local (Rs.)	Plant Center	Field Center
4PORTED EQUIPMENT						
3 . Thermo-Flex struc./large capa.	1		338,700		7,790,100	
4 . Temp. & hum. control system	1		45,500		1,046,500	
3TAL INVESTMENT					8,836,600	

ootnotes for Tables III & III(bis)

1 . Unit = 1 acre. In addition to the area required for the silos, 5 acres of land are required for the procurement center located at the plant site. The cost estimate for the silos and the procurement area needed at the plant is estimated under section B. of the concept paper.
2 . Cleaning equipment cost is estimated with dehulling and delinting equipment as quotations provided by manufacturers give the breakdown. Therefore refer to section B = processing unit report
3 . Seed house: capacity ranging from 18,000 to 33,000 mt. Includes aeration and conveying system.
4 . One system per large Thermoflex structure
5 . Seed house: capacity 200 tons each
6 . Hydraulic truck dumper. Size = 10' x 30'
7 . Portable, to be used in the villages
8 . Portable, to be used in the villages and at the procurement center
9 . To load the seeds into the small Thermo-Flex silos
0 . Toyota twin cab pickup truck
3 . 75 KVA. A generator is not needed at the plant center as there is a power station on the plant site.
4 . Local equipment to be used for the small silos at the field procurement center (additional parts to the imported machinery).
6 . Toyota twin cab pickup truck
8 . 75 HP tractor
9 . Each team will be equipped with the following implements :

Chisel plough	@ Rs. 9,000
Ridger	@ Rs. 8,750
Offset disk harrow	@ Rs. 21,975
Mouldboard plough	@ Rs. 11,000
Total	= Rs. 63,875 (about Rs. 64,000)

1 . Each extension team has its field equipment. It includes moisture testers etc.
2 . Unit = square feet @ Rs. 300 / sq. ft.
4 . Parking area for the trucks. Unit = square feet @ Rs. 150 / sq.ft.
5 . Unit = foot @ Rs. 12 / ft. For the plant center, the wall is the same as the one of the plant site.
6 . Wapda connection, including transformer

axes (Iqra tax, surcharge etc.) on imported equipment are calculated in the financial analysis section,
s well as the cost of erection and installation.

TABLE A-4 DAILY QUANTITIES OF SEEDS TO BE SHIPPED AS PER PROCUREMENT REQUIREMENT AND NUMBER OF 20 TON TRUCKS REQUIRED

	DAILY QUANTITIES TO BE SHIPPED (TON) (1)		NUMBER OF TRUCKS REQUIRED DAILY (2)		PROCUREMENT PERIOD (DAYS)	
	Cottonseed	Sunflower seed	Cottonseed	Sunflower seed	Cottonseed	Sunflower seed
YEAR 1	525	200	14	5	150	45
YEAR 2	587	242	15	7	150	45
YEAR 3	660	293	17	8	150	45
YEAR 4	697	346	18	9	150	45
YEAR 5	697	399	18	10	150	45
YEAR 6	665	584	17	15	150	45

(1) The daily quantity to be shipped for cottonseed are obtained from Table I
The daily quantity of sunflower seed to be shipped is calculated by multiplying the annual production of one village by the number of villages depending on the field procurement center (see Table II) and then by dividing by 45 days.

(2) 20 ton truck doing two return trip between the ginning factory or the field procurement center and the plant. Figures are rounded up to the next superior unit.

TABLE A-5 MAXIMUM STORAGE REQUIREMENTS FOR COTTONSEED AND SUNFLOWER SEED

	QUANTITY OF SEED PROCESSED DAILY (MT) (1)		NUMBER OF PROCESSING DAYS BEYOND THE PROCUREMENT PERIOD		MAXIMUM STORAGE REQUIREMENTS (MT) (2)	
	Cottonseed	Sunflower seed	Cottonseed	Sunflower seed	Cottonseed	Sunflower seed
YEAR 1	375	300	60	35	22,500	10,500
YEAR 2	400	325	70	55	28,000	17,875
YEAR 3	450	350	70	65	31,500	22,750
YEAR 4	475	375	70	75	33,250	28,125
YEAR 5	475	400	70	85	33,250	34,000
YEAR 6	475	450	60	95	28,500	42,750

(1) For the quantity daily processed and the number of days of processing after the end of the procurement period, refer to the production program, section B, part I, chapter 4.
(2) The maximum storage requirements are to be encountered the last day of the procurement period when inventories are built up for processing beyond this day.

TABLE A-6 ANNUAL REQUIREMENT AND COST OF SUNFLOWER HYBRID SEED

	TOTAL HA SOWN	HYBRID SEED MT/YEAR	Rs/MT	TOTAL COST Rs. 000'
YEAR 0	3,250	24.375	120,000	2,925
YEAR 1	10,588	79.410	120,000	9,529
YEAR 2	12,639	94.793	126,000	11,944
YEAR 3	14,737	110.528	132,300	14,623
YEAR 4	16,875	126.563	138,915	17,581
YEAR 5	19,048	142.860	145,861	20,838
YEAR 6	24,546	184.095	145,861	26,852

- Seed rate = 7.5 kg/ha
- Unit cost estimate based on 1990/91 prices and RONCO/ACSCA Industry Case Study

TABLE A-7 ANNUAL REQUIREMENT AND COST OF FERTILIZER : DAP

	TOTAL HA	BAG/YR 50 KG	MT/YEAR	Rs/BAG	Rs/MT	TOTAL COST Rs. 000'
YEAR 0	3,250	8,125	406	290	5,800	2,356
YEAR 1	10,588	26,470	1,324	290	5,800	7,676
YEAR 2	12,639	31,598	1,580	305	6,090	9,621
YEAR 3	14,737	36,843	1,842	320	6,395	11,779
YEAR 4	16,875	42,188	2,109	336	6,714	14,163
YEAR 5	19,048	47,620	2,381	352	7,050	16,786
YEAR 6	24,546	61,365	3,068	352	7,050	21,631

- DAP rate = 125 kg/ha/year = 2.5 bags/ha/year
- Source for unit cost : IBRD, projected price for 1990

TABLE A-8 ANNUAL REQUIREMENT AND COST OF FERTILIZER : UREA

	TOTAL HA	BAG/YR 50 KG	MT/YEAR	Rs/BAG	Rs/MT	TOTAL COST Rs. 000'
YEAR 0	3,250	12,188	609	250	5,000	3,047
YEAR 1	10,588	39,705	1,985	250	5,000	9,926
YEAR 2	12,639	47,396	2,370	263	5,250	12,442
YEAR 3	14,737	55,264	2,763	276	5,513	15,232
YEAR 4	16,875	63,281	3,164	289	5,788	18,314
YEAR 5	19,048	71,430	3,572	304	6,078	21,706
YEAR 6	24,546	92,048	4,602	304	6,078	27,971

- Urea rate = 187.5 kg/ha/year = 3.75 bags/ha/year
- Source for unit cost : IBRD, projected price for 1990

TABLE A-9 ANNUAL REQUIREMENT AND COST OF FERTILIZER : SOP

	TOTAL HA	BAG/YR 50 KG	MT/YEAR	Rs/BAG	Rs/MT	TOTAL COST Rs. 000'
YEAR 0	3,250	4,063	203	100	2,000	406
YEAR 1	10,588	13,235	662	100	2,000	1,324
YEAR 2	12,639	15,799	790	105	2,100	1,659
YEAR 3	14,737	18,421	921	110	2,205	2,031
YEAR 4	16,875	21,094	1,055	116	2,315	2,442
YEAR 5	19,048	23,810	1,191	122	2,431	2,894
YEAR 6	24,546	30,683	1,534	122	2,431	3,729

- SOP rate = 62.5 kg/ha/year = 1.25 bag/ha/year
- Source for unit cost : IBRD, projected price for 1990

TABLE A-10 ANNUAL COST OF PESTICIDES AND WEEDICIDES

	TOTAL HA	Rs/HA	TOTAL COST Rs. 000'
YEAR 0	3,250	500	1,625
YEAR 1	10,588	500	5,294
YEAR 2	12,639	525	6,635
YEAR 3	14,737	551	8,124
YEAR 4	16,875	579	9,767
YEAR 5	19,048	608	11,576
YEAR 6	24,546	608	14,918

- Cost estimate / ha derived from Annexure 10: estimate cost of production of sunflower, 1991 crop (Source : GCP Seed Division)

TABLE A-11 ANNUAL COST OF PRODUCTION INPUTS

	TOTAL HA	HYBRID SEED	FERTILIZER	PESTICIDES	TOTAL COST Rs.000'
YEAR 0	3,250	2,925	5,809	1,625	10,359
YEAR 1	10,588	9,529	18,926	5,294	33,749
YEAR 2	12,639	11,944	23,722	6,635	42,301
YEAR 3	14,737	14,623	29,042	8,124	51,789
YEAR 4	16,875	17,581	34,919	9,767	62,267
YEAR 5	19,048	20,838	41,386	11,576	73,800
YEAR 6	24,546	26,852	53,332	14,918	95,102

TABLE A-12 PROCUREMENT COST OF SUNFLOWER SEED (IN RUPEES)

	MT SEEDS REQUIRED	YIELD TON/HA	TOTAL HA REQUIRED	TOTAL PRODUCTION UNDER CONTRACT	COST/TON RAW MATERIAL Rs.	ANNUAL COST RAW MATERIAL Rs. 000'	ANNUAL COST INPUTS Rs. 000'	COST INPUT PER TON Rs.	NET COST OF SEEDS (2) Rs.
AR 0	NONE (1)	1.6	3,250	5,200	6,000	31,200	10,359	1,992	3,808
AR 1	18,000	1.7	10,588	18,000	6,000	108,000	33,749	1,875	3,925
AR 2	22,750	1.8	12,639	22,750	6,300	143,325	42,301	1,859	4,241
AR 3	28,000	1.9	14,737	28,000	6,615	185,220	51,789	1,850	4,565
AR 4	33,750	2.0	16,875	33,750	6,946	234,419	62,267	1,845	4,901
AR 5	40,000	2.1	19,048	40,000	7,293	291,722	73,800	1,845	5,248
AR 6	54,000	2.2	24,545	54,000	7,293	393,824	95,102	1,761	5,332

) No seed is required Year 0 as the plants starts its operation on year 1.
ever sunflower seed will be produced as part as the production under the extension program to take place on year 0.
) The net cost/ton of sunflower seed is obtained by deducting the cost/ton of input and 200 rupees per ton for transportation arges from the cost/ton of raw material

TABLE A-13 PROCUREMENT AND EXTENSION PERSONNEL SALARIES

DESIGNATION	NUMBER OF PERSONS	BASE SALARY MONTHLY	YEAR 1 COST PER MONTH	ADDITIONAL PERSONNEL TO BE HIRED FROM YEAR 4
Development Manager	1	40,000	40,000	
Purchase Manager	1	20,000	20,000	
Purchase Officer	2	16,500	33,000	
Purchase Assistant	8	6,000	48,000	
Agronomist/Extension Manager	1	20,000	20,000	
Extension Agronomist	8	13,500	108,000	
Extension Assistant	8	9,000	72,000	
Store Manager	1	36,000	36,000	
Seed House Supervisor	7	12,000	84,000	+ 3
Seed House Operator	6	8,000	48,000	+ 3
Seed House Helpers	12	2,000	24,000	+ 6
Seed Handling Supervisor	2	12,000	24,000	
Seed Handling Assistant	2	8,000	16,000	
Bookeeper	4	9,000	36,000	
Operator	8	6,000	48,000	
Mechanic	4	6,000	24,000	
Security Staff	6	3,000	18,000	
Driver	6	5,000	30,000	
Tractor Operator	4	6,000	24,000	
Total			753,000	
Fringe benefit 50 %			376,500	
TOTAL PERSONNEL			1,129,500	

TABLE A-13(bis) - CASUAL LABOR FOR PROCUREMENT OF OILSEEDS

	NUMBER	BASE SALARY DAILY	NUMBER OF DAYS PER YEAR	YEAR 1 ANNUAL COST
Casual Labor	58	80	200	928,000
Fringe Benefit 15 %				139,200
TOTAL CASUAL LABOR				1,067,200

DESIGNATION	NUMBER OF PERSONS	BASE SALARY MONTHLY	NUMBER OF MONTHS	YEAR 0 ANNUAL COST
MANAGERIAL AND ADMINISTRATIVE PERSONNEL				
Chief Executive	1	100,000	12	1,200,000
General Manager Finance	1	80,000	11	880,000
Factory Manager	1	80,000	6	480,000
Personnel Manager	1	60,000	11	660,000
Assistant Finance Manager	1	60,000	3	180,000
Assistant Personnel Manager	1	40,000	3	120,000
Purchase Officer	1	16,500	3	49,500
Account Officer	1	25,000	3	75,000
Administrative Manager	1	50,000	3	150,000
Account Assistant	2	8,000	3	48,000
Store assistant	1	5,000	3	15,000
Security Officer	1	15,000	6	90,000
Typist	2	6,000	6	72,000
Security Staff	15	3,000	6	270,000
Drivers	2	5,000	11	110,000
Cook	1	3,000	6	18,000
Feen	2	2,000	6	24,000
Sweeper	1	2,000	6	12,000
PRODUCTION AND TECHNICAL PERSONNEL				
Production Manager	1	60,000	6	360,000
Chief Chemist	1	45,000	3	135,000
Technical Manager	1	36,000	6	216,000
Engineer	9	32,000	3	864,000
Mechanic	9	16,000	3	432,000
Electrician	6	16,000	3	288,000
Supervisor	24	12,000	3	864,000
Foremen	9	10,000	3	270,000
Operator	36	8,000	3	864,000
Worker	9	6,000	3	162,000
PROCUREMENT AND EXTENSION PERSONNEL				
Development Manager	1	40,000	11	440,000
Purchase Manager	1	20,000	11	220,000
Purchase Officer	2	16,500	6	198,000
Purchase Assistant	4	6,000	6	144,000
Agronomist/Extension Manager	1	20,000	11	220,000
Extension Agronomist	4	13,500	11	594,000
Extension Assistant	4	9,000	11	396,000
Store Manager	1	36,000	6	216,000
Seed house Supervisor	7	12,000	6	504,000
Seed house Operator	3	8,000	6	144,000
Seed handling Supervisor	2	12,000	6	144,000
Seed handling Assistant	2	8,000	6	96,000
Driver	2	5,000	11	110,000
Tractor Operator	2	6,000	11	132,000
Security Staff	2	3,000	11	66,000
MARKETING PERSONNEL				
Marketing Manager	1	80,000	11	880,000
Sales Manager Oil	1	40,000	6	240,000
Sales Manager Meal	1	40,000	6	240,000
Advertising Manager	1	40,000	6	240,000
Meal Nutritionist	1	30,000	6	180,000
Sales Officer Oil	2	25,000	6	300,000
Sales Officer Meal	2	25,000	6	300,000
Advertising Executive	1	25,000	6	150,000
Analyst/Programmer	1	20,000	6	120,000
Executive Secretary	1	10,000	11	110,000
Typist	3	6,000	3	54,000
Total				15,346,500
FRINGE BENEFIT 50 %				7,673,250
TOTAL PERSONNEL				23,019,750

Table A-14. ILLUSTRATIVE SUNFLOWER CROP FARM BUDGET
(Source: RONCO Oilseed Commodity System Paper year-5)

Operations/Inputs	Total Exp. Rs./Acre		Total Exp. Rs./HA
Land Preparation:	460		1136
Inputs:			
Seed	360		889
Fertilizer	715		1766
Pesticides	200		494
Irrigation	200		494
Labour:			
Sowing and Interculture	322		795
Harvesting:			
Combine	600		1,482
	2857		7057
Management Charges	148	155	366
Interest Charges @ 15% Per year for 6 months.	179	188	442
Total Cost of Production	3184		7864
Yield per Acre/Hectare	0.648 T/Acre	1.6 T/Ha	
Price Rs. 250/Mond	6250 Rs./Ton	6250 Rs./Ton	
Gross Income	4049		10000
Net Income	865		2136
Land Rent @ 1x1000	1000		2470
Profit/Loss	-135		-334

Year-1

Operations/Inputs	Total Exp. Rs./Acre		Total Exp. Rs./HA
Land Preparation:	483		1193
Inputs:			
Seed	378		980
Fertilizer	751		1854
Pesticides	210		519
Irrigation	210		519
Labour:			
Sowing and Interculture	338		835
Harvesting:			
[illegible]	630		1556
	3000		7456
Management Charges	155		384
Interest Charges @ 15% Per year for 6 months.	188		464
Total Cost of Production	3343		8304
Yield per Acre/Hectare	0.688 T/Acre	1.7 T/Ha	
Price Rs. 250/Mond	6563 Rs./Ton	6563 Rs./Ton	
Gross Income	4517		11157
Net Income	1174		2853
Land Rent @ 1x1000	1050		2594
Profit/Loss	124		259

YEAR - 2

Operations/Inputs	Total Exp. Rs./Acre		Total Exp. Rs./HA
Land Preparation:	558		1378
Inputs:			
Seed	437		1132
Fertilizer	867		2142
Pesticides	243		599
Irrigation	243		599
Labour:			
Sowing and Interculture	391		965
Harvesting:			
Combine	728		1797
	3465		8612
Management Charges	179		443
Interest Charges @ 15% Per year for 6 months.	217		536
Total Cost of Production	3861		9592
Yield per Acre/Hectare Price Rs. 250/Mond	0.729 T/Acre 6890 Rs./Ton	1.8 T/Ha 6890 Rs./Ton	
Gross Income	5021		12402
Net Income	1160		2810
Land Rent @ 1x1000	1103		2723
Profit/Loss	57		87

YEAR - 3

Operations/Inputs	Total Exp. Rs./Acre		Total Exp. Rs./HA
Land Preparation:	614		1516
Inputs:			
Seed	480		1246
Fertilizer	954		2356
Pesticides	267		659
Irrigation	267		659
Labour:			
Sowing and Interculture	430		1061
Harvesting:			
Combine	800		1977
	3811		9473
Management Charges	197		488
Interest Charges @ 15% Per year for 6 months.	239		590
Total Cost of Production	4248		10551
Yield per Acre/Hectare	0.769 T/Acre	1.9 T/Ha	
Price Rs. 250/Mond	7580 Rs./Ton	7580 Rs./Ton	
Gross Income	5831		14402
Net Income	1583		3851
Land Rent @ 1x1000	1213		2995
Profit/Loss	370		856

YEAR - 4

Operations/Inputs	Total Exp. Rs./Acre		Total Exp. Rs./HA
Land Preparation:	675		1667
Inputs:			
Seed	528		1370
Fertilizer	1049		2592
Pesticides	293		725
Irrigation	293		725
Labour:			
Sowing and Interculture	473		1167
Harvesting:			
Combine	880		2175
	4192		10421
Management Charges	217		536
Interest Charges @ 15% Per year for 6 months.	263		649
Total Cost of Production	4672		11606
Yield per Acre/Hectare	0.810 T/Acre	2.0 T/Ha	
Price Rs. 250/Mond	8338 Rs./Ton	8338 Rs./Ton	
Gross Income	6751		16676
Net Income	2079		5070
Land Rent @ 1x1000	1335		3295
Profit/Loss	744		1775

YEAR - 5

Operations/Inputs	Total Exp. Rs./Acre		Total Exp. Rs./HA
Land Preparation:	743		1834
Inputs:			
Seed	581		1507
Fertilizer	1154		2851
Pesticides	323		797
Irrigation	323		797
Labour:			
Sowing and Interculture	520		1284
Harvesting:			
Combine	969		2392
	4612		11463
Management Charges	239		590
Interest Charges @ 15% Per year for 6 months.	289		714
Total Cost of Production	5140		12766
Yield per Acre/Hectare	0.850 T/Acre	2.1 T/Ha	
Price Rs. 250/Mond	9070 Rs./To	9070 Rs./Ton	
Gross Income	7711		19047
Net Income	2572		6281
Land Rent @ 1x1000	1468		3625
Profit/Loss	1104		2656

I. TECHNICAL REQUIREMENTS

1. PLANT CAPACITY

1.1. Justification for a Rated Capacity of 500 metric tons per day (500 mt/d) as Daily Seed Intake

As a result of financial and technical constraints the majority of the oilseed processing plants recently sanctioned by ADBP in Pakistan have a rated capacity of 250 mt/d.

An appropriate technical and financial rationale must be developed in order to introduce a new concept to the oilseed industry in Pakistan; the concept of developing a vertically integrated commodity system, tying the edible oil manufacturing components with farm production.

As a result of an in-depth study and extensive discussions with equipment suppliers and entrepreneurs within the oilseed industry, a 500 mt/d plant was considered the optimum sized processing plant for the following reasons:

- The cardinal principle of this concept is to assure an ample and steady supply of sunflower seed through a procurement division that will effect contracts directly with sunflower growers. Therefore, availability of sunflower seeds will be secured and is no longer considered as a constraint. Pakistan produces a substantial quantity of cottonseed as a by-product of the textile industry. Therefore sufficient supply of cottonseed would be readily available.

- 200 tons is the maximum daily tonnage of seed that can be handled in bags under a conventional operation. However, in the context of a 500 mt/d plant, the bulk handling of raw materials must be introduced to the Pakistani oilseed industry. Over time, bulk handling will prove to be both more efficient and cost effective.

- A significant step to achieving the necessary economies of scale would be the establishment of a plant with a rated capacity of 500 mt/d since existing process modules are available from equipment suppliers.

- A daily seed intake of 500 tons justifies the installation of a complete refining unit (neutralization, bleaching and deodorization). At full capacity (500 mt/d), the plant can produce a maximum of 185 tons of sunflower oil daily. This coincides with manufacturers' recommendations regarding the minimum daily production of oil to justify the investment in a complete refinery unit. The recommendations stipulate production ranging from 120 to 200 mt/d of edible oil. The rated

capacity and the operational capacity of the refinery unit are given below.

- The installation of a complete refining unit further integrates the commodity system with the edible oil market: the maximum value of the process is derived through complete refining and packaging of edible oil. This will enable the plant to sell a finished product in the retail market. Serving as a logical extension of the concept, the result is a speedier recovery of investment including costs associated with the establishment of the linkages with sunflower growers at the opposite end of the chain.

- The total cost of the project (including the establishment of two procurement centers for sunflower seed) is estimated at US $26 million for a 500 mt/d plant. This is an attractive scale of investment for financing institutions: it is above the minimum level for international banks such as IFC or ADB to show any interest in a project.

- The larger the scale of operation, the more attractive the project is for investment by a transnational corporation.

1.2. Processing Plant Capacity and Other Parameters

The following technical data are based on actual operations as well as recommendations obtained from equipment manufacturers:

RATED CAPACITY Continuous process based on three shifts per day at 100% capacity.	= 500 mt/d
MAXIMUM UTILIZATION PERCENTAGE	= 95 %
DAILY OPERATIONAL CAPACITY	= 475 mt/d
MAXIMUM PRODUCTION DAYS Based on three shifts per day, seven days a week, with a maximum of 330 days per annum (production program, part I, chapter 4, Table B-2).	= 330 days
MAINTENANCE AND REPAIR In addition to these 30 days,	= 30 days

5 days are necessary to adjust the machines when shifting from cottonseed to sunflower seed. The plant operates continually since halting operations proves costly as the press must be opened and cleaned.

MAXIMUM ANNUAL SEED INPUT	= 475 t x 330 d = 156,750 tons
ACTUAL SEED INPUT	= daily seed intake x prod. days
CAPACITY UTILIZATION PERCENTAGE (production program, Table B-9)	= ACTUAL SEED INPUT / MAXIMUM ANNUAL SEED INPUT

1.3. Refinery Plant Capacity

RATED CAPACITY Continuous process based on three shifts per day at 100% capacity.	= 200 mt/d
MAXIMUM UTILIZATION PERCENTAGE	= 95 %
DAILY OPERATIONAL CAPACITY	= 190 mt/d
MAXIMUM PRODUCTION DAYS Based on three shifts per day, seven days a week, with a maximum of 330 days per annum (production program, part I, chapter 4, Table B-2)	= 330 days
MAINTENANCE AND REPAIR Halting operations has adverse effects on the neutralized oil which may become contaminated	= 30 days

with soap stock. In addition bleaching earth will be deposited on the agitators and the oil in the deodorizer will oxidize

MAXIMUM ANNUAL OIL INPUT = **190 t x 330 d = 62,700 tons**

ACTUAL OIL INPUT = **daily oil input x prod. days**

CAPACITY UTILIZATION PERCENTAGE = $\frac{\text{ACTUAL OIL INPUT}}{\text{MAXIMUM ANNUAL CRUDE OIL INPUT}}$

2. PLANT SITE LOCATION AND COST OF LAND

2.1. Proposed Plant Site Location and Rationale

The identification of a possible geographic area for the location of a sunflower and cottonseed oil processing plant is based on the following criteria:

- **Accessibility to sunflower seed and cottonseed**
  Ideally, the plant should be located in the cotton belt (maximization of plant income), at the border of an area where sunflower is also currently grown.

- **Water availability for sunflower cultivation**
  It is reported that the non availability of water for a spring crop coming after cotton in a rotation cycle is a major constraint to sunflower cultivation in Punjab. Therefore, the selection of a geographic area should also focus on irrigation facilities and water availability.

- **Average economic size of holding**
  In light of the fact that sunflower is not a traditional crop, it has to be encouraged and developed. The focus of the oilseed commodity system is to effect forward contracts with private growers. The average size of holding in the area where the plant's procurement division will be operational is important, since it is reported that sunflower is mainly cultivated on medium to large farms (greater than 10 ha, PARC/CIMMYT Paper 90-8). Mechanized cultivation is most likely to be found in medium to large farms.

- **Other factors affecting the availability of sunflower seed**
  Sunflower at maturity attracts pest attacks from birds (parrots) that cause great loss to the sunflower grower and simultaneously to adjacent mango/fruit orchards. It is recommended that to avoid this conflict between the two productions, an area where sunflower is widely grown should be selected as the losses resulting from birds will be shared by more farmers and thus the loss less dramatic to growers.

- **Facilities and communications**
  The site should be equipped with all facilities such as natural gas, electricity, water, telephone lines and situated adjacent to a paved road. However, as the availability of electricity in Pakistan is critically deficient, generation of electricity at the site of the plant has to be considered.

Telecommunication and transport facility requirements are indispensable as outputs will have to be transported. If explored in the future, oil and meal sales on international markets will require excellent telecommunications. Since the plant will not be located in a port, the proximity of a railway is another requirement.

- **Management personnel availability**
  Obtaining well qualified management personnel is a major requirement. In this respect, the proximity to a major urban center such as Lahore or Multan will prove advantageous to the organization's ability to retain the services of technically competent personnel. The availability of labor for the project can be easily secured.

- **Governmental regulations**
  To take full advantage of the rural industrialization policy announced by the Government of Pakistan in December 1990, the plant should be located in an area falling under the regulation (SRO 1284)[1] regarding the exemption from customs duty, surcharge and sales tax. (A copy of the regulation is attached in Annex B-1.)

In view of the above requirements and constraints, the rationale for possible sites for the plant and procurement division is as follows (see a map of Punjab in Annex B-2):

- The requirement for highly qualified management personnel makes it necessary to locate the plant next to a major urban center.

- The location of the plant will be procurement oriented rather than market oriented as the forward linkage with sunflower production is the main focus of the oilseed commodity system and the supply of cottonseed has to be secured. In this respect, the Multan area is preferred as it is in the heart of the cotton belt.

- Any site at least 10 kilometers removed from the Multan administrative limits but

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[1] Tax exemption is given to any plant machinery, equipment or power generating unit imported before June 10, 1995 and installed in a rural area. The plant must be located a minimum distance of at least 10 kilometers from the existing limits of Municipal Corporations and their Cantonment Boards, and outside the limits of Municipal Committees (for Lahore the minimum distance is 30 km).

no further than Kabirwala or Khanewal, located on a main road, with access to gas and water (the plant will generate its own electricity), will be suitable for the project.

- Locating the plant adjacent to Multan has the advantage of saving on freight[2]. As a result, with an oilseed procurement division located between Multan and Lahore (currently a sunflower growing area), the carriage of raw materials to the site of the plant will be less costly. In addition, Multan is closer to the market as well as the port of Karachi for distribution of its finished products.

- A procurement center must be established at the site of the processing unit, since it is intended to develop maximum sunflower cultivation in the vicinity of the plant.

- In addition, field procurement centers will be set up in the sunflower growing area (primarily, it is a sunflower seed procurement division, but can also serve for the supply of cottonseed). The location of this center should take into account the constraints and requirements mentioned above (water availability, average economic size of holding, etc...).

The rationale for setting up the plant in a rural area versus an industrial estate is as follows:

- According to SRO 1284 (see Annex B-1) pertaining to rural industrialization, there is full exemption from customs duties, sales taxes and surcharges on equipment and machinery imported for a plant located in a rural area. But land has to be purchased: for the project described in this concept paper, the total cost estimate for rural land with access to a suitable road is approximately 6.25 million rupees, which includes the necessary land development (see chapter 2.2 hereafter).

- If the plant is located in an industrial estate, while there is no initial investment for land as it is rented from the government, the exemption on imported machinery is only 50% of the duty normally leviable and surcharge, which is 10% of the equipment value, which is fully leviable. With 200 million rupees as a rough estimate for the cost of imported machinery for a 500 mt/d plant, a surcharge of 20 million rupees has to be paid by the company if the plant is located in an industrial estate.

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2 Transportation of goods in Pakistan is more expensive from south to north than from north to south.

- Therefore, by locating the plant in a rural area, the company achieves an immediate net savings on fixed investment of 13.75 million rupees (the land costs Rs.6,250,000, but a surcharge of Rs.20,000,000 is saved), without taking into account the savings gained from custom duty exemptions.

- The cost of land is insignificant compared to the various taxes (custom duties, surcharge) that have to be paid for establishing a plant in an industrial estate. Therefore, it is more economical for a company to set up a plant in a rural area.

2.2. Acreage Required for the Plant and Cost Estimate

The total acreage required for a 500 mt/d plant is about 25 acres.

A 200 mt/d plant producing semi-refined oil requires about 8 acres. Considering normal extension for raw material, output storage and machinery (especially the seed preparation unit) and additional space for a complete refinery plant with a packaging unit, a surface of 20 acres will be needed. Additionally, a main procurement center will be installed at the site of the plant for which about 5 acres are required.

Near Multan, the unit cost of rural land ranges from Rs.150,000 to Rs.200,000 per acre depending upon existing amenities and accessibility to the road. Keeping in mind the inflation and the necessary land development, including a gas connection and the installation of a tubewell and water tank, the unit cost estimate used in this concept paper is Rs.250,000 per acre.

Therefore, the total cost of land for the site, including the plant and the procurement division, is Rs.6,250,000.

2.3. Environmental Constraints

The government has now liberalized the installation of industrial units in the country. Units which are being established outside municipal limits, and do not violate environmental protection laws do not require approvals or authorizations. However, as a precaution, it would be advisable to approach the local divisional office of the Ministry of Industries.

A packaging unit is planned to be installed at the site during a second investment phase, to manufacture plastic bottles. However, the technology selected in this concept paper (blow-molding based on P.E.T., see part 1, chapter 5.1) is non-polluting: the burning of P.E.T. does not release toxic gas and the plastic can be recycled.

3. SITE PREPARATION AND BUILDING COST ESTIMATE

Building cost estimate:

- First phase = Rs.37,600,000 (see Table B-1)
- Second phase = Rs. 3,000,000 (see Table B-1 bis)

The unit cost estimates range from Rs.180 to Rs.350 per square feet depending on the structure and level of finishing required for each type of building.

The built-up area required for a 500 mt/d plant and its storage facilities along with the breakdown per type of building, is estimated on the basis of dimensions recommended by equipment manufacturers.

For the second phase of investment, a bleaching and a deodorization section will be added to the neutralization process to complement the refinery unit. A packaging area and a warehouse with a 10-day storage capacity of refined packed oil will be needed in addition to the existing building.

Note: The cost of the oilseed silos is estimated separately in section A. Silos account for about 40% of the constructed area.

4. PRODUCTION PROGRAM

Note: The plant parameters are defined in part I, chapters 1.2 and 1.3.

The production program of the plant is based on and detailed for a 6-year schedule (Table B-2 to B-9). An overview of the monthly production program is presented in Table B-3. The production program of the 500 mt/d Oil Processing Unit (Table B-9), has been compiled by the plan of operation outlined in Tables B-2 through B-8.

The program for the final refining is presented in Tables B-10 to B-13.

The primary objective of establishing an integrated commodity system must be fulfilled by utilizing a dual program which would necessitate encompassing existing and available cottonseed production along with the progressive introduction of sunflower. The primary focus of the production program is to utilize sunflower seed to the greatest extent possible, as both the volume of oil recovered from the seed and the value of sunflower oil are high. To maximize its income, the plant has to make the best use of its operational capacity by purchasing and processing cottonseed to be sold in the form of edible oil and meal.

Targeted Production Days (Tables B-2 & B-3)

Define the annual allocation of the 330 days for total production for both the selected oilseeds, cottonseed and sunflower seed respectively, beginning with year 1, up to year 6. Sunflower production days are progressively increased annually with incremental crop production through the forward linkage of the commodity system. High quality seed is available during a short period of time following each growing season.

Cottonseed of an acceptable quality, is available for procurement from ginning factories from the beginning of November till the end of March (150 days). The highest percentage of oil content is found in cottonseed purchased from early November until mid December.

A minimum of 35 days are essentially needed for plant adjustment (5 days when shifting from cottonseed to sunflower seed, and 30 days for annual repair and maintenance).

Annual Cottonseed and Sunflower Seed Intake (Tables B-4 & B-5)

Defines the percentage of capacity utilized of daily seed intake multiplied by the annual

production days, to determine the annual seed intake. The capacity utilized gradually increases from 75% (375 mt/d) in year 1 to 95% (475 mt/d) of the rated capacity in year 4 for cottonseed; and, from 60% (300 mt/d) in year 1 to 90% (450 mt/d) of the rated capacity in year 6 for sunflower seed.

Output Recovery Percentage (Table B-6)

Defines the individual percentage output of oil and by-products of the raw seed intake. Comparatively, a sunflower seed produces more oil than a cottonseed.

Material Balance for Raw Materials (Tables B-7 & B-8)

Defines the total product output and by-product outputs for cottonseed (Table B-7) and sunflower seed (Table B-8).

It is assumed that the period of oilseed procurement and the storage conditions are such that a balanced seed quality can be maintained throughout the production period. As a result, the percentage recovery for each output (Table B-6) is valid, irrespective of the time of production.

Production Program for 500 mt/d, Year 1 to 6 (Table B-9)

Comprehensively defines the annual seed input and total annual output based on the product mix and the percentage of operational capacity utilized, beginning with 62% in year 1 to 98% in year 6. Crude oil must be submitted to a basic refining (neutralization of fatty-free acids) as soon as it leaves the extractor, due to quality constraints. Therefore, a neutralization plant is required from the first year of operation to produce basic refined oil.

Production Program for Refined Oil (Tables B-10 to B-13)

Outlines the daily basic refined cotton and sunflower oil available for a 200 mt/d final refining plant.

> Tables B-10 & B-11:
> The daily seed intake progressively increases corresponding to an increase in daily oil production.

Table B-12:
Defines the targeted annual cottonseed and sunflower oil production, based on the daily oil input and the number of production days.

Table B-13:
Quantifies the production program based on the varying quantity of oil produced annually. In year 4, the total oil production is 30,253 tons which is only 48% of the refining capacity, mainly due to a lower oil recovery percentage from cottonseed. Therefore, to fully utilize the refining capacity, an additional volume of basic refined oil needs to be purchased from the local market as quantified in year 4, 5 and 6, enabling an increased capacity utilization from 74% in the first year of the complete refining operation to 100% by the third year which corresponds to year 6 from the initiation of the project.

Keeping in mind the initial cost of a complete refinery unit, including bleaching and deodorization, the investment is not justified in the first year of operation. Therefore, the final refining part of the plant will be set up during a second phase of investment, beginning operation from year 4.

The additional total volume of refined and packed edible oil will ultimately generate incremental sales revenue along with a greater share of the edible oil market nationally.

TABLE B-2 - TARGETED PRODUCTION DAYS
FOR A 6-YEAR PRODUCTION PROGRAMME

	PRODUCTION DAYS		NUMBER OF DAYS OF SHUT DOWN	TOTAL
	COTTONSEED	SUNFLOWER SEED		
YEAR 1	210	60	95	365
YEAR 2	220	70	75	365
YEAR 3	220	80	65	365
YEAR 4	220	90	55	365
YEAR 5	220	100	45	365
YEAR 6	210	120	35	365

PRODUCTION PROGRAMME FOR THE 500 MT/D OILSEED PROCESSING PLANT

TABLE B-3 - 6-YEAR PRODUCTION PROGRAMME ON A MONTHLY BASIS

PD/22/04/1991

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|YEAR/MONTH |   NOV   |   DEC   |   JAN   |   FEB   |   MAR   |   APR   |   MAY   |   JUN   |   JUL   |   AUG   |   SEP   |   OCT   |
|---------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                 |
|YEAR 1     1 Nov                 210 days                                29 May  5 Jun        60 days    3 Aug                Oct 31 |
|          <-------------------------------------------------------------------------->xx<------------------------>xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx|
|                                 COTTONSEED                                                SUNFLOWER SEED                          |
|                                                                                                                                 |
|YEAR 2     1 Nov                 220 days                                 8 Jun      15 Jun  70 days        23 Aug              Oct 31 |
|          <-------------------------------------------------------------------------------->xx<--------------------------->xxxxxxxxxxxxxxxxxxxxxxxx|
|                                 COTTONSEED                                                     SUNFLOWER SEED                     |
|                                                                                                                                 |
|YEAR 3     1 Nov                 220 days                                8 Jun       15 Jun     80 days          2 Sept          Oct 31 |
|          <-------------------------------------------------------------------------------------->xx<----------------------------->xxxxxxxxxxxxxxxxxxxx|
|                                 COTTONSEED                                                     SUNFLOWER SEED                     |
|                                                                                                                                 |
|YEAR 4     1 Nov                 220 days                                8 Jun       15 Jun     90 days            12 Sept       Oct 31 |
|          <-------------------------------------------------------------------------------------------->xx<------------------------------->xxxxxxxxxxxxxxxxxx|
|                                 COTTONSEED                                                                                      |
|                                                                                                                                 |
|YEAR 5     1 Nov                 220 days                                8 Jun       15 Jun    100 days              22 Sept       Oct 31 |
|          <-------------------------------------------------------------------------------------------------->xx<------------------------------------>xxxxxxxxxxxxx|
|                                 COTTONSEED                                                     SUNFLOWER SEED                     |
|                                                                                                                                 |
|YEAR 6     1 Nov                 210 days                                29 May  5 Jun          120 days                  2 Oct    Oct 31 |
|          <-------------------------------------------------------------------------->xx<------------------------------------------------------>xxxxxxxxxxxx|
|                                 COTTONSEED                                                     SUNFLOWER SEED                     |
|                                                                                                                                 |
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x = Shut Down

PRODUCTION PROGRAMME FOR THE 500 MT/D OILSEED PROCESSING PLANT

TABLE B-4 - ANNUAL COTTONSEED INTAKE FOR A 6-YEAR PRODUCTION PROGRAMME WITH 500 MT/D AS RATED PLANT CAPACITY

	RATED CAPACITY (tons)	TARGETED PERCENTAGE OF MAXIMUM DAILY SEED INTAKE	DAILY SEED INTAKE (tons)	TARGETED TOTAL PRODUCTION DAYS	COTTONSEED ANNUAL INTAKE (tons)
YEAR 1	500	75%	375	210	78,750
YEAR 2	500	80%	400	220	88,000
YEAR 3	500	90%	450	220	99,000
YEAR 4	500	95%	475	220	104,500
YEAR 5	500	95%	475	220	104,500
YEAR 6	500	95%	475	210	99,750

TABLE B-5 - ANNUAL SUNFLOWER SEED INTAKE FOR A 6-YEAR PRODUCTION PROGRAMME WITH 500 MT/D AS RATED PLANT CAPACITY

	RATED CAPACITY (tons)	TARGETED PERCENTAGE OF MAXIMUM DAILY SEED INTAKE	DAILY SEED INTAKE (tons)	TARGETED TOTAL PRODUCTION DAYS	SUNFLOWER SEED ANNUAL INTAKE (tons)
YEAR 1	500	60%	300	60	18,000
YEAR 2	500	65%	325	70	22,750
YEAR 3	500	70%	350	80	28,000
YEAR 4	500	75%	375	90	33,750
YEAR 5	500	80%	400	100	40,000
YEAR 6	500	90%	450	120	54,000

TABLE B-6 - OUTPUT PERCENTAGE RECOVERY

OUTPUT	COTTONSEED	SUNFLOWER SEED
Oil	17%	37%
Meal	39%	40%
Hulls	31%	18%
Linters	7%	
Soap Stock	3%	2%
Losses	3%	3%
TOTAL	100%	100%

SOURCE: estimates derived from several feasibility studies on oilseed processing plants in Pakistan, as well as from actual operation.

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MATERIAL BALANCE FOR A 6-YEAR PRODUCTION PROGRAMME
WITH 500 MT/D AS RATED PLANT CAPACITY

TABLE B-7 - MATERIAL BALANCE FOR COTTONSEED

	INPUT (tons)	OUTPUT (tons) (1)						
	RAW MATERIAL INTAKE	OIL 17%	MEAL 39%	HULLS 31%	LINTERS 7%	SOAP STOCK 3%	LOSSES 3%	TOTAL OUTPUT 100%
YEAR 1	78,750	13,388	30,713	24,413	5,513	2,363	2,363	78,750
YEAR 2	88,000	14,960	34,320	27,280	6,160	2,640	2,640	88,000
YEAR 3	99,000	16,830	38,610	30,690	6,930	2,970	2,970	99,000
YEAR 4	104,500	17,765	40,755	32,395	7,315	3,135	3,135	104,500
YEAR 5	104,500	17,765	40,755	32,395	7,315	3,135	3,135	104,500
YEAR 6	99,750	16,958	38,903	30,923	6,983	2,993	2,993	99,750

TABLE B-8 - MATERIAL BALANCE FOR SUNFLOWER SEED

	INPUT (tons)	OUTPUT (tons) (1)					
	RAW MATERIAL INTAKE	OIL 37%	MEAL 40%	HULLS 18%	SOAP STOCK 2%	LOSSES 3%	TOTAL OUTPUT 100%
YEAR 1	18,000	6,660	7,200	3,240	360	540	18,000
YEAR 2	22,750	8,418	9,100	4,095	455	683	22,750
YEAR 3	28,000	10,360	11,200	5,040	560	840	28,000
YEAR 4	33,750	12,488	13,500	6,075	675	1,013	33,750
YEAR 5	40,000	14,800	16,000	7,200	800	1,200	40,000
YEAR 6	54,000	19,980	21,600	9,720	1,080	1,620	54,000

(1) Source for output recovery percentages = estimates derived from several feasibility studies on oilseed processing plants in Pakistan, as well as from actual operations.

PLANT CAPACITY AND OTHER PARAMETERS

RATED CAPACITY = 500 MT/D (3 shifts, continuous process)
MAXIMUM UTILIZATION PERCENTAGE = 95%
DAILY OPERATIONAL CAPACITY = 475 MT/D
MAXIMUM PRODUCTION DAYS = 330 days
MAXIMUM ANNUAL INPUT = 330 days x 475 tons = 156,750 tons
ACTUAL INPUT = Production days x daily seed intake
CAPACITY UTILIZATION PERCENTAGE = ACTUAL INPUT/MAXIMUM ANNUAL INPUT

TABLE B-9 - 6-YEAR PRODUCTION PROGRAMME FOR A 500 MT/D RATED PLANT CAPACITY

		INPUT (tons)	OUTPUT (tons)						LOSSES (tons)	TOTAL OUTPUT + LOSSES (tons)
			OIL (1)	MEAL	HULLS	LINTERS	SOAP STOCK	TOTAL		
Y 1	COTTONSEED	78,750	13,388	30,713	24,413	5,513	2,363	76,388	2,363	78,750
	SUNFLOWER SEED	18,000	6,660	7,200	3,240		360	17,460	540	18,000
	TOTAL INTAKE	96,750								
	% UTILIZATION	62%								
Y 2	COTTONSEED	88,000	14,960	34,320	27,280	6,160	2,640	85,360	2,640	88,000
	SUNFLOWER SEED	22,750	8,418	9,100	4,095		455	22,068	683	22,750
	TOTAL INTAKE	110,750								
	% UTILIZATION	71%								
Y 3	COTTONSEED	99,000	16,830	38,610	30,690	6,930	2,970	96,030	2,970	99,000
	SUNFLOWER SEED	28,000	10,360	11,200	5,040		560	27,160	840	28,000
	TOTAL INTAKE	127,000								
	% UTILIZATION	81%								
Y 4	COTTONSEED	104,500	17,765	40,755	32,395	7,315	3,135	101,365	3,135	104,500
	SUNFLOWER SEED	33,750	12,488	13,500	6,075		675	32,738	1,013	33,750
	TOTAL INTAKE	138,250								
	% UTILIZATION	88%								
Y 5	COTTONSEED	104,500	17,765	40,755	32,395	7,315	3,135	101,365	3,135	104,500
	SUNFLOWER SEED	40,000	14,800	16,000	7,200		800	38,800	1,200	40,000
	TOTAL INTAKE	144,500								
	% UTILIZATION	92%								
Y 6	COTTONSEED	99,750	16,958	38,903	30,923	6,983	2,993	96,758	2,993	99,750
	SUNFLOWER SEED	54,000	19,980	21,600	9,720		1,080	52,380	1,620	54,000
	TOTAL INTAKE	153,750								
	% UTILIZATION	98%								

(1) Basic refined oil

PRODUCTION PROGRAMME FOR THE 200 MT/D REFINERY PLANT

TABLE B-10 - DAILY COTTONSEED OIL PRODUCTION (1)

	DAILY SEED INTAKE (tons)	DAILY OIL PRODUCTION (2) (tons)
YEAR 1	375	64
YEAR 2	400	68
YEAR 3	450	77
YEAR 4	475	81
YEAR 5	475	81
YEAR 6	475	81

(1) Basic refined oil
(2) Oil percentage recovery for cottonseed is 17%

TABLE B-11 - DAILY SUNFLOWER SEED OIL PRODUCTION (1)

	DAILY SEED INTAKE (tons)	DAILY OIL PRODUCTION (2) (tons)
YEAR 1	300	111
YEAR 2	325	120
YEAR 3	350	130
YEAR 4	375	139
YEAR 5	400	148
YEAR 6	450	167

(1) Basic refined oil
(2) Oil percentage recovery for sunflower seed is 37%

TABLE B-12 - ANNUAL TARGETED PRODUCTION OF FULLY REFINED OIL FROM YEAR 4 TO YEAR 6

	RATED CAPACITY (tons)	TARGETED DAILY BASIC REFINED OIL INPUT	COTTONSEED OIL		SUNFLOWER SEED OIL	
			PRODUCTION DAYS	TARGETED FULLY REFINED OIL PRD. (tons)	PRODUCTION DAYS	TARGETED FULLY REFINED OIL PRD. (tons)
YEAR 4	200	150 tons (75%)	220	33,000	90	13,500
YEAR 5	200	170 tons (85%)	220	37,400	100	17,000
YEAR 6	200	190 tons (95%)	210	39,900	120	22,800

PRODUCTION PROGRAMME FOR THE 200 MT/D REFINERY PLANT

CAPACITY

RATED CAPACITY	=	200 MT/D
MAXIMUM UTILIZATION PERCENTAGE	=	95%
DAILY OPERATIONAL CAPACITY	=	190 MT/D
MAXIMUM PRODUCTION DAYS	=	330 days
MAXIMUM ANNUAL OIL INPUT	=	330 days x 190 tons = 62,700 tons
ACTUAL OIL INPUT	=	Production days x daily oil input
CAPACITY UTILIZATION PERCENTAGE	=	ACTUAL OIL INPUT/MAXIMUM ANNUAL OIL INPUT

TABLE B-13 - 3-YEAR OIL PRODUCTION PROGRAMME

	OIL	PRODUCED AND FULLY REFINED BY THE PLANT (1) (tons)	PURCHASED (2) AND FULLY REFINED BY THE PLANT (1) (tons)	TOTAL OIL REFINED (1) (tons)
	COTTONSEED OIL	17,765	15,235	33,000
	SUNFLOWER SEED OIL	12,488	1,012	13,500
YEAR 4	TOTAL OIL	30,253	16,247	46,500
	% UTILIZATION	43%	26%	74%
	COTTONSEED OIL	17,765	19,635	37,400
	SUNFLOWER SEED OIL	14,800	2,200	17,000
YEAR 5	TOTAL OIL	32,565	21,835	54,400
	% UTILIZATION	52%	35%	87%
	COTTONSEED OIL	16,958	22,942	39,900
	SUNFLOWER SEED OIL	19,980	2,820	22,800
YEAR 6	TOTAL OIL	36,938	25,762	62,700
	% UTILIZATION	59%	41%	100%

(1) And packed

(2) The plant purchases basic refined oil which it fully refines and packs.

5. TECHNOLOGY AND EQUIPMENT

See Tables B-14 and B-14bis: Specifications and Cost of Imported Machinery for the 500 mt/d Plant - Phases 1 & 2.

EQUIPMENT AND MACHINERY - FIXED INVESTMENT ESTIMATE:

First Investment Phase

Cost Estimate of Imported Machinery CIF Karachi	= Rs. 195,345,900
15 % Charges	= Rs. 29,301,885
Cost Estimate of Local Machinery	= Rs. 48,836,475
Cost Estimate of Erection and Installation	= Rs. 4,883,647
Miscellaneous Equipment	= Rs. 5,000,000
TOTAL phase 1	**= Rs. 283,367,907**

Second Investment Phase

Cost Estimate of Imported Machinery CIF Karachi	= Rs. 134,161,300
15 % Charges	= Rs. 20,124,195
Cost Estimate of Local Machinery	= Rs. 33,540,325
Cost Estimate of Erection and Installation	= Rs. 3,354,033
Miscellaneous Equipment	= Rs. 5,000,000
TOTAL Phase 2	**= Rs. 196,179,853**

5.1. Selected Technology and Alternatives

See the chart attached in Annex B-4, describing the production process and the product input/output material balance.

After considering all the alternatives to establish a 500 mt/d edible oil processing plant, it is suggested that the following technology and equipment outlined should be imported, due to the fact that several aspects of the project are to be introduced to the Pakistan oilseed industrial sector for the first time. Although the initial investment is higher, the processing technology

and machinery has proven longevity and reliability. This imported technology is more modern and energy efficient. Moreover, several foreign equipment manufacturers (listed in Annex B-3) have excellent references throughout the country. The technology selected is as follows (oilseed receiving, handling and storage technologies are discussed in section A of the concept paper):

Seed Preparation

Preparation of the seed includes cleaning and dehulling. In addition, delinting is required when processing cottonseed. The seed preparation machinery to be imported is basically manufactured for cottonseed. However, it can be adapted for cleaning and dehulling sunflower seed: specific parts required for the necessary adjustment are also provided by the manufacturer.

The purpose of dehulling the seed is to reduce the fiber content of the meal. However, it is reported that sunflower seed decortication is a difficult operation and a crucial aspect of the process: the variation in the size of sunflower seed is important but it is difficult to adjust the machinery so as to obtain perfect results. This drawback can be reduced by selecting varieties yielding more homogenous seeds in terms of size, and also by having a skilled technician to make necessary adjustments on the dehulling machines. Otherwise, the fiber content of sunflower meal might be too high, compared to other oilseed meals. Consequently, marketing problems can be encountered because of livestock feed millers' reluctance to use sunflower meal.

Note: To maintain a good quality oilseed until the processing stage, it is recommended to clean the seed before final storage as foreign matters may affect their quality during this period. However, a global estimate for seed preparation machinery was obtained from equipment manufacturers, as it has already been mentioned in section A, part II, chapter 1.1, and the cost of the cleaning machines is estimated altogether with the cost of delinting and dehulling machines.

Oil Extraction

The process selected includes three stages:

- Flattening and cooking decorticated seed (also called meats) to facilitate oil extraction.

- Pre-pressing to extract crude oil: a low pressure pre-press extracts about 50% of the oil contained in the seed. An alternative is to have a high pressure pre-press. It is more costly in terms of fixed investment and operating costs but it increases

the pre-press oil extraction capacity by 50%, decreases the hexane consumption at the solvent extraction stage and increases the global oil recovery percentage. A force-feeder can be adapted on certain low pressure pre-presses to raise the extraction pressure.

- Solvent extraction using hexane (the solvent) mixed with the first cake to recover the residual crude oil contained in the cake.

Refining

The refining comprises two stages:

- Basic refining, or neutralization of the fatty free acids contained in the oil,
- Final refining, including bleaching and deodorization.

Packaging

Plastic bottles are preferred to metal cans since they are less expensive, more hygienic and leak-proof.

The refining capacity considered in this concept paper (200 tons of oil per day) is large enough to justify the manufacturing of plastic bottles at the plant. Bottles can be produced through a blow-molding process: pre-forms are manufactured and used as molds for the bottles. The size of the pre-form can be modified to allow different sizes of bottle with regard to the oil content: 1, 2, 3, 4 or 5 kgs.

The raw material used for plastic bottle production will be P.E.T. Despite the higher initial investment required for the machinery, P.E.T. is preferred to P.V.C. for several reasons: it is more solid, it is non-polluting (does not release toxic gas when burned) and it can be recycled.

A packaging unit also includes filling and capping equipment.

Quality Control

Quality Control is a major concern. Because many local laboratories proved non-reliable, the plant laboratory equipment must have the capability to perform sophisticated tests on seeds, oil and meal on a regular basis. Some of the laboratory equipment will have to be imported.

Power generating

Rationale for producing electricity rather than using WAPDA electricity is as follows:

The cost of electrical energy is not a determining factor in the production of oil. It is of far greater importance that power be available at all times. A power failure of only one hour will have damaging consequences: the press must be opened and cleaned, neutralized oil may be contaminated with soap stock, bleaching earth will be deposited on the agitators and the oil in the deodorizer will oxidize. Collectively, the cost of these events represent more than a couple of days' total electricity consumption.

In this respect, WAPDA electrical supply is unreliable due to current fluctuations and numerous load shedding. Moreover, the rural industrialization policy stipulates that creation of power generation by entrepreneurs will be encouraged and in cases where excess electricity is generated beyond the plants needs, WAPDA will purchase the same.

Therefore, a power generation unit will be installed at the plant. This technology will also be imported.

Diesel, gas and furnace oil generator units are the three possible options. For purposes of calculation, a gas generator has been selected. It has a high initial cost than a diesel generator but is economical in terms of operating costs. Moreover, Sui gas will be available at the plant through a pipeline connection. Gas load-sheddings may also occur but are more infrequent than electric load-sheddings. As a precaution, a gas tank should also be installed to avoid any power generation breakdown.

The total maximum capacity required for the plant is 3.76 MWH (see part I, chapter 6.3). Six generator units (five during the first phase, one during the second) of 750 KVA each will be installed to meet this requirement.

Note: Modern edible oil processing and packaging plants are fully computerized, but equipment suppliers and local entrepreneurs were reluctant to recommend this level of sophistication as local infrastructure and personnel do not have the required technical ability to handle such a high level of automation. Addition of such a facility may be considered in the future.

5.2. Imported Plant Machinery Specifications and Cost Estimate

Except for the small percentage of equipment that will be purchased locally (see chapter 5.3 hereafter), the bulk of the machinery is to be imported.

The cost estimates are derived from quotations provided by several equipment suppliers listed in the annexes. Specifications and cost estimates of imported machinery for a 500 mt/d plant are listed in Tables B-14 and B-14bis (see also the synopsis at the beginning of this chapter).

Various taxes and charges accounting for 15% of the cost of imported machinery are leviable. They include Iqra tax (5%), L/C charges, import license fee, insurance, octroi, clearing and forwarding charges and inland freight.

There is no leviable custom duty, sales tax and surcharge, as the plant will be established in a rural area.

5.3. Locally Manufactured Plant Equipment and Cost Estimate

A rough cost estimate for the local machinery is 25% of the cost CIF of imported machinery for each phase.

A list of locally manufactured machinery (derived from several quotations and feasibility studies) required for the project is as follows.

- Vessels, storage tanks, cyclones, ducts, chutes, bins, hoppers, conveyors, bucket elevators, baling press, boilers
- Pipes and fittings
- Cooling towers
- Motor pump for water and oil
- Transformers, switchboards and distribution boards, motors and starters
- Electric cables and wiring
- Gas and electric welding equipment
- Workshop equipment
- Weighbridge
- Tubewells and water tank
- Gas tank
- Fire fighting equipment
- Laboratory equipment
- Auxiliary equipment for the packaging unit

5.4. Erection, Installation and Commissioning

The expenses are estimated to be 2.5% of the cost CIF of the imported machinery for each

phase.

5.5. Miscellaneous Equipment

A provision of Rs.5,000,000 (lumpsum) will be made for the purchase of vehicles, furniture, office equipment, computers, etc., for each phase of the project.

5.6. Spare Parts for Repair and Maintenance

The annual spare parts cost is conservatively estimated to be 1% of the total investment capital in machinery (including imported and local equipment).

6. AUXILIARY INPUTS (EXCEPT COTTONSEED AND SUNFLOWER SEED)

6.1. Hexane

See Table B-15: Daily Hexane Consumption and Cost Estimate.

Hexane is the solvent used to extract the oil left in the cake after the prepressing stage.

An initial volume of about 60 tons of hexane is required the very first day of operation to be mixed with about 187 tons of cake (see Table B-15) this combination (also referred as first cake) is fed into the extractor.

Since hexane is recycled, its consumption is estimated in terms of losses per ton of first cake (Table B-15).

It is assumed that for an equal tonnage of cottonseed first cake and sunflower seed first cake, the losses are identical and equal to 0.25% of the weight of the first cake.

Hexane is imported and distributed locally by Pakistan State Oil (PSO) or Pakistan Burma Shell (PBS). It is advisable to have three or four month inventories on hand at the site.

The price of hexane is estimated to be approximately Rs.18 per liter, including the cost of transportation. During the Gulf War, the price jumped to Rs.30 per liter, but one can expect the price to go down in the future and a reasonable estimate would be Rs.20 per liter or about Rs.25 per kg (hexane density is 0.82) or Rs.25,000/ton.

6.2. Caustic Soda

See Table B-16: Daily Caustic Soda Consumption & Cost Estimate.

Caustic soda is used during basic refining to neutralize the fatty free acids (FFA) contained in the crude oil.

The consumption of caustic soda (NaOH) depends on the FFA content in oil. For this calculation, it is assumed that the percentage of FFA in oil is only 1% and remains constant throughout the year. This assumes that the moisture content of the seed is maintained at an acceptable level throughout the production period.

Recommendations for caustic soda usage by refining manufacturers are rather low and the

consumption during actual operations is more realistic: 4.4 kg of caustic soda per ton of crude oil with 1% as FFA content.

The total tonnage of crude oil produced is taken as a basis for estimating the caustic soda requirements (Table B-16). There is a difference between the volume of crude oil going into basic refining and the volume of basic refined oil as soap stock is formed during the process (see Table B-16).

Caustic soda is produced locally and is available throughout the year. Its unit cost is estimated to Rs.9,000/ton.

6.3. Bleaching Earth

See Table B-17: Daily Bleaching Earth Consumption and Cost Estimate.

Bleaching earth (also called fullers' earth or filtering earth) absorbs the color bodies of the basic refined oil during bleaching or decolorization.

Bleaching takes place during the final refining stage. A bleaching plant will be installed at the plant during the second phase of investment. It should be operational from year 4.

It is assumed that for an equal tonnage of cottonseed oil and sunflower seed oil, the bleaching earth requirements are equivalent and amount to 20 kg per ton of basic refined oil.

Existing requirements of bleaching earth are met substantially through imports. One plant in Dera Ismael Khan produces bleaching earth. It is advisable to have a two to three month inventory at the plant. Unit cost for bleaching earth is estimated at Rs.6,500/ton.

6.4. Plastic (P.E.T.)

See Table B-18: Daily Plastic (P.E.T.) Consumption and Cost Estimate Year 1 to 6.

Together with the complete refining plant, the packaging unit will be operational from the fourth year.

For this calculation, one will only consider the production of 3 kg bottles. The plastic consumption is estimated to 105 grams per 3 kg bottle.

P.E.T. is not produced locally and must be imported. It is advisable to have a two to three

month inventory at the plant. The P.E.T. unit cost is estimated at Rs.65,000/ton.

Note: Bulk technology used for handling raw materials will also be used for meal handling. Therefore neither bagging equipment nor any input in the form of bags is necessary.

7. UTILITIES

Steam and water requirement estimates by machine manufacturers are usually far too low and have to be doubled in order to fulfill actual needs.

Estimates for utility consumption (steam, water, electricity) are derived from: Pre-Investment Considerations and Appropriate Planning in the Vegetable Oil Industry, UNIDO Publications.

The cost estimate for installation of water and gas connections is included in the unit cost of land as estimated in chapter 2, part 1.

Note: It is assumed that the consumption of water and electricity estimated hereafter also covers the requirements of the procurement division installed at the site of the plant.

7.1. Steam

See Table B-19: Daily Gas Requirements and Cost Estimate for Steam Production.

Steam is required for extraction and refining. It is produced by locally manufactured boilers and should be constantly available.

The average steam consumption per ton of oil is as follows:

- 2 tons, if the process stops at the neutralization stage (production of basic refined oil),
- 2.3 tons, if the process includes a final refining (production of fully refined oil),
- 0.3 tons for the final refining (bleaching + deodorization).

An exact calculation of daily steam consumption for oilseed processing and oil refining is found in Annex B 5. It is assumed that the steam requirements for processing cottonseed and sunflower seed, are identical.

The fuel selected to operate the boilers is gas, this will be available at the plant site through a main pipeline connection. Gas is less costly than furnace oil and does not normally require any storage facility. However, gas load-shedding may occur, therefore a small-capacity gas tank will be installed (a gas tank is included in the list of local equipment required for the plant, see part 1, chapter 5.3). Another fuel alternative would be to use hulls as their value is low and their

heating capacity is 4,000 to 7,000 kcal/kg. However, they must be dried and pelletized to a convenient form before use and have the disadvantage of leaving large deposits of ash, thus necessitating burners and boilers of a special design, ultimately proving uneconomical since hulls can also be sold as fertilizer or mixed with meal.

Gas requirements are estimated to be 78.83 cubic meter per ton of steam per hour. The unit cost is estimated to be Rs. 0.706 per cubic meter.

7.2. Water

The total amount of fresh water needed ranges from 3 to 5 m3 per ton of oil produced.

A tubewell and water tank must be installed at the plant to fulfill the water requirements. Their cost estimates are included in the list of local equipment and machinery found in part I, chapter 5.3.

A water treatment plant will also be installed (see part I, chapter 5.2) as drinking water is required during the refining stage.

7.3. Electricity

See Table B-20: Daily Gas Consumption and Cost Estimate for Electricity Generation.

Power should be available at all times and will be generated on-site.

Electricity requirements are as follows:

- Oil extraction: 150 KWH per ton of seed, including seed houses operation, cleaning, delinting, dehulling, pre-pressing, solvent extraction,
- Oil refining: 100 KWH per ton of oil, including basic and final refining and packaging.

The above estimates include electricity for the plant and offices. A detailed estimate of the daily electricity requirements for oilseed processing and oil refining is found in Annex B-6.

On the basis of electricity requirements defined hereabove, the calculation of the maximum hourly power generation capacity is as follows:

- Oil extraction: with 475 tons as maximum daily seed intake, 19.8 tons of seed will be processed per hour and for which 2970 KWH are required (19.8 tons x 150 KWH),

- Oil refining: with 190 tons as maximum daily oil input, 7.9 tons of oil will be refined per hour for which 790 KWH are required (7.9 tons x 100 KWH).

It is assumed that the electricity requirements for processing a cottonseed and a sunflower seed are identical.

Therefore, generator units with a total capacity of 3.76 MWH (2.97 MWH + 0.79 MWH) must be installed.

The technology selected in this concept paper is a generator unit with gas as the prime power (see part I, chapter 5). The gas cost estimate is Rs. 0.57/KWH (Source: Caterpillar Representative in Pakistan).

Note: The plant will not operate at full capacity from the first year and therefore its power generation capacity will not be fully utilized. According to the rural industrialization policy, creation of power generation by the entrepreneurs will be encouraged and in cases where excess electricity beyond the normal requirements is produced by the plant, WAPDA will purchase. Consequently the company could operate its power generation unit at full capacity and sell the excess electricity.

II. PLANT ORGANIZATION MANAGEMENT AND TECHNICAL PERSONNEL

1. MANAGEMENT AND TECHNICAL PERSONNEL

This chapter outlines the personnel requirements for the following divisions of the commodity system: Factory, Personnel & Administration and Finance & Accounts. It estimates salaries and wages of staff and labor attached to the different divisions and departments. Personnel requirements for the following divisions: Procurement, Sales & Distribution and Marketing are outlined in separate reports (sections B and C).

Availability of staff and labor was a determining factor when elaborating the rationale with regard to the location of the plant (see part I, chapter 2).

Note: Management personnel, supervisors, foremen and some skilled operators will be recruited in advance, in order to be trained and be present during the construction of the buildings and the installation of equipment. Personnel requirements during the pre-operational phase are estimated in the following chapter (part II, chapter 2).

1.1. Production and Technical Personnel

See Chart B-I: Technical Personnel Required per Type of Operation and per Shift and Table B-21: Production and Technical Personnel Base Salaries.

Except for the Production Manager, the Chief Chemist, and the Technical Manager, production and technical personnel requirements are estimated on a three-shift basis.

As the process is continuous, the plant will operate 7 days a week. Therefore, the total cost of monthly salaries, as calculated on the basis of a 6-day work-week in Table B-21, must be increased by 14% (roughly 1/7).

In addition, fringe benefits will be calculated at the rate of 50%.

Additional labor may be required from the fourth year to handle and transfer the bottles of oil to the store house. The filling and capping machines of the packaging plant operate only 8 hours a day, although personnel requirements for this section were estimated on the basis of three daily shifts. Therefore, additional personnel will be available for bottle handling at the plant.

CHART B-I - TECHNICAL PERSONNEL REQUIRED PER TYPE OF OPERATION AND PER SHIFT

WAREHOUSE / EACH	1 Supervisor 1 Operator 2 Helpers
POWER GENERATION	1 Engineer 1 Operator 1 Mechanic 1 Helper
MAINTENANCE / WORKSHOP	1 Supervisor 4 Workers
LABORATORY	1 Chemist

SEED CRUSHING
- 1 Engineer
- 1 Electrician
- 1 Mechanic

SEED PREPARATION
- 1 Supervisor
- 1 Foreman

CLEANING
- 1 Operator
- 2 Helpers

DELINTING
- 1 Operator
- 2 Helpers

DEHULLING
- 1 Operator
- 2 Helpers

OIL EXTRACTION
- 1 Supervisor
- 1 Foreman

PRE-PRESSING
- 1 Operator
- 2 Helpers

SOLVENT EXTRACTION
- 1 Operator
- 2 Helpers

OIL PROCESSING AND PACKING
- 1 Engineer
- 1 Electrician
- 1 Mechanic

REFINING
- 1 Supervisor
- 1 Foreman

NEUTRALIZATION
- 1 Operator
- 2 Helpers

BLEACHING
- 1 Operator
- 2 Helpers

DEODORIZATION
- 1 Operator
- 2 Helpers

WATER TREATMENT
- 1 Operator
- 2 Helpers

PACKAGING
- 1 Supervisor
- 1 Foreman

BLOW MOLDING
- 1 Operator
- 2 Helpers

FILLING
- 1 Operator
- 2 Helpers

CAPPING
- 1 Operator

1.2. Managerial and Administrative Personnel

Table B-22 outlines the managerial and administrative personnel base salaries.

In addition to the monthly cost of managerial and administrative personnel, fringe benefits must be added at the rate of 50%.

Unlike the production and technical staff, it is assumed that the managerial and administrative personnel requirements remain the same during the second phase of investment.

2. PRE-PRODUCTION PHASE AND TRAINING PROGRAM

A sound recruitment policy is not sufficient to offset the lack of managerial skills at the technical and administrative level in the Pakistani oilseed industry. A training program in the form of technical assistance is also required.

Training programs will be arranged on-site with foreign experts, but training visits overseas to an oilseed processing plant will also have to be organized.

2.1. Pre-production Phase

A substantial portion of the managerial, technical and administrative personnel must be recruited during the pre-production phase in order to supervise/attend the installation of the machines, recruit the rest of the necessary technical and administrative staff, define the production program, plan the purchase of auxiliary inputs, etc..

Tables B-23 outlines the personnel requirements for this period. Similarly a fringe benefit of 50% must be added to each monthly salary.

The cost of installation of the equipment and machinery by foreign specialists has already been estimated in part I, chapter 5.4 (Erection, Installation and Commissioning). However, the role of these experts is not specifically to train the local personnel. Therefore, a training program must be organized.

For this purpose, two oilseed processing experts will be assigned for a period of three months during the pre production phase for on site training of the technical personnel recruited for the project. The cost is estimated at US $10,000 per man, per month (total cost: US $60,000).

In addition, a one-month training visit to an oilseed processing plant in a foreign country will be organized for the Chief Executive, the Factory Manager and the Production Manager before the production starts. The total cost of their visit is roughly estimated at US $5,000 per person, per month (including international travel and per diem).

2.2. Training of Personnel during the Operational Phase

Similarly, on-site training by foreign experts will be provided to the production personnel during the operational phase. The technical assistance will consist of foreign experts assigned as outlined in Table B-24.

In addition, a two-month training visit to an oilseed processing plant in a foreign country will be organized during the shut-down period for the technical personnel of the plant.

Five engineers and five supervisors will be selected to visit a plant by the end of year 1. Similarly, a training visit for five engineers and five supervisors will be organized at the end of year 2.

The cost of each annual visit is estimated at US $100,000 (10 people at the rate of US $5,000 per person, per month, including international travel and per diem).

TABLE B-1 - BUILDING COST ESTIMATE / PHASE 1

DESIGNATION	AREA sq ft	UNIT COST Rs./sq ft (1)	TOTAL COST Rs.000'
Warehouses (meal, lints etc.)	45,000	180	8,100
Machinery (except solvent extr.)	50,000	300	15,000
Solvent Extraction	10,000	350	3,500
Office, Residence	25,000	300	7,500
Power Station & miscellaneous	10,000	200	2,000
Boundary Wall (2)	125,000	12	1,500
TOTAL PHASE 1	140,000 (3)		37,600

(1) Unit cost derived from architects, actual operations and team estimates.
(2) Lenght in feet and unit cost in Rs/ft
(3) Except the boundary wall

TABLE B-1 bis - BUILDING COST ESTIMATE / PHASE 2

DESIGNATION	AREA sq ft	UNIT COST Rs./sq ft (1)	TOTAL COST Rs.000'
Refinery and Packaging	10,000	300	3,000

TABLE B-14 - SPECIFICATION AND COST OF IMPORTED MACHINERY FOR THE 500 MT/D PLANT / PHASE 1

EQUIPMENT SPECIFICATION	UNIT COST US $ (1)	NUMBER OF UNITS	TOTAL COST US $	TOTAL COST RS
- SEED PREPARATION				
Cleaning, Delinting and Dehulling Plant	2,326,100	1	2,326,100	53,500,300
OIL EXTRACTION				
Pre-pressing and Solvent Extraction Plant	3,685,500	1	3,685,500	84,766,500
- BASIC REFINING				
Neutralization Plant	1,110,600	1	1,110,600	25,543,800
- QUALITY CONTROL				
Laboratory Equipment for Analysis of Protein, Oil and Moisture of Meal and Seeds	20,200	1	20,200	464,600
Laboratory Equipment for Potentiometric Titrations	11,000	1	11,000	253,000
- AUXILIARY EQUIPMENT				
Water Treatment Plant	39,900	1	39,900	917,700
Power Generator, 250 KVA	260,000	5	1,300,000	29,900,000
TOTAL PHASE 1			8,493,300	195,345,900

(1) CIF Karachi

TABLE B-14 bis - SPECIFICATION AND COST OF IMPORTED MACHINERY FOR THE 500 MT/D PLANT / PHASE 2

EQUIPMENT SPECIFICATION	UNIT COST US $ (1)	NUMBER OF UNITS	TOTAL COST US $	TOTAL COST RS
- FINAL REFINING				
Bleaching Plant	530,400	1	530,400	12,199,200
Deodorization Plant	1,342,700	1	1,342,700	30,882,100
- PACKAGING				
Blow Molding Equipment for Plastic Bottles Manufacturing	2,000,000	1	2,000,000	46,000,000
Filling Machine	1,300,000	1	1,300,000	29,900,000
Capping Machine	400,000	1	400,000	9,200,000
AUXILIARY EQUIPMENT				
Power Generator, 750 KVA	260,000	1	260,000	5,980,000
TOTAL PHASE 2			5,833,100	134,161,300

(1) CIF Karachi

TABLE B-15 - DAILY HEXANE CONSUMPTION AND COST ESTIMATE YEAR 1 TO 6

	HEXANE UNIT COST ESTIMATE (Rs/ton)	COTTONSEED				SUNFLOWER SEED			
		DAILY INTAKE (tons)	FIRST CAKE (1) (tons)	DAILY HEXANE LOSSES (3) (tons)	DAILY COST ESTIMATE (Rs.)	DAILY INTAKE (tons)	FIRST CAKE (2) (tons)	DAILY HEXANE LOSSES (3) (tons)	DAILY COST ESTIMATE (Rs.)
YEAR 1	25,000	375	187.5	0.469	11,719	300	180	0.450	11,250
YEAR 2	26,250	400	200.0	0.500	13,125	325	195	0.488	12,797
YEAR 3	27,563	450	225.0	0.563	15,504	350	210	0.525	14,470
YEAR 4	28,941	475	237.5	0.594	17,183	375	225	0.563	16,279
YEAR 5	30,388	475	237.5	0.594	18,043	400	240	0.600	18,233
YEAR 6	30,388	475	237.5	0.594	18,043	450	270	0.675	20,512

(1) First cake = 50 % of the cottonseed intake

(2) First cake = 60 % of the sunflower seed intake

(3) Losses are estimated to 0.25 % of the weight of the first cake

TABLE B-16 - DAILY CAUSTIC SODA CONSUMPTION AND COST ESTIMATE YEAR 1 TO 6

	CAUSTIC SODA UNIT COST ESTIMATE (Rs/ton)	COTTONSEED OIL			SUNFLOWER OIL		
		DAILY CRUDE OIL PRODUCTION (1) (tons)	DAILY CAUSTIC SODA CONSUMTPION (3) (tons)	DAILY COST (Rs.)	DAILY CRUDE OIL PRODUCTION (2) (tons)	DAILY CAUSTIC SODA CONSUMTPION (3) (tons)	DAILY COST (Rs.)
YEAR 1	9,000	75	0.330	2,970	117	0.515	4,633
YEAR 2	9,450	80	0.352	3,326	127	0.559	5,281
YEAR 3	9,923	90	0.396	3,929	137	0.603	5,981
YEAR 4	10,419	95	0.418	4,355	146	0.642	6,693
YEAR 5	10,940	95	0.418	4,573	156	0.686	7,509
YEAR 6	10,940	95	0.418	4,573	176	0.774	8,472

(1) crude cottonseed oil = 20 % of the cottonseed intake

(2) crude sunflower oil = 39 % of the sunflower seed intake

(3) caustic soda consumption: 4.4 kg per ton of crude oil

TABLE B-17 - DAILY BLEACHING EARTH CONSUMPTION AND COST ESTIMATE YEAR 4 TO 6

	BLEACHING EARTH COST ESTIMATE (1) (Rs/ton)	BASIC REFINED COTTONSEED OR SUNFLOWER OIL DAILY INPUT (2) (tons)	BLEACHING EARTH DAILY CONSUMPTION (3) (tons)	DAILY COST (Rs)
YEAR 4	7,525	150	3.0	22,574
YEAR 5	7,901	170	3.4	26,863
YEAR 6	7,901	190	3.8	30,023

(1) Bleaching earth cost estimate for year 1 = Rs.6,500/ton

(2) Refer to Table 11 of the production program that outlines the daily cottonseed or sunflower oil production.

(3) Bleaching earth consumption: 20 kg per ton of basic refined oil.

TABLE 6-18 - DAILY PLASTIC (P.E.T.) CONSUMPTION AND COST ESTIMATE YEAR 4 TO 6

	P.E.T. COST ESTIMATE (1) (Rs/ton)	DAILY OIL PRODUCTION (2) (tons)	DAILY PRODUCTION OF 3 KG PLASTIC BOTTLES (number of bottles)	DAILY P.E.T. CONSUMPTION (3) (tons)	DAILY COST (Rs)
YEAR 4	75,246	150	50,000	5.25	395,040
YEAR 5	79,008	170	56,667	5.95	470,097
YEAR 6	79,008	190	63,334	6.65	525,411

(1) P.E.T. cost estimate for year 1 = Rs.65,000/ton

(2) Refer to Table 11 of the production program that outlines the daily cottonseed or sunflower oil production.

(3) P.E.T. consumption: 105 grams per 3 kg bottle.

TABLE B-19 - DAILY GAS REQUIREMENTS AND COST ESTIMATE FOR STEAM PRODUCTION YEAR 1 TO 6

	GAS UNIT COST ESTIMATE (Rs/cubic meter)	COTTONSEED			SUNFLOWER SEED		
		DAILY STEAM REQUIREMENTS (1) (tons)	DAILY GAS REQUIREMENTS (2) (cubic meter)	DAILY COST (Rs.)	DAILY STEAM REQUIREMENTS (1) (tons)	DAILY GAS REQUIREMENTS (2) (cubic meter)	DAILY COST (Rs.)
YEAR 1	0.706	128	10,090	7,124	222	17,500	12,355
YEAR 2	0.741	136	10,721	7,947	240	18,919	14,025
YEAR 3	0.778	154	12,140	9,449	260	20,496	15,953
YEAR 4	0.817	207	16,318	13,336	323	25,462	20,810
YEAR 5	0.858	213	16,791	14,409	347	27,354	23,474
YEAR 6	0.858	219	17,264	14,815	391	30,823	26,450

(1) See Annexure 5 for the detail of the calculation of steam requirements

(2) Estimated gas requirement: 78.83 cubic meter per ton of steam per hour

TABLE B-20 - DAILY GAS REQUIREMENTS AND COST ESTIMATE FOR ELECTRICITY GENERATION YEAR 1 TO 6

	GAS UNIT COST ESTIMATE (Rs/KWH)	COTTONSEED		SUNFLOWER SEED	
		HOURLY ELECTRICITY REQUIREMENTS (1) (KWH)	DAILY GAS COST ESTIMATE (2) (Rs.)	HOURLY ELECTRICITY REQUIREMENTS (1) (KWH)	DAILY GAS COST ESTIMATE (2) (Rs.)
YEAR 1	0.57	2,397	32,791	1,968	26,922
YEAR 2	0.60	2,557	36,729	2,131	30,610
YEAR 3	0.63	2,877	43,391	2,296	34,629
YEAR 4	0.66	3,537	56,013	2,939	46,543
YEAR 5	0.69	3,604	59,928	3,196	53,044
YEAR 6	0.69	3,670	61,025	3,586	59,628

(1) See Annexure 6 for the detail of the calculation of KWH requirements

(2) Gas cost estimate for electricity generation = Rs 0.57/KWH (source: Caterpillar representative in Pakistan)

TABLE B-21 - PRODUCTION AND TECHNICAL PERSONNEL BASE SALARIES

DESIGNATION	NUMBER OF PERSONS	BASE SALARY MONTHLY (Rs)	YEAR 1 COST/MONTH (Rs)	ADDITIONAL PERSONNEL TO BE HIRED FROM YEAR 4
Production Manager	1	60,000	60,000	
Chief Chemist (1)	1	45,000	45,000	
Technical Manager (2)	1	36,000	36,000	
Engineers	9	32,000	288,000	
Mechanics	9	16,000	144,000	
Electricians	6	16,000	96,000	
Chemists	3	16,000	48,000	
Supervisors	24	12,000	288,000	+ 3
Foreman (3)	9	10,000	90,000	+ 3
Operators (3)	36	8,000	288,000	+ 15
Workers (3)	9	6,000	54,000	+ 3
Helpers (4)	69	2,000	138,000	+ 30
TOTAL	177		1,575,000	+ 54

(1) In charge of the laboratory

(2) In charge of the factory maintenance

(3) Skilled labor

(4) Unskilled labor

TABLE B-22 - MANAGERIAL AND ADMINISTRATIVE PERSONNEL BASE SALARIES

DESIGNATION	NUMBER OF PERSONS	BASE SALARY MONTHLY (Rs.)	YEAR 1 COST/MONTH (Rs)
Chief Executive	1	100,000	100,000
Factory Manager	1	80,000	80,000
General Manager Finance	1	80,000	80,000
Assistant Finance Manager	1	60,000	60,000
Personnel Manager (1)	1	60,000	60,000
Assistant Personnel Manager	1	40,000	40,000
Purchase Officer (2)	1	16,500	16,500
Account Officer	1	25,000	25,000
Administrative Manager	1	50,000	50,000
Account Assistants	6	8,000	48,000
Store Assistants	5	5,000	25,000
Security Officer	1	15,000	15,000
Typists	4	6,000	24,000
Security Staff	25	3,000	75,000
Drivers	5	5,000	25,000
Cooks	2	3,000	6,000
Peons	10	2,000	20,000
Sweepers	2	2,000	4,000
TOTAL	69		753,500

(1) The personnel manager should be familiar with legal issues.
(2) In charge of the purchase of all the necessary inputs other than the raw materials.

TABLE B-23 - MANAGEMENT AND TECHNICAL PERSONNEL REQUIREMENTS DURING THE PREPRODUCTION PHASE

DESIGNATION	NUMBER OF PERSONS	BASE SALARY MONTHLY (Rs)	NUMBER OF MONTHS	YEAR 0 ANNUAL COST (Rs)
MANAGERIAL AND ADMINISTRATIVE PERSONNEL				
Chief Executive	1	100,000	12	1,200,000
General Manager Finance	1	80,000	11	880,000
Factory Manager	1	80,000	6	480,000
Personnel Manager	1	60,000	11	660,000
Assistant Finance Manager	1	60,000	3	180,000
Assistant Personnel Manager	1	40,000	3	120,000
Purchase Officer	1	16,500	3	49,500
Account Officer	1	25,000	3	75,000
Administrative Manager	1	50,000	3	150,000
Account Assistant	2	8,000	3	48,000
Store assistant	1	5,000	3	15,000
Security Officer	1	15,000	6	90,000
Typist	2	6,000	6	72,000
Security Staff	15	3,000	6	270,000
Drivers	2	5,000	11	110,000
Cook	1	3,000	6	18,000
Peon	2	2,000	6	24,000
Sweeper	1	2,000	6	12,000
PRODUCTION AND TECHNICAL PERSONNEL				
Production Manager	1	60,000	6	360,000
Chief Chemist	1	45,000	3	135,000
Technical Manager	1	36,000	6	216,000
Engineer	9	32,000	3	864,000
Mechanic	9	16,000	3	432,000
Electrician	6	16,000	3	288,000
Supervisor	24	12,000	3	864,000
Foreman	9	10,000	3	270,000
Operator	36	8,000	3	864,000
Worker	9	6,000	3	162,000
TOTAL PERSONNEL				8,908,500

TABLE B-24 - FOREIGN TECHNICAL ASSISTANCE DURING THE PRODUCTION PHASE

	DESIGNATION OF EXPERT	PERIOD OF TRAINING	COST/MONTH US$	ANNUAL COST US$
YEAR 1	Processing	3 months	10,000	30,000
	Quality Control	3 months	10,000	30,000
YEAR 2	Processing	3 months	10,000	30,000
	Quality Control	3 months	10,000	30,000
YEAR 3	Processing	3 months	10,000	30,000
YEAR 4	Annual cost of training = 15,000 US$ (lumpsum)			
YEAR 5	Annual cost of training = 15,000 US$ (lumpsum)			
YEAR 6	Annual cost of training = 15,000 US$ (lumpsum)			

I. SUNFLOWER AND COTTONSEED OIL MARKET

1. EVOLUTION OF THE EDIBLE OIL MARKET IN PAKISTAN

1.1 The Traditional Pattern

A feature of the traditional pattern of edible oil consumption in Pakistan before the late nineteen-fifties was the sharp division in consumption patterns between the poor and the better-off. The upper and middle classes used clarified butter (asli ghee) as a cooking medium, while the poor relied on a variety of vegetable oils ranging from cottonseed oil to various brassica types such as rape, mustard and taramira (arugula), almost all which were grown locally by the largely rural population. The total consumption of fats by the majority of the population, including edible oils, was very low. Asli ghee was for most, a rarely attained luxury. With rapid population growth, urbanization, and rising standards of living, the demand for edible fat, above all for asli ghee, rose quickly, outstripping the sluggish increase in availability of dairy products. Price rises and shortages of asli ghee came to affect even the middle classes and it became necessary to find a substitute for what was rapidly becoming a luxury rather than a staple.

1.2 The Introduction of Ghee

The substitute selected by both the government and private sectors was vanaspati ghee (hereinafter ghee), basically hydrogenated vegetable fat which physically resembles asli ghee (as well as lard and shortening) and like the aforementioned, is solid at room temperatures. This change over was not made for reasons of health (ghee has the same high cholesterol content as asli ghee while lacking even its' limited nutritional value) but rather due to the fact that the two products were similar enough in appearance to encourage substitution and ghee could be made from a wide variety of oils. It can, in fact, be made from a blend of oils, a typical mixture today being palm and soybean oils. The disadvantages of encouraging consumption of a product that involves an additional manufacturing process and is not only inferior to ordinary cooking oil but positively harmful, dawned on the government twenty years after ghee had been introduced, had displaced asli ghee (which is now over twice the price of when the substitution was introduced), and had even begun to extensively displace crude vegetable oils in rural areas. However, in the face of an entrenched ghee industry (both state-owned and private sector) the move towards refined cooking oil has been excruciatingly slow.

1.3 Consequences of GOP Intervention

The historic paucity of fats in the diet of the majority of Pakistanis has meant that butter, ghee and other fats have been considered highly desirable foods. The greater availability and a stable price of ghee had become a political objective. The nationalization of private Pakistani-owned ghee manufacturing units and their consolidation into the Ghee Corporation of Pakistan (GCP), gave the GOP an unprecedented degree of control over the edible oil manufacturing sector and over prices in particular. Thereafter, keeping down ghee prices became as much a political article of faith to every succeeding government as low wheat prices. The GOP could do this because the availability of cheap, often subsidized, imported oil has allowed it to escape the immediate economic consequences of its own policy. However, this effective underpricing of ghee to the Pakistani consumer was fraught with serious consequences for oilseeds production in the country.

Ghee prices in Pakistan, which were already low, have risen by only 84% in rupee terms between 1975-76 and 1988-89. During this period, mutton and beef have registered 220% and 242% increases respectively, eggs, despite a massive increase in production, 145%, pulses 345% and wheat, the price of which has always been severely controlled, has risen by 91%[1]. Ghee prices are no longer formally controlled by the GOP but GCP's weight in the market is so overwhelming that by setting GCP's prices, the GOP has so far been able to dictate overall market prices.

During the decade ending 1984-85, per capita consumption of vegetable ghee increased by about 80 percent, from 3.77 kg. per person per annum in 1975-76 to 6.76 kg. in 1984-85. In 1975-76, expenditure on vegetable ghee was 2.10 percent of per capita income for that year, whereas in 1984-85 it was no more than 1.89 percent of annual per capita income.

1.4 Smuggling of Ghee

If we compare Pakistani ghee/edible oil prices to those of two neighboring countries, we find that Indian prices are 40 - 50% higher for comparable products, while Iranian prices have varied from two to three times the Pakistani price[2]. Low comparative prices have meant that Pakistani ghee is consumed not only in Afghanistan, as well as in Indian Punjab and Iran, but occasionally in Soviet Central Asia and in the Gulf States as well. The only limit seems to be the carrying capacity of smugglers. It is difficult to quantify the amounts smuggled; estimates have ranged from 13 to 20 percent of production. Even the lower figure represents a staggering quantity.

1.5 State of the Industry

The industry is technically proficient in ghee manufacture but economically inefficient. Sanitation is substandard in most units and packaging and presentation generally primitive.[3] Over staffing is so endemic in the state-owned GCP that productivity per employee is typically 18% of that in private sector mills.[4]

The industry has less experience in manufacturing, packaging and selling cooking oil. Deodorization is generally not fully effective and packaging is relatively poor and fails to take into account the potential upmarket appeal of cooking oil. The lack of mandatory labelling by content and consumer inexperience still hampers the growth of public consciousness of the comparative characteristics of cooking oils and their relative health advantages when compared with ghee.

2. DOMESTIC OILSEED PRODUCTION

2.1 Oilseed Production

The 1989-90 production of oilseeds is given in Table C-1. This gives an indication of the potentially available quantities of edible oil in Pakistan, but is by no means indicative of the actual amounts of oil produced.

In the first instance, the bulk of cottonseed processed passes through expellers rather than through a solvent extraction process and thus yields only 10 to 11 percent oil rather than the 16-17% possible with the solvent extraction process.

Rapeseed likewise is processed through kohlus and expellers and the domestic varieties are in any case not suitable for processing into cooking oil. This will be possible once canola and other double-zero varieties are widely grown, but this will not occur in the near to medium term.

At present, rice bran is not treated immediately upon processing to neutralize free fatty acid formation, hence this potentially high quality oil is not extracted in edible form and is used instead for soap manufacture. For the foreseeable future, only the large scale rice mills will be able to install bran treatment facilities even if market opportunities for rice bran oil are seen to exist.

Soybean cultivation has been held back by the lack of locally adapted varieties of the seed and the lack of cultivation technology. Disease, low germination rates and low yields have

TABLE C-1

OILSEED PRODUCTION AND POTENTIAL EDIBLE OIL IN PAKISTAN (1989-90)

	Material	Quantity Grown (M/tons)	Less 10% Seed Retained	% Oil Content	Gross Ed. Oil (M/tons)
1.	Cottonseed	2,949,000	2,654,100	17	451,197
2.	Rapeseed/Mustard	300,000	270,000	35	94,500
3.	Sunflower seed #	60,000	N.A.	37	22,200
4.	Soyabean #	1,000	N.A.	12	120
5.	Safflower seed	500	450	28	126
6.	Rice bran *	300,000	270,000	11	27,700
7.	Others	2,000	1,800	20**	360
	Total	3,613,300			598,203
	Total excl. rice bran oil				568,503

been the result. Soybean also needs to find its proper place in the crop rotation cycle.

It is particularly discouraging fact that cottonseed, which provides over 70% of domestically available edible oil, is not even an oilseed crop but a by-product of the raw material for the textile industry. As far as the edible oil sector is concerned, it is merely fortuitous that cottonseed oil availability has risen rapidly; it could just as easily decline.

2.2 Impact of GOP Policy on Oilseeds

Pakistan's edible oil policy has, in effect, been ad-hoc and implicit rather than long-term and planned. This policy has had as its main features low prices for edible fats, ghee as well as

cooking oil, and reliance on cheap imported oils, both palm which is suitable for ghee production, and soybean which for a variety of incentives offered to the GOP by the U.S., is financially attractive to the GOP. The result is that edible fat prices for the consumer have actually declined in real terms for the Pakistani consumer over the last fifteen years. This in turn has led to depressed prices, low demand, and limited financial incentive for the production of oilseeds in Pakistan.

The availability of cheap imported oils has had an adverse impact on prices offered for local oilseeds. As the National Commission on Agriculture put it:

> "...gross output of all agricultural products has quadrupled since independence, but the production of oilseeds has stagnated."

As demand in the past decade has grown by about 9% per year, imports of edible oils have climbed sharply and now account (1988) for more than 60% of the domestic use of about 1.2 million tons."[5] (Subsequent research has shown that domestic use is 1.1 million tons).

The income disadvantage of growing oilseeds is further exacerbated by low yields in Pakistan - the rate of introduction of new types and better varieties seeds has been slow and hampered by weak research efforts and lack of diffusion of new seeds and technologies among farmers. A further complication is that the main domestic source of edible oil is cottonseed which is not primarily an oil crop.

Accepting the highly optimistic growth rates in domestic edible oil availability assumed in the NCA report,[6] no more than 51% of total demand would be met through domestic sources by the year 2000; this would include growth in yields and acreage, higher oilseed prices, strengthened oilseeds research and extension and the growth solvent extraction processing.[7] This situation presents a major continuing problem for Pakistan for the foreseeable future, from both the balance of payments and food security perspectives.

Currently, there are clear indications that the GOP policy of artificially maintaining low ghee and oil prices is unsustainable and thus will have to be gradually abandoned, particularly as cheap soybean oil becomes difficult to obtain.

2.3 Impact of GOP Policy on the Solvent Extraction Industry

Solvent extraction plants were introduced in Pakistan in the late 1950s, and there are now 24 such plants with a total seed extraction capacity of 550,000 tons per year. By October 1989,

five of these units had been shut down because raw materials were in short supply and production was unprofitable at the prevailing prices. Most of the other units switched over to rice bran oil extraction (which is extracted in non-edible condition), so that only about five plants were being utilized for cottonseed, rapeseed/mustard, or sunflower. The extraction of the high residual oil content from cotton and rapeseed cake from local expellers has also become increasingly prevalent. There is a general consensus that many of the solvent extraction plants are in need of new equipment and general overhaul. In particular, decortication equipment for sunflower seed is needed in order to achieve efficient levels of oil extraction and high quality meals.

3. THE EDIBLE OIL MARKET IN PAKISTAN

3.1 Market Size

Private sector members of the industry regard the best estimate for 1990-91 consumption as 1.1 million tons (Table C-2) with ghee comp.ising 75%, cooking oils of all types 20%, packaged oils 7% and other fats including butterfat, comprising the remaining 5%. By far the most dynamic segment of the market is the packaged cooking oil sector which is growing at an annual rate of a minimum of 15%, some estimates range up to 20 percent. The expansion of ghee is more modest at 5% per annum although even if some market substitution of oil for ghee at the upper end is assumed, the rate is not expected to fall below the 3.1 percent growth rate of population in any case.

Table C-3 assumes growth rates of 15% per annum for cooking oil and an optimistic 5% per annum for ghee through 1995-96.

3.2 Product Differentiation

Cooking oils were introduced by GCP over a decade ago and at one point sunflower oil was even being sold at a price slightly lower than that of ghee, as a consumer incentive. For a variety of reasons connected with GOP pricing policy and GCP inertia, the growth rate in the consumption of cooking oils was low. The present relative pricing of cooking oil and ghee however, reflects a strong, relatively recent, consumer driven product differentiation between cooking oil and ghee to the extent that they can be regarded as two different product ranges with some possible substitutability at the lower end of the cooking oil range. This reflects increasing consumer awareness, especially at the top of the market, of the fact that ghee is an inferior, less healthy product and a willingness to pay a premium for cooking oil.

TABLE C-2

EDIBLE OIL MARKET STRUCTURE - 1990-91

	M.TONS	PERCENT
Total Edible Oils	1,100,000	100
Ghee	825,000	75
All Cooking Oils	220,000	20
Packaged Oils	75,000	7
Other Fats	55,000	5

Source: Estimates, various sources

TABLE C-3

EDIBLE OILS - PROJECTED GROWTH RATES

	Ghee*	Packaged Oil**
1990-91	825,000	75,000
1991-92	866,250	86,250
1992-93	909,563	99,187
1993-94	955,041	114,066
1994-95	1,002,793	131,175
1995-96	1,052,932	150,852

* 5 percent annual increase
** 15 percent annual increase

C. MARKET, SALES, AND DISTRIBUTION

Heavy consumer demand for cooking oils in general and sunflower oil in particular, has led to the typically Pakistani market situation of hoarding, shortages and unauthorized retailer premiums. This in turn has led to upward price adjustments by manufacturers including GCP and widening interest in cooking oils by the private sector.

The situation by early 1991 was a price range for domestic cooking oils (see Table C-4) of between Rs. 21.20/kg for the low end of the market, GCP's Pakwan (soybean) to Rs. 29.15 for the recently introduced Dalda Sunflower Oil and Rs. 33.92 for Rafhan Corn Oil. Rafhan, the oldest cooking oil in Pakistan, is still hampered by odor problems and limited supplies of crude maize oil, but retains a devoted following (and commands a premium) due to its supposedly superior health characteristics. There are even cheaper less known oils available, often of dubious quality, but these cannot be considered true mass-market products.

If the price for GCP's Kohinoor Ghee is taken as a benchmark, Pakwan the cheapest mass-market domestic oil is priced 113% higher while Dalda SF and Rafhan are 155% and 180% higher respectively.

By contrast, the prices of most ghees tend to cluster at or slightly below the price of Kohinoor, with only Dalda Vanaspati, truly one of a kind in terms of marketing success, 124% more expensive. The market is clearly divided into two distinct sectors, oil and ghee, with sunflower near the top of it's sector. Tullo sunflower, by no means the most expensive sunflower oil is a full 38% more expensive than Kohinoor and 11% more expensive than Dalda Vanaspati.

There is a separate, small niche devoted to imported packaged cooking oils, corn, sunflower, soy and blended oils. The major brands are Coroli, Golden Drop and Chef. These command a considerable premium of between 230% and 275% over the benchmark, albeit on a small scale. This market segment would appear to owe it's existence to the restricted supply of high quality Pakistani cooking oils, doubts about quality of domestic packaged oils etc. It will be interesting to see the impact of this segment on Dalda sunflower oil and other well-marketed, good quality oils.

Given the fact that cooking oil is not only a different product from ghee but is also itself differentiated into several major products, some of which are directly price-competitive and close to each other in quality and others forming a hierarchy by price and quality, it is clear that the old system of marketing, if it can be so called, is inapplicable. The program of hydrogenating whichever oil or blend of oils is cheapest or available by government decree and selling it in a fat-starved market which, seemingly oblivious to quality, soaked up whatever was offered, seems to be at an end. This was helped by declining real prices for a considerable period.

TABLE C-4

COMPARATIVE EDIBLE OIL PRICES

	Retail					% Premium over	Metric
	5 litre	4 litre	3 litre	1 litre	1 Kg	Benchmark	Ton
1. Dalda Sunflower Oil (Lever)	-	110		27.50	29.15	155	29,150
2. Planta (Lever)	119			23.80	25.23	134	25,228
3. Dalda Cooking Oil (Lever)	113			22.60	23.96	127	23,956
4. Tullo Sunflower Oil (GCP)	122			24.40	25.86	138	25,864
4A Tullo SF 1989 (GCP)	90			18.00	19.08	101	19,080
5. Pakwan (GCP)	100			20.00	21.20	113	21,200
6. Rathan (2.25 litr)	72			32.00	33.92	180	33,920
7. Imported cornoil (Coroli, Golden Drop)			145	48.33	51.23	273	51,233
8. Imported SF oil (Coroli)			125	41.67	44.17	235	44,167
Kohinoor Ghee 5kg* (GCP)	94				18.80	100	18,800
[illegible] Ghee 5 kg (Lever)	117				23.40	124	23,400

Source: Various retail outlets

Note: Imported brand prices vary by upto 10 percent depending on retail outlet. Most prevalent price selected.

3.3 Price Trends

Not only have cooking oil prices risen steadily in the last two years despite GOP efforts to control ghee prices, there is a premium of 13% to 55% commanded by cooking oil over ghee with sunflower oil in the upper ranges. Even if the premium were to narrow as GOP allows ghee prices to rise to the point where domestic oilseed production becomes a major factor (as it is doing at the time of writing), it is unlikely to go below 25 percent for sunflower. In fact, with prices expected to rise in the near term, cooking oil appears set to enjoy both higher real prices and a significant premium over ghee in an increasingly quality conscious market.

3.4 Edible Oil Imports

The two major types of edible oil imported are palm oil and soybean oil (see Tables C-5 and C-6) Palm oil, the cheapest, lowest quality oil, is used for blending into ghee.

TABLE C-5

VOLUME OF IMPORTED OILS

FY	('000 tons)
1979-80	346
1980-81	467
1981-82	624
1982-83	656
1983-84	753
1984-85	664
1985-86	825
1986-87	710
1987-88	1,013
1988-89	986
1989-90	957

Source: Various newspaper reports

TABLE C-6

EDIBLE OIL IMPORTS

Year	Quantity ('000 tons)	Value (Rs. Million)	Avg. Price Rs/Ton
		Palm Oil	
1983-84	345	2,980	8,640
1984-85	458	4,344	9,480
1985-86	596	3,877	6,510
1986-87	438	2,150	4,910
1987-88	458	3,193	6,970
1988-89	475	3,962	8,340
1989-90	597	4,120	6,901
		Soybean Oil	
1983-84	407	3,512	8,630
1984-85	195	2,432	12,470
1985-86	218	2,146	9,840
1986-87	249	1,706	6,850
1987-88	500	4,035	8,070
1988-89	384	4,440	11,630
1989-90	343	3,863	11,262

Source: Federal Bureau of Statistics Monthly Statistical

indicates an average import price of around $ 420 a ton in 1988-89. Current prices in Kuala Lumpur are even lower.

Soybean oil, which is used both in cooking oil and for blending into ghee is supplied by GOP to processors at a price 500 rupees per ton below the current price of refined, bleached and deodorized (RBD) palm oil. This policy is aimed at taking advantage of subsidized U.S. soybean oil. The United States supplies Pakistan with soybean oil under the PL-480 program. Approximately $ 80 million worth of oil has been supplied under this program in 1987-88 and 1988-89. Tonnages amounted to 137,135 in 1987-88, and 155,571 in 1988-89. The arrangement also commits Pakistan to additional mandatory purchases of U.S. soybean oil which in 1987-88 amounted to 247,600 tons and in 1988-89 to 258,700 tons. There was some element of subsidy implicit in the generous credit terms extended for oil purchases, under VMR-102 Commodity Credit, so that the mandatory purchase of U.S. oil is financially attractive to GOP.[8] The balance of the soybean oil is purchased on world markets. While this dumping of cheap oil provides a short-term fix for GOP's congenital resource and balance of payments problems, it has proved devastating to the domestic production of oilseeds in Pakistan. It would not be surprising, in view of the present government's recognition of the external resource squeeze to see a regulatory tariff on imported oil aimed at increasing domestic oilseed production.

4. MARKETING STRATEGY

4.1 Plant Output

The output of the plant will comprise sunflower and cotton seed oil. Sunflower oil production will commence with 6,600 tons in Year One, rising to 19,980 tons in Year Six while cotton seed oil will commence with 13,388 tons in Year One rising to 16,958 tons in Year Six (see Table C-7).

In a market that is presently 75,000 tons per annum and is projected to be over 150,000 tons per annum by the time refining facilities are operative, the sale of this amount of sunflower oil should present no problem if a comprehensive marketing strategy is followed. While it should also be possible to sell cottonseed oil in refined form sale to ghee manufacturers remains a fallback option.

TABLE C-7

OIL & MEAL OUTPUT

		OIL	MEAL
Y 1	COTTONSEED	13,388	30,713
	SUNFLOWER	6,660	7,200
Y 2	COTTONSEED	14,960	34,320
	SUNFLOWER	8,418	9,100
Y 3	COTTONSEED	16,618	38,123
	SUNFLOWER	10,360	11,200
Y 4	COTTONSEED	17,595	40,365
	SUNFLOWER	12,488	13,500
Y 5	COTTONSEED	17,765	40,755
	SUNFLOWER	14,800	16,000
Y 6	COTTONSEED	16,958	38,903
	SUNFLOWER	19,980	21,600

4.2 Marketing Requirements

Marketing or promotion activities are required in four areas:

i) Bulk sunflower and cottonseed oil (First phase of production)

ii) Sunflower and cotton meal

iii) Refined, packaged, sunflower and cottonseed oil (Second phase of production)

iv) Procurement related promotional activities.

4.3 Marketing Strategy

The following factors will have to be considered:

i) Sunflower oil presently comprises virtually the top segment of the cooking oil market,

second only to corn oil, which is sold in relatively small quantities. This is a market that commands a premium price but where competition is likely to become fairly stiff. There are already indications that this is occurring; Lever Brothers has recently introduced their own sunflower oil which sells at a price below only that of Rafhan corn oil, and which benefits from Lever's excellent distribution and marketing system. There are bound to be other competitors in this market. Therefore a major marketing and distribution effort for packaged sunflower oil will be absolutely necessary.

In the early stages it would be a sound strategy to avoid the major investment required in refining and packaging facilities as well as the effort needed to market and distribute finished cooking oil. The idea would be to seek a firm with an existing distribution system and a similar product line which would buy the oil in bulk form, refine, package and distribute the product on its own account. An interesting prospect would be to approach a company such as Lever Brothers; which has a marketing and distribution system, refining facilities and has recently formed a strong interest on the seed side to gauge their interest in purchasing the bulk oil. The missing link for Lever is solvent extraction. They presently buy their oil in bulk form from the market. Guaranteed minimum amounts of guaranteed quality at market prices are likely to be of interest to them.

ii) Cotton seed oil is presently sold almost entirely to ghee manufacturers, the exception being Lever's Planta oil which is a blend of cotton seed and soybean oils. Cotton seed oil is intrinsically a high quality oil, the international price of which is at par with, and sometimes above that of sunflower oil. While this oil is attractive to ghee manufacturers at present and can be initially sold to them in bulk form, once refining facilities are in place and a distribution system is developed, it would be a more profitable proposition to sell cottonseed oil as refined cooking oil rather than as raw material for ghee. The introductory market price could be at par with Lever's Planta and somewhat higher thereafter. Given its relatively high smoke point, cotton seed oil is often used by processors of potato chips, snack foods and nuts. This opens the possibility of supplying refined cotton seed oil in bulk packing directly to manufacturers in Pakistan and aborad should the current ban of exports of edible oils be lifted.

iii) Pakistan's varied agro-ecological environments allow the growing of a number of other oil seed crops. Three other crops are likely to be formidable competitors to sunflower and cotton seed oil and can also be considered for inclusion in the plant's product range at a later period. These are peanut, canola, and safflower. These are discussed below.

4.3.1 Bulk Sunflower and Cottonseed oil

While it is convenient and desirable to locate a single purchaser for bulk oil, or if necessary one for each type of oil, the marketing division must ensure that:

i) The prices incorporated in purchase agreements should be attractive and subject to annual revision to take advantage of changing market prices.

ii) All possible purchasers should be thoroughly explored to provide alternatives in case problems are experienced with the original purchaser. A monopsony situation is to be avoided.

iii) The oil supplier must have the right to publicize the fact that he is a (or the) supplier of the oil being refined, packaged and sold to consumers by the marketer. The collaborative aspect of the arrangement should be publicized.

iv) The company must publicize its activities including the sale of bulk oil from the very beginning.

4.3.2 Sunflower and cotton meal

Given the importance of meal revenues to plant profitability and the nascent, though vigorous meal market this is discussed in detail separately. (Section C. II.)

4.4 Refined Sunflower and Cottonseed oil

The marketing effort for cooking oil can conveniently be divided into four segments:

i) The first phase, to commence in the year prior to plant operation, is publicity concerning the enterprise itself, as mentioned above. This would highlight the firm's procurement and processing activities, stressing the unique features of its operation, its technical superiority, product quality and commitment to the Pakistani market and consumer.

ii) Market research should commence as early as possible after the management decision to invest in refining and packaging, and in any case no later than a full year and a half before the refined oil is due to be marketed. This would involve a full-scale market study including current demand, consumer profile, growth projections and

market segmentation not only by differential price and product but by area, i.e. each major city and surrounding zone, smaller towns in aggregate etc.(the latter is indispensable in planning a distribution network). Seasonal variations must be noted. This information should be updated annually. It is suggested that the study be carried out by a professional market research firm with the close involvement of nominated personnel of the marketing division who would gain valuable experience thereby.

iii) Based on the information gathered from the market study, a distribution network will be developed. This will involve targeting initial markets, appointing distributors, determining retail markups (indicative markups are illustrated in Table C-8), and distributor incentives.

iv) A major advertising and promotion campaign will be necessary to launch the product and capture the targeted market share. This would not only involve advertising on television, radio and print media but also promotional literature such as specially commissioned cookbooks and distribution of cooked items and samples of oil in selected markets. It would be cost-effective to undertake this in conjunction with a major advertising agency.

Apart from promotion of its own products, the firm should take steps to increase public awareness on the question of cooking oil versus ghee, stressing the health aspects and quality of cooking oil and the cost to the national economy and the Pakistani farmer of importing low quality oil for hydrogenation. This latter campaign should be undertaken in conjunction with other interested cooking oil manufacturers and every effort should be made to revive the dormant Ministry of Health campaign on the same subject.

4.4.1 Pricing Policy

It is proposed to price the refined sunflower oil at an introductory wholesale price of Rs. 26/kg, approximately 7.5 percent below the price of Dalda sunflower oil for the first year. In subsequent years the price will be Rs. 28/kg, which is only fractionally below the price of Dalda sunflower oil. The cottonseed oil will be sold in refined form initially at Rs. 24.38/kg, the same price as Levers Planta oil which is a blend of cottonseed and lower quality soybean. In subsequent years it is proposed to raise this price to Rs. 25.6, a level 5 percent above the price of Planta (For revenues, see Table C-9).

TABLE C-9

PROVISION FOR MARKETING AND DISTRIBUTION
****

	PROJECTED CASH RECEIPTS	% MARKETING PROVISION	TOTAL RUPEES MARKETING
YEAR 0	31,200,000	1%	5,419,232 *
YEAR 1	541,923,150	1%	5,419,232
YEAR 2	607,918,390	1%	6,079,184
YEAR 3	766,660,902	2%	15,333,218
YEAR 4	1,523,062,167	3%	45,691,865
YEAR 5	1,872,406,120	3%	56,172,184
YEAR 6	2,036,449,408	3%	61,093,482

*provision for Year 0 is 1% of projected cash receipts for Year 1

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4.5 Procurement Related Promotional Activities

A procurement system for a relatively new crop based on contract growers is a considerable undertaking. Promotional activities would be a considerable help in setting up this system. These would have the aim of:

i) encouraging the growing of sunflower in the procurement areas and

ii) attracting as many growers as possible towards participation in the firms contract farmer scheme and encouraging their continuing participation by

1) Publicity campaigns in the areas themselves on local radio newspapers billboards etc.

2) Regular publicized field days and contract farmer meetings.

3) A newsletter (with photographs) for contract farmers.

4) Incentives such as prizes for farmers with highest yields, highest quality, most profitable innovation etc.

5) Annual functions at the mill itself where national, provincial and local dignitaries are invited to address contract farmers.

These programs will be planned and implemented jointly by the marketing and procurement/extension personnel, all of whom will participate in implementation.

4.6. Other Oilseeds

4.6.1 Peanuts

Peanuts are grown widely if not intensively in Pakistan. Yields are low, and inappropriate varieties and improper storage lead to contamination of stock by aflatoxins which render the oil inedible. Once these problems have been solved, peanut oil which is of higher quality than most others, would become available. Given its high price it would compete with corn oil in a higher market segment than sunflower and cottonseed oil. It would be a useful high value, high margin, exportable product to add to the product line.

4.6.2 Safflower

Safflower is a native plant in Pakistan which yields an oil that in quality and price is above sunflower, cottonseed or canola and just below peanut oil. The major problems with its cultivation have been securing a suitable niche in crop rotation patterns and the fact that the highest oil content is to be found in the spiny varieties. This will make mechanical harvesting a necessity for this crop; in any case mechanical harvesting is becoming increasingly desirable for any large scale cultivation. It is likely that both these problems will be solved in the coming decade. In this case, safflower would definitely be a crop to consider in the future.

4.6.3 Canola

Canola oil is close to and directly competitive with sunflower oil. Canola is an erucic acid and glucosinolate free (double zero) variety of rapeseed which is already the second largest oil seed crop in Pakistan. It has been hampered by three major factors i) lack of varieties adapted for Pakistan, ii) the need for zoning to prevent contamination by domestic varieties which lower its double zero quality and iii) low oil seed prices. Adaptation of varieties is already in progress, and with prices already on the increase, the zoning problem can be considered as simply one more major constraint to be overcome through extension programs similar to those that the company is already considering.

4.7 Export Markets

Given the buoyancy of the domestic market and the quantities of oil planned to be produced, no export sales are planned at this time. It should be noted however, that quality sunflower oil in packaged form would be an attractive export to both Middle-East and Far-Eastern markets, should the legal barriers to such exports fall, and qualified importer/distributors be located. Cottonseed oil in finished bulk packing could also be exported to the Far-East for use in snacks manufacture and canned seafood.

5. MARKETING MANAGEMENT, STRUCTURE AND COSTS

5.1 Personnel

Although the oil produced will be sold in bulk form to refiners or ghee manufacturers in the initial stage, and the meal will also be sold in bulk form, it will be necessary to set up the basic structure of the Marketing Division early on to meet the objectives outlined in 4.3.1 above and to prepare for the activities outlined in 4.4 and 4.5. The establishment and operation of distribution networks will require additional staff and funds for promotional costs.

Accordingly the marketing structure will consist of:

1. The General Manager Marketing, who will be responsible to the chief executive for all marketing, sales, distribution and promotional activities related to plant products.

2. The Sales Manager, Oil, who will be responsible to the General Manager Marketing for sales and distribution of sunflower and cottonseed oil initially in bulk and subsequently in finished form.

3. The Sales Manager, Meal, who will be responsible to the General Manager Marketing for sales and distribution of sunflower and cottonseed meal.

4. The Advertising Manager, who will be responsible to the General Manager Marketing (and will coordinate with both sales managers) for all advertising and promotional activities relating to oil and meal. He and his staff will provide assistance to the Development Manager on procurement related promotional activities. He will also be the Division's main liaison with the advertising agency.

5. The Meal Nutritionist, who will be responsible to the Sales Manager, and will assist in design and implementation of the marketing strategy for meal. He will be a Livestock Nutrition Specialist and with the assistance of the Programmer/Analyst, will be particularly responsible for the formulation of least cost rations.

6. Sales Officer, Meal. Initially two, to be raised to three in Year 3 as meal production rises. Responsible to the Sales Manager Meal, for implementation of the marketing strategy for meal, contacts with buyers including feed mills and brokers.

7. Sales Officer, Oil. Initially two, to be raised to four in Year 2 as a distribution network for packaged cooking oil is being established, and to six at the beginning of Year Four as the distribution network is up and running. Responsible to the Sales Manager Oil, for implementation of the marketing strategy for oil, contacts with distributors and overseeing particular retail markets etc.

8. Advertising Executive. Initially one, to be raised to two in Year 2 as an advertising and promotion program for packaged cooking oil is being established, and to three at the beginning of Year Four as the Program is in full operation. Responsible to the Advertising Manager, whom they will assist in all his activities.

9. An Analyst/Programmer will be hired to assist in all computerized operations including meal formulation, demand and revenue projections etc.

10. Executive Secretary. One, for the G.M. Marketing.

11. Typist. Initially three, to be raised to four in Year 3.

5.2 Marketing Costs

Indicative salary and benefit costs for the marketing division are given in Table C-10. These personnel costs will be paid as general personnel costs of the organization. Additional funds for the marketing division will be met by block provisions of 1% of the projected cash receipts of each year in Years 0 (Start-up) through 2, two percent in Year 3, and three percent of the projected cash receipts for Years 4 through 6. (Table C-9). The provision for Year 0 is 1 % of the expected cash receipts for Year 1 as Year) is a preoperational year. These block provisions should provide sufficient funds to meet all advertising, promotion and distribution costs.

TABLE C-10

SALARY AND BENEFIT COSTS - MARKETING DIVISION

Marketing Personnel

Designation	Number	Base Salary	Year 1 Cost/Month	Year 1 Annual Cost	Number	Base Salary	Year 2 Monthly	Year 2 Annual	Number	Base Salary	Year 3 Monthly	Year 3 Annual	Number	Base Salary	Year 4 Monthly	Year 4 Annual
Marketing Manager	1	80,000	80,000	960,000	1	84,000	84,000	1,008,000	1	88,200	88,200	1,058,400	1	92,610	92,610	1,111,320
Sales Manager, Oil	1	40,000	40,000	480,000	1	42,000	42,000	504,000	1	44,100	44,100	529,200	1	46,305	46,305	555,660
Sales Manager, Meal	1	40,000	40,000	480,000	1	42,000	42,000	504,000	1	44,100	44,100	529,200	1	46,305	46,305	555,660
Advertising Manager	1	40,000	40,000	480,000	1	42,000	42,000	504,000	1	44,100	44,100	529,200	1	46,305	46,305	555,660
Meal Nutritionist	1	30,000	30,000	360,000	1	31,500	31,500	378,000	1	33,075	33,075	396,900	1	34,729	34,729	416,745
Sales Officer, Oil	2	25,000	50,000	600,000	2	26,250	52,500	630,000	4	27,563	110,250	1,323,000	6	28,941	173,644	2,083,725
Sales Officer, Meal	2	25,000	50,000	600,000	2	26,250	52,500	630,000	3	27,563	82,688	992,250	3	28,941	86,822	1,041,863
Advertising Executive	1	25,000	25,000	300,000	1	26,250	26,250	315,000	2	27,563	55,125	661,500	3	28,941	86,822	1,041,863
Analyst / Programmer	1	20,000	20,000	240,000	1	21,000	21,000	252,000	1	22,050	22,050	264,600	1	23,153	23,153	277,830
Executive Secretary	1	10,000	10,000	120,000	1	10,500	10,500	126,000	1	11,025	11,025	132,300	1	11,576	11,576	138.915
Typist	3	6,000	18,000	216,000	3	6,300	18,900	226,800	4	6,615	26,460	317,520	4	6,946	27,783	333,396
Total Personnel	15		403,000	4,836,000	15		423,150	5,077,800	20		561,173	6,734,070	23		676,053	8,112,636
Fringe Benefit @ 50 %			201,500	2,418,000			211,575	2,538,900			280,586	3,367,035			338,027	4,056,318
Total			604,500	7,254,000			634,725	7,616,700			841,759	10,101,105			1,014,080	12,168,954

TABLE C-10

Marketing Personnel

Designation	Number	Base Salary	Year 5 Monthly	Year 5 Annual	Number	Base Salary	Year 6 Monthly	Year 6 Annual
Marketing Manager	1	97,241	97,241	1,166,886	1	102,103	102,103	1,225,230
Sales Manager, Oil	1	48,620	48,620	583,443	1	51,051	51,051	612,615
Sales Manager, Meal	1	48,620	48,620	583,443	1	51,051	51,051	612,615
Advertising Manager	1	48,620	48,620	583,443	1	51,051	51,051	612,615
Meal Nutritionist	1	36,465	36,465	437,582	1	38,288	38,288	459,461
Sales Officer, Oil	6	30,388	182,326	2,187,911	6	31,907	191,442	2,297,307
Sales Officer, Meal	3	30,388	91,163	1,093,956	3	31,907	95,721	1,148,653
Advertising Executive	3	30,388	91,163	1,093,956	3	31,907	95,721	1,148,653
Analyst / Programmer	1	24,310	24,310	291,722	1	25,526	25,526	306,303
Executive Secretary	1	12,155	12,155	145,861	1	12,763	12,763	153,154
Typist	4	7,293	29,172	350,066	4	7,658	30,631	367,569
Total Personnel	23		709,856	8,518,268	23		745,348	8,944,181
Fringe Benefit @ 50 %			354,928	4,259,134			372,674	4,472,091
Total			1,064,783	12,777,402			1,118,023	13,416,272

1. Calculated from indices given in GOP Economic Survey 1988-89, pp. 125-135. It is worth noting that in order to further increase wheat production, GOP has raised the price for the 1990 harvest still further.

2.. It can rightly be argued that India, with a considerable indigenous oilseeds production capability and similar patterns of consumption, presents a closer approximation to a realistic Pakistani model for the future than Iran. That is to miss the point. Iran's domestic oilseed production is even less able to meet internal needs than Pakistan, and Iran, unlike Pakistan, imports much edible oil in finished packaged form, at world market prices. It thus presents an example more closely reflective of real world costs, if Pakistan continues to ignore domestic oilseeds production and the PL-480 bonanza comes to an end.

3.. For details see PEOI pp.211-228

4.. ibid. p.260

5.. GOP, Report of the National Commission on Agriculture, Islamabad ,1988 pp.158-59

6.. 33 % annually during the 7th Plan, 23% on average from 1987-2000. NCA, op. cit. p.164

7.. ibid. pp.159-162

8.. Import figures supplied by Robin Tilsworth, Attache, U.S. Embassy, Islamabad. Credit extended under PL-480 has a grace period for repayment of 10 years at an interest rate of 2% per annum and a subsequent repayment period of 30 years at 3% per annum. The remaining amount purchased under VMR-102 Commodity Credit has a one-year grace period and, for the first three years, an interest rate of 6.5 %, which is well below market rates.

II. SUNFLOWER MEAL AND COTTONSEED MEAL MARKET

1. POULTRY AND CATTLE FEED MARKET

Meal is the main by-product of solvent oil extraction. It is used as a source of protein in compounded livestock feed.

Commercial poultry farms are the main consumers of the livestock feed industry. A few commercial dairy farms also consume compounded feed.

The solvent extraction process results in meal recovery percentages of 39% for cottonseed, and 40% for sunflower seed. The value of meal follows seasonal fluctuations and ranges from Rs.2,500 to Rs. 3,500 per ton.

The volume and the value of this by-product is important enough to positively affect the economic viability of the proposed company. Therefore, the disposal of sunflower and cottonseed meals must be given special attention. By analyzing the feed market, the strengths and weaknesses of the linkages between the final consumer (the poultry and cattle farms), the feed industry and the oilseed processing plant will be determined. This will help in devising a meal marketing strategy as well as a meal sales and distribution programme for the model company.

Sunflower meal is the primary focus of the following market analysis. It is still produced in small quantities and therefore not widely used by the local feed industry. The scope of use for sunflower meal by the local livestock feed industry has to be estimated.

1.1. Poultry Feed Requirements

Table C-11 lists the different types of rations produced by feed millers in Pakistan and estimates the feed requirements of commercial farms (opposed to rural poultry), on the basis of recommendations for standard layers, broilers and breeders. The requirements are estimated for each kind of ration because the rate of incorporation of sunflower meal varies with the type of ration (see annex C-1: Estimated Market Demand for Sunflower Meal in the Livestock and Poultry Feed Industry in Pakistan).

In 1989, total feed requirements for commercial farms were about 1 million tons. Despite several recession periods, the general trend of the poultry industry has been positive for the last ten years with the commercial poultry flock having grown 9.3% per annum since 1980.

C. MARKET, SALES, AND DISTRIBUTION

A bad quality feed and the consumers preference for "desi" products are currently the major constraints to the development of the commercial poultry industry.

TABLE C-11

COMMERCIAL POULTRY FARMS FEED REQUIREMENTS IN 1989

RATIONS DESIGNATION	FEEDING LENGTH (1)	FEED (2) CONSUMPTION kg/100 birds	NUMBER BIRDS (3)	1989 FEED REQUIREMENTS tons
LAYERS			11.2	
Rations				
Chick Starter	5 weeks	85.6		10
Chick Grower	17 weeks	649.1		73
Layer Mash	52 weeks (4)	3810.0		427
Total LAYERS				510
BROILERS			94.6	
Rations				
Broiler Starter	4 weeks	126.0		119
Broiler Finisher	4 weeks	320.0		303
Total BROILERS				422
BREEDERS			2.0	
Rations (5)				
Chick Starter	5 weeks	85.6		2
Chick Grower	17 weeks	649.1		13
Layer Mash	42 weeks	3110.0		63
Total BREEDERS				78
TOTAL			107.8	1010

(1) Number of weeks during which the bird is fed with the designated ration
(2) Total cumulative feed consumption of 100 standard birds for the period of time considered

Source for (1) & (2): feed consumption recommendations are drawn from NORTH M.O., 1984, Commercial Chicken Production Manual.

(3) Source: Poultry Research Institute
(4) Egg production length for layers in Pakistan
(5) Assumption: breeder rations and layer rations are identical, but egg production length of breeders is only 42 weeks.

Note: The official number of birds is probably over-estimated by 10 to 15% and consequently so are the feed requirements.

1.2. Poultry Feed Production and Market

Desi poultry scavenges for feed in backyards. Therefore, poultry feed is only manufactured for intensive farming systems (commercial farms).

Feed manufacturers are located in the main poultry breeding areas. Punjab is now the main poultry business area, concentrating about 70% of the industry fixed investment and producing about 50% of the total volume of feed. Related activities, including feed mills, are located around Lahore and Rawalpindi. According to data provided by the Poultry Research Institute, the total feed production has grown at an average rate of 15% for the last three years.

Table C-12 outlines some parameters of the poultry feed industry, including home-mix production: home-mix is feed compounded by poultry farmers for their own flock. Home-mix production started to develop in the seventies and has increased at a rate of 20% per year during the last ten years. The current production is estimated about 400,000 tons per year.

TABLE C-12

POULTRY FEED INDUSTRY IN 1989

NUMBER OF PLANTS	110
FEED PRODUCTION CAPACITY	2.586
PRODUCTION	1.142
CAPACITY UTILIZATION PERCENTAGE	44%

Source : Poultry Research Institute - Rawalpindi

The total requirement for commercial farms is about 1 million tons, whereas the volume of feed produced is about 15% higher. Assuming that the official data provided by the Poultry Research Institute are accurate and given the insignificant feed exports, the difference between requirements and production supplies evidence a poor quality feed (law nutritive

value) resulting in a high feed conversion rate[9] and high production costs.

Commercial feed accounts for 61% of total volume (about 700,000 tons). A few (15-20) large commercial feed mills producing an average of 35 to 40,000 tons of feed per year account for more than 85% of the commercial feed market (61% of the total business). Commercial feed millers are reported to have 80% of the broiler feed market and 50% of the layer and breeder feed market.

The dramatic development of home-mixing, confirmed by observations in the field, is a major trend of this last decade and is the market's response to poor feed quality and high prices. But it tends to exacerbate current problems such as scarcity of inputs and proper quality control is too expensive for home-mixers.

Poultry feed market demand is estimated on the basis of statistics related to imports of parent flock. However, this data is not readily available when feed mills plan their production and it does provided enought detailed to enable the miller to accurately estimate the demand for each product. As a result, production is based on decisions made with inadequate information and daily orders.

The feed demand is highly elastic as a function of the poultry product (eggs, broilers) supply/demand. Therefore, the poultry product market may be a gross indicator of the feed market at a national scale. Demand for poultry feed is highly seasonal, peaking in the cool winter months (December) and falling sharply in the hot summer months (June). This partially explains the excess installed capacity of the plant to meet peak demand.

Table C-13 (below) estimates the poultry feed market for 1989, per type of ration (opportunity for full replacement of any vegetable protein source by sunflower meal depends upon the ration). About 40% of the finished feed is home-mix which is not marketed as it is directly manufactured by farmers.

The commercial volumes and corresponding gross value have been also calculated and detailed in Table C-13 (does not include the cattle feed market).

TABLE C-13

ESTIMATED 1989 POULTRY FEED TOTAL AND COMMERCIAL VOLUMES ('000 BAGS) AND RESPECTIVE GROSS VALUES (MILLION RUPEES)

RATION	PRICES (1)	RATION PERCENT. (2)	TOTAL FEED (3)		COM. FEED (4)	
			VOLUME	GROSS VALUE	VOLUME	GROSS VALUE
Broiler						
-Starter	236	10.8 %	2,467	582.2	1,974	465.9
-Finisher	230	27.4 %	6,258	1,439.3	5,006	1,151.4
Layer						
-Ch.Starter	215	1.0 %	228	49.0	114	24.5
-Ch.Grower	195	7.7 %	1,759	343.0	880	171.6
-Layer Mash	200	45.5 %	10,392	2,078.4	5,196	1,039.2
Breeder						
-Starter	215	0.2 %	46	9.9	23	4.9
-Grower	214	1.3 %	297	63.6	149	31.9
-Layer	215	6.2 %	1,416	304.5	708	1552.2
TOTAL		100.0 %	22,908	4,870.0	14,050	3,034.3

Source : Livestock Feed Case Study, ACSCA, RONCO, 1990.

(1) In rupees per 50-kg bag, effected in 1989. The average weighted price comes to Rs. 212,57 per 50-kg bag.
(2) Estimated percentage of each ration. Total may not add due to rounding.
(3) Commercial feed mills + home mixer production: estimated total volume in thousands of 50-kg bags and corresponding gross value in million rupees.
(4) Commercial feed mills only: estimated commercial volume and corresponding gross value in million rupees.

In 1989, 22.9 million bags were manufactured, representing a volume of 1.142 million tons of feed and a gross value of Rs.4.87 billion. Feed prices are not regulated and are fixed by a commission of compound feed producers who meet regularly to revise and adjust them according to raw material costs and feed demand.

The gross value of commercial feed comes to Rs.3.03 billion which accounts for 62% of the total value of the manufactured feed.

1.3. Major Constraints to the Development of the Feed Industry

Feed quality is the major problem faced by the livestock feed industry. This is due to:

- **Lack of feed inputs**
  Good quality high protein oilseed meal does not exist. Good quality cereals are also in short supply.

  Several inputs are not available throughout the year. As a result capital is tied up in raw material inventories. Fish meal, a major source of protein, is only seasonally available, adulterated and expensive. Sunflower meal has high levels of fiber content, low level of protein and contains aflatoxin.

- **Absence of enforceable quality standards**
  Current laws are considered too stringent, and apply only to finished feed and not to feed inputs (Punjab Animal Compound Feeding Stuffs Act - 1974, Punjab Act no XIV). As a result, they are unenforceable.

- **Lack of proper storage facilities for feed inputs and finished feed**
  Storage facilities are basic warehouses where bagged inputs are stacked in tight piles (no air flow stacking). High storage temperatures badly affect vitamin content. The quality of the finished feed is so bad that no feed miller will store the feed for more than two days.

Another major constraint to the development of the feed industry is the weakness of forward linkages with the poultry industry and of backward linkages with the feed input industry, including the oilseed processing industry.

Market planning, marketing, market testing, quality control, product packaging rationale, product promotion: all these concepts are almost unknown to most feed millers. Moreover, the credit system has been dominating the industry for a long time. However large feed mills tend to abandon credit facilities.

The only positive feature of the feed industry with regard to forward linkages with the

poultry industry is the existence of a network of full-time veterinarians involved in the sales and distribution of providing technical assistance to customers and promoting mill products.

1.4. Cattle Feed Market

Livestock breeding in Pakistan is not developed on scientific lines. However, some spots of intensive dairy production can be found here and there:

- The main concentration of dairy buffalos is found in the cattle colonies near Karachi where about 250,000 females are maintained on intensive breeding lines.
- A dozen military dairy farms breed altogether some 50,000 females for the strict purpose of providing the army with milk products.
- For the last five years, several large farms (more than 200 cattleheads) have been developing in the neighborhood of large cities (Lahore, Peshawar, Hyderabad...).

Everywhere else, small flocks of dairy cows or buffalos are maintained in the rural areas.

As a result, the manufacture of concentrated feed for large animals is still very limited (only three cattle-feed mills in Pakistan). Intensive breeding is developing but the necessity of a better nutrition and better management is not yet anchored in farmers' minds.

Therefore, dairy cattle rations are a very minuscule part of the livestock market. There is a long tradition of using cottonseed cake (even by small farmers) for milk production, as a supplemental protein to the basic maintenance ration: cottonseed cake currently provides tough competition to livestock feed millers.

2. MARKET AND PROJECTED PENETRATION

2.1. Meal Quality

The scope for the use of meal in poultry or livestock rations, greatly depends upon the quality of the meal. This is determined by the following factors:

- **Initial quality of the seed crushed**
  It is assumed that good quality seed will be supplied to the company and that appropriate storage facilities will maintain the moisture content of the seed at an acceptable level.

- **Industrial process**
  The seed will be totally dehulled and the solvent oil extracted. This process produces a low fiber and fat content product compared to direct oil extraction of undehulled, or partially dehulled seeds.

  Gossypol, a toxic substance contained in cottonseed, will be removed during the process at the heating stage (see section B, part I, chapter 5).

- **Storage of the meal**
  To prevent mould and aflatoxin, the meal must be kept in a properly ventilated warehouse. Heat can also damage the meal by evaporating the vitamin content. The meal should not contain more than 10% moisture.

The targeted quality of meal to be produced by the model company is presented in Table C-14:

TABLE C-14

COTTONSEED AND SUNFLOWER MEAL - TARGETED QUALITY

	COTTONSEED MEAL	SUNFLOWER MEAL
	% as fed	
Fiber	13.0 %	14.0 %
Crude Protein	41.0 %	41.0 %
Fat	0.5 %	0.5 %

Source: For sunflower meal : National Sunflower Association, USA
For cottonseed meal: American Soybean Association

2.2. Local Market Development Opportunities for Sunflower Meal

Table C-15

1989/90 PRODUCTION AND SUPPLY OF MEALS IN PAKISTAN

MEAL (1)	PRODUCTION	IMPORT SUPPLY	TOTAL PER TON	PRICE (2) (3)	VALUE
Cottonseed (4)	1143	0	1143	2,265	2,589
Rapeseed (5)	148	0	148	2,250	333
Sunflower	16	0	16	3,500	56
Soybean	3	22	25	5,750	144
Fish meal	30	0	30	10,500	315
TOTAL MEAL	1340	22	1362		3,437

Source : Oilseeds and Products Annual Report, 1990.

(1) Volume in thousand metric tons
(2) Sources : For cottonseed meal, 1989/90 average
For soybean meal, landed price in Lahore, May 1990
For other meals, data collected from feed millers for 1989/90
(3) Marketed value in millions of rupees.
(4) 90% Cake and 10% Meal
(5) Mostly Cake

Pakistan oilseed and marine meal production in 1989/90 was estimated at 1.34 million tons and is entirely absorbed by domestic feed consumption. Moreover, due to price and freight advantages, 22,000 tons of soybean meal were imported from India in 1989/90 to meet the growing requirements of the poultry feed industry. Fish meal production has remained static at 30,000 tons with cottonseed cake mainly used as ruminant feed.

Due to strong domestic demand, Pakistan has not exported any meal since 1982, when small amounts of rapeseed meals were shipped out.

The Pakistani meal market currently suffers from Indian soybean meal imports. As a non-traditional protein source, soybean meal is the most popular vegetable protein meal used in feed manufacturing. Soybean is not grown in Pakistan and, by suppressing import duties and sales tax on soybean imports in 1989, the government has enabled the feed industry to have access to a good quality source of protein. However, due to the pressure of the oilseed industry which has mounting problems marketing its cottonseed meal, soybean meal imports are likely to be restricted again.

Despite its mediocre quality, the aggregate of small sunflower meal currently output (16,000 tons in 1989/90) is used for poultry feed production. The import of soybean has definitely improved the situation, but there is still a lack of reasonably priced, high quality protein that forces the feed miller to accept poor quality sunflower meal.

However, on a long term basis, the current quality of sunflower meal in Pakistan retricts its use in poultry rations. For instance, large feed mills would not incorporate more than 5 to 7% of sunflower meal in their rations due to the high fiber content which results in low protein content.

Scope for the Use of Sunflower Meal in the Poultry Feed Industry

Replacement of soybean meal by sunflower meal in poultry rations is subject to three factors:

- Comparative prices on an equivalent protein basis:

  - Cost of soybean meal = Rs.5,750/ton,
    current protein content = 41%
  - Cost of sunflower meal = Rs.3,500/ton,
    current protein content = 34%

  (Source : data collected from feed millers)

The ratio "cost/protein content" is actually in favor of the sunflower meal :

- sunflower meal ratio = Rs.10.3 per kg of protein
- soybean meal ratio = Rs.14.0 per kg of protein

- Availability of sunflower meal throughout the year: it is presently available only three months a year, while soybean meal can be imported throughout the year.

- The quality of the meal determined by the protein and fiber content: a meal recovering from a good quality seed, properly dehulled before solvent extraction can yield a protein content as high as 41%.

In layer diets, full replacement of soybean meal (extensively used in typical poultry rations) with sunflower meal on an equivalent protein basis is possible using a lysine supplementation, if the ration contains more than 5% of sunflower meal.

Due to its high fiber content (compared to other meals), the use sunflower meal is restricted to 8% in broiler growing diets, and 16% in broiler finishing diets.

In 1989, based on the above recommendations, the poultry feed industry could have theoretically absorbed a maximum of 215,000 tons of sunflower meal (see calculation in annexure 1), for a total marketed value of Rs. 752.5 million (based on a unit price of Rs.3,500/ton). This is contingent on the availability of sunflower meal throughout the year and provides a comparatively cheaper alternative to other sources of vegetable proteins on an equivalent protein basis.

Opportunities for Replacement of Traditional Protein Cake by Sunflower Meal in the Dairy Industry

Mediocre quality is not the major deterrent for using sunflower meal in cattle feed: the main constraint is farmers' preference for cottonseed cake, the traditional protein and energy supplemental source in dairy rations.

But ruminant rations offer very interesting opportunities for sunflower meal consumption partially because dehulled sunflower meal can be the sole source of supplemental protein in dairy rations. Undehulled or partially dehulled sunflower meal can fully replace soybean meal on an equivalent protein basis.

Market development opportunities for sunflower meal in the dairy industry are directly proportional to the number of intensive dairy units developing throughout the country. The concept of protein supplementation is most likely to spread with the development of intensive production, resulting in a growing demand for protein cake or meal. An increase of 50 grams in the average supplemental protein consumption of a female buffalo or cow at a national scale would lead to a 110,000 tons increase in the demand of cottonseed cake, cottonseed meal or sunflower meal (Rs. 385 million is marketed value for sunflower meal) as they are interchangeable in rations, assuming the price is the same for both (see annex C-1). But as compared to cottonseed cake, sunflower meal is hardly known to dairy farmers, therefore, a product promotion has to be developed.

As far as the use of sunflower meal for fattening is concerned, there is no immediate scope as such units are not yet developed in the country. As with dairy cattle, sunflower meal can be the sole source of supplemental protein in beef rations.

Assuming that the development of a solvent oil extraction industry will progressively result in larger sunflower meal outputs of a better quality (lower fiber content, high protein content) and at a cheaper rate, the scope for use of sunflower meal in the livestock and poultry feed industry is promising.

2.3. Sunflower Meal Export Market Opportunities and Constraints

Future opportunities with regard to the sunflower meal international market are most likely to be found in Eastern Europe (see annex C-2: International Sunflower Meal Trade Overview and Market Opportunities and Constraints for Pakistani Sunflower Meal) and in Eastern Asia to a lesser extent.

However, there are several constraints with regard to meal traded internationally and the scope for Pakistani exports :

- Standard quality requirements must be fulfilled, including a minimum protein-plus-fat content. Meal is normally pelleted so as to reduce bulk and transportation cost.
- The quantity marketed has to be significant. This requires larger inventories.
- Economic incentives are given to similar industries in other countries to encourage crushing of seed.

2.4 Cottonseed Meal Market

Cottonseed meal is a vegetable protein of good quality with about 41% protein content. A dehulled cottonseed meal will carry 50% protein. However, the nutritional value is inferior to soybean meal and should not be used as the sole source of vegetable protein in a ration. Current poultry rations in Pakistan contain 10% cottonseed meal.

1989/90 cottonseed meal production is estimated at 143,000 tons and is used entirely in poultry feed.

The best opportunity for cottonseed meal market is offered by the development of the livestock feed market, assuming a progressive replacement of cottonseed cake by cottonseed meal. This is most likely to occur when the development of the solvent oil extraction industry in Pakistan progressively eliminates oil expellers: a decreasing volume of cottonseed cake will be available on the market whereas cottonseed meal will be available in larger quantities and at cheaper rates.

2.5 Projected Market Penetration

The projected market penetration of the project (Table C-16) is roughly estimated on the basis of the plant production programme, with the following assumptions:

- Periods of availability for cottonseed meal and sunflower meal do not overlap with each other nor with any other meal: the different meal markets are independent and therefore the meals are not interchangeable in rations. The market penetration for one type of meal is estimated as a percentage of the total production of this meal.

- The national meal production, excluding the project production, remains static at the level indicated in Table C-16 for 1989/90.

TABLE C-16

OILSEED PROCESSING COMPANY - PROJECTED MARKET PENETRATION FOR COTTONSEED MEAL AND SUNFLOWER MEAL

	COTTONSEED MEAL (000'tons)						SUNFLOWER MEAL (000'tons)					
	TARGET PROD. (1)		1989/90 PROD. (2)		TOTAL PROD. (3)	% (4)	PROJECT PROD. (1)		1989/90 PROD. (2)		TOTAL PROD. (3)	% (4)
Y1	31	+	143	=	174	18	7	+	16	=	23	30
Y2	34	+	143	=	177	19	9	+	16	=	25	36
Y3	39	+	143	=	182	21	11	+	16	=	27	41
Y4	41	+	143	=	184	22	14	+	16	=	30	47
Y5	41	+	143	=	184	22	16	+	16	=	32	50
Y6	39	+	143	=	182	21	22	+	16	=	38	58

(1) Targeted production (rounded) by the company
(2) 1989/90 National Production (see Table 21)
(3) (1) + (2)
(4) Projected market penetration (percentage)

Projected market penetration of sunflower meal may not seem realistic. However, one should not forget that current production is very small and equivalent to the production of three 200 mt/d sunflower seed plants operating two months a year. By setting up a 500 mt/d plant, the national production will dramatically increase. Moreover, current production accounts for only 7% of the maximum volume of sunflower meal that could be used in poultry rations as estimated earlier.

3. MARKETING STRATEGY, SALES AND DISTRIBUTION

3.1. Marketing Strategy

The purpose of a meal marketing strategy is to establish a strong linkage between the oilseed processing plant, as part of the feed input industry, and feed manufacturing plants.

High quality meal will be produced by the plant (crude protein content = 41% for sunflower meal and cottonseed meal). Therefore, it is important to identify feed millers who emphasize nutrient value per kg of feed produced. Potential customers are likely to be the largest feed manufacturing plants looking for a regular supply of high quality standard meal.

The quality of the meal as an input to the feed industry must be highlighted through consumer awareness programs and market promotion. This should include :

- Technical assistance to customers by formulating least cost poultry rations based on sunflower meal and/or cottonseed meal.

- Organization and financing of trials based on sunflower meal or cottonseed meal supplementation in dairy and fattening diets with publication of the results and comparison with traditional protein sources (cottonseed cake, rapeseed cake...).

- Advertising (technical magazines, billboards in feed manufacturing areas...).

- Introduction of bulk handling of meal: bulk handling facilities are available at the oilseed processing plant. A grain conveyor can be used to load/unload the truck. This system eliminates the costly jute bags and later prevents mold and aflatoxin from appearing by eliminating the stage of piled bags without aeration in the feed plant warehouse.

- Technical information to the feed millers on the benefit of better storage facilities (ventilation), pelletizing the meal and introduction of quality control at the feed plant.

- Discount or credit facilities on sales, to promote and develop the use of good quality meal and to hold customers. Discounts could go up to 5% of the FOB price and credit facilities could be provided for a month.

Product pricing

As quality is a major issue in the marketing strategy, product pricing is mainly based on the unit cost of crude protein contained in the meal. Comparative 1990 prices of sunflower meal currently produced in Pakistan and imported soybean meal (the favourite protein source of poultry feed millers) and unit costs for protein follow (table C-17) :

TABLE C-17

COMPARATIVE UNIT COSTS OF CRUDE PROTEIN FOR SUNFLOWER AND SOYBEAN MEALS CURRENTLY AVAILABLE IN PAKISTAN

	Sunflower	Soybean
Cost of meal in rupees per ton	3,500	5,750
Crude Protein content	34%	41%
unit cost of protein in rupees per kg	10.3	14.0

The company will face competition with:

- Other sunflower meal and cottonseed meal producers: a premium can be charged on the current unit cost of protein to highlight the nutritional value of the meal (cottonseed or sunflower) produced by the project.

- Soybean meal imports (if any): on an equivalent protein basis, sunflower meal must be supplemented by lysine; moreover, it is unavailable throughout the year, whereas soybean meal can be purchased anytime. Therefore, the unit cost of sunflower protein has to be significantly lower than the unit cost of soybean protein.

A proposed unit price is Rs.11 per kg of crude protein. A good quality meal (sunflower or cottonseed) containing 41% of crude protein can be sold at Rs.4,500 per ton. Meal is normally purchased by feed manufacturers at the plant gate, therefore the price proposed is an FOB price. There is no sales tax on meal.

Note:

There is no distribution programme to be organized because the meal is normally purchased by millers at the oilseed processing plant gate and the cost of transportation is borne by the feed miller. Due to the current shortage of good quality protein sources, feed millers purchase vegetable or fish meal whenever it is available on the market and store it as long as is required. Therefore raw material inventories are most likely to be found at the feed plant rather than at the oilseed processing plant. However, as a target, the marketing strategy should aim at not keeping meal inventories for more than three months.

The marketing strategy will be designed and implemented by a meal promotion supervisor assisted by a programmer analyst.

The cost of implementation of the marketing strategy, excluding personnel requirements (see chapter 3.3 below), including ration formulation, protein supplementation trials and discounts on sales is part of the provision for marketing expenses as estimated in section C, part I.

3.2. Sales Revenues

Refer to the production programme (section B, part I, chapter 4) for volume produced, product pricing (chapter 3.1 above) for unit cost of meal and to the financial analysis section (D) for sales revenues.

3.3. Marketing and Sales Cost

Sales costs are limited to salaries, training and travel expenses of sales personnel.

There is no distribution cost as meal is purchased at the plant gate.

The company's Organization Chart is presented in section B, part II, chapter 1 (chart B-I). The cost of sales and distribution and marketing management personnel is detailed in section C, part .

The personnel in charge of the meal sales will operate under the supervision of the Sales and Distribution Department Manager.

Personnel requirements for the purpose of designing and implementing a meal marketing strategy and for selling the meal are defined in section C, part I.

4. FOOD CONSUMPTION AND AGRICULTURAL COMMODITY PRODUCTION TRENDS

Per capita estimates of food consumption trends for major food items is presented in Table C-18. The projected annual consumption growth rates for both edible oil and poultry meat products through 1996 confirm that market demand trends are very favorable for companies entering the oilseed processing and poultry production sectors.

With respect to feed meal products and compound feed manufacturing sectors, the livestock production trends presented in Table C-19 overwhelmingly confirm the strong market development opportunities for poultry feed products in the medium term. The data presented also reflects that the overall growth trends for livestock production significantly exceeds the estimated growth of locally produced feed inputs such as cereal, cotton and oilseed and sugarcane.

Note:

[9] 2.5 kg of feed are required to produce 1 kg of broiler alive, whereas in standard conditions the consumption should not exceed 2 kg.

TABLE C-18

PER CAPITA ANNUAL CONSUMPTION OF MAJOR FOOD ITEMS IN PAKISTAN, 1979 TO 1995-96 (SELECTED YEARS)

Sl.No.	Food Items	(KG unless otherwise stated)				Growth Rate	
		1979	1985-86	1989-90	1995-96	1985-88 to 1989-90	1989-90 to 1995-96
1.	Cereals	149.76	146.88	140.09	135.94	-1.10	-0.5
2.	Pulses	7.8	6.24	6.42	6.62	0.45	0.45
3.	Milk, Fresh and Boiled (Litre)	62.16	80.40	83.04	89.89	0.8	1.3
4.	Butter and Desi Ghee	2.28	1.92	1.68	1.68	-3.0	0
5.	Vegetable Ghee and Oil	6.48	7.32	9.10	12.62	5.85	5.5
6.	Mutton and Beef	6.84	6.44	6.30	6.50	-0.75	0.5
7.	Chicken	0.6	0.72	0.93	1.24	7.25	5.0
8.	Eggs (Nos.)	16.2	18.42	18.52	18.63	0.06	0.1

Source: Estimates based on data from the Household Income and Expenditure Surveys of 1979, 1985-86 and 1987-88. Figures for 1989-90 and 1995-96 were estimated using growth trends in consumption between 1985-86 and 1987-88. The growth rates used were, however, slightly adjusted (upward or downward) keeping in view the trends between 1979 and 1985-86

TABLE C-19

ACTUAL AND PROJECTED ESTIMATES RELATING TO LIVESTOCK AND CROP SUB-SECTORS IN PAKISTAN, 1980-081 TO 1995-96

Sl.No.	Item	1980-8	1989-90	1995-9	% Increase 1980-81 to 1989-90	% Increase 1989-90 to 1995-96	Annual Growth Rate (1)* 1980-81 to 1989-90	Annual Growth Rate (1)* 1989-90 to 1995-96
1.	Value added (At constant factor cost 1980-81)							
	- Livestock (Rs. bill)	20.14	32.48	46.07	61.27	41.84	5.75	6.0
	- All crops (Rs. bill)	52.79	72.37	88.96	37.08	22.92	3.55	3.50
2.	Livestock Population (Mill.)							
	- Buffaloes (E)	11.60	18.53	25.78	59.71	39.13	5.70	5.66
	- Cattle (E)	14.72	17.98	21.47	22.15	19.41	2.10	3.00
	- Goats	25.8	35.40	44.79	37.21	26.53	3.75	4.00
	- Sheep	22.1	29.2	37.76	32.13	29.32	3.66	4.50
	(2)							
	- Total Standard Animal Units (Mill)	33.70	46.7	60.28	38.58	29.08	3.90	4.45
	- Poultry	67.4	184.70	327.2	174.04	77.15	12.5	10.00
3.	Crops Tonnage (Mill.Tonne)							
	- Cereal	16714	20726	23204	24.00	11.96	2.2	1.90
	- Cotton and Oilseeds (3)	2416	4625	5852	91.40	26.53	7.2	4.25
	- Sugarcane	32359	36188	44484	11.18	22.92	1.1	3.50

Source: Except the figures on buffaloes and cattle, data on which the estimates are based were taken from Economic Survey 1989-90.

E: Estimates based on Pakistan Agricultural Census, 1980 and Livestock Census, 1986.

(1) Annual growth rates used for projecting 1995-96 data are based on the growth trends between 1985-86 and 1989-90 estimated on the basis of the data from Economic Survey, 1989-90.

(2) Standard animal units refer to cow units and are calculated by using conversion factors taken from Sial, Munawar, et.al, "Livestock Feed Sources and Requirements Scenario" (Draft) University of Agriculture, Faisalabad, 1990.

(3) Cotton growth between 1985-86 and 1989-90 was much lower as compared to that between 1983-84 and 1985-86 when it was more than doubled. This phenomenon is not likely to be repeated in the next five years or so.

I. THE MODEL OILSEED PROCESSING COMPANY

1. GENERAL OPERATIONS AND ANALYSIS ASSUMPTIONS

1.1.

All data analyzed and integrated on oilseed production, procurement, processing plant technology and capacity, marketing, sales estimates and personnel requirements are derived from the Oilseed Production and Procurement Unit, Technical Feasibility Analysis for a Vertically Integrated Solvent Extraction Plant and the Edible Oil and Feed Mill Market Analysis reports that form part of the RONCO/ACSCA Oilseed Commodity System Investment Concept Paper.

1.2.

All cost and revenue projections are estimates based on prevailing rates and assumptions made as of April 1, 1991 and are increased at the rate of 5% per year for Years Two through Four, and 10% per year for Year Five. For the purposes of this analysis, input cost and revenue projections are held at Year Five levels for Year Six, with the exception of Human Resources. (See 1.4 below)

1.3.

A Rupee to Dollar conversion rate of Rs. 23 : US$ 1 is held constant for all years.

1.4.

All salaries and labor costs are based on the prevailing rates and estimates as of April 1, 1991 and increased at the rate of 5% per year for Years Two - Four, and 10% per year for Years Five and Six. (See Table D-18)

1.5.

All projections assume GOP policies and laws as of April 1, 1991. This model does not anticipate any policy changes such as lifting the current ban on the export of edible oil and feed

1.6.

All capital equipment costs are based on recent quotations from manufacturers or their distributors. No discount has been assumed.

1.7.

Capital cost estimates are based on the prevailing terms and conditions, both domestic and offshore, as of April 1, 1991 and are held constant.

1.8.

Depreciation Schedules are prepared in accordance with prevailing GOP statutes as of April 1, 1991.

1.9.

All input costs are paid upon receipt, all revenues are received 90 days after sales.

1.10.

The Fiscal Year used is November 1 through October 31.

2. PROPOSED CAPITAL STRUCTURE ASSUMPTIONS

2.1.

The capital investment for the proposed enterprise occurs in two phases. The first phase (Investment Phase One) consists of the construction of a complete 500 metric ton (MT) per day oilseed processing plant and two seed procurement centers. The second phase (Investment Phase Two) adds a complete 200 MT per day crude oil refining plant with bottling and capping facilities.

2.2.

Total expenditures for the start-up year (Year Zero, Investment Phase One) are estimated to be Rs 410,260,309. These include Capital Asset costs of Rs 370,896,323 for the Oilseed Production and Oilseed Procurement Unit, and the Oilseed Processing Unit; as well as Rs 39,363,986 to fulfill the proposed marketing, extension and training programs plus all other start-up administrative and management costs. (See Table D-8).

2.3.1.

The proposed capital structure for the venture (See Table D-1) is based on the assumption that a financially solid transnational corporation undertakes the project. An equity stake in the amount of Rs 201,102,455 (US$ 8,743,585) provides 49% of the Year Zero costs; the initial capitalization. (See Table D-8). Four Loans provide the remaining 51% of the initial capitalization.

2.3.2.

An offshore Suppliers Credit or Capital Equipment Loan of US$ 3,000,000 carrying an interest rate of 15% for a term of six years is assumed. This loan would be secured offshore by the transnational company.

2.3.3.

A Locally Manufactured Machinery Loan would be obtained through a Development Finance Institution (DFI) in Pakistan. The loan would be in the full amount of the locally purchased equipment, Rs 59,934,400, and would carry an interest rate of 7% for a term of ten years. It

is secured by the value of the equipment plus a portion of the value of the imported equipment. (US$ 7,122,200)

2.3.4.

A mortgage loan in the amount of Rs 39,922,200 would be obtained from DFI in Pakistan to finance the actual construction cost of the buildings for the plant and the two procurement centers and would be collateralized by the land and buildings themselves. This loan would be for a term of ten years and carry an interest rate of 16%.

2.3.5.

An Overdraft facility would be obtained in the amount of Rs 40,301,254 to meet the remaining Year Zero costs. Interest will be charged at the rate of 1.5% per month (18% per annum). All principal and interest will be cleared by the end of Year One.

2.4.

At the beginning of Year Three a second phase of investment is envisioned. The costs for Investment Phase Two (see Table D-9) are estimated to be Rs 207,000,000 (US$ 9,000,000.00). This is the estimated cost for building and equipment to install a complete 200 MT per day crude oil refining plant with bottling and capping facilities to begin operation at the start of Year Four.

2.5.

The capital to finance the entire cost of Investment Phase Two would be obtained in three loans. The first is an offshore Suppliers Credit or Capital Equipment Loan in the amount of US$ 5,833,100 (Rs 134,161,300) carrying an interest rate of 15% for a term of six years. A second mortgage loan in the amount Rs 34,298,375 (US$ 1,491,234) would be obtained from a local institution with an interest rate of 16% for a term of ten years, secured by the buildings and the plant. A third loan in the amount of Rs 38,540,325 (US$ 1,675,666) would be obtained from a local DFI for the procurement of locally manufactured machinery and would carry an interest rate of 7% for a term of ten years.

2.6.1.

In addition to the sources and uses of capital cited above, additional significant overdraft facilities must be obtained for the procurement of raw materials and meeting operating expenses in Years One through Four. (See Table D-14, Years One - Four) This need arises for two reasons. The first is that the cottonseed and sunflower seed Procurement and Production "Seasons" are distinct. (See Section B. I. 4.) Thus, it is necessary to purchase the raw materials required during specific times of the fiscal year. The second reason is that for the purposes of this analysis, it is assumed that oilseed raw material costs are paid upon receipt while all revenues are received 90 days net.

2.6.2.

The maximum overdraft balances in Years One through Four are:

Year One	Rs 240,595,610	(US$ 10,460,679)
Year Two	Rs 223,724,291	(US$ 9,727,143)
Year Three	Rs 174,463,828	(US$ 7,585,384)
Year Four	Rs 227,475,136	(US$ 9,890,223).

2.6.3.

The overdraft balances have been charged at a monthly interest rate of 1.5% (18% per annum). All overdraft balances are cleared, all interest is paid, and all balances are in surplus at the end of each fiscal year.

3. BALANCE SHEET ASSUMPTIONS

3.1.

The current assets of the company are cash and accounts receivable. This assumes that no inventory of raw materials is carried over from one year to the next and that all production in a given fiscal year is sold. The fiscal year has been set to the Procurement Season. Further, it is assumed that all other purchased inputs are fully utilized during the fiscal year. Accounts receivables arise from the assumption that all sales revenue is received ninety days after the sale.

3.2.

The cash at the end of Year Zero, Rs 2,300,000 assumes sale of oilseeds procured at the end of the year.

3.3.

The fixed assets of the venture are carried at costs less accumulated straight line depreciation.

3.4.

Based on the assumption that all purchases are paid upon receipt, the only current liability is the long term debt (principal) payable in one year.

3.5.

No provision is made for the payment of dividends in these projections.

4. INCOME STATEMENT ASSUMPTIONS

4.1.

All sales projections by volume assume the production targets and schedules projected in Section B of this concept paper.

4.2.

For Years One through Three the Oilseed Processing Plant produces nine separate products each of which sells for a separate price. (See Table D-13) Years Four through Six add to these products the purchase of additional crude oil that the Oilseed Refining Plant fully refines and bottles. Each of the sales prices used for this analysis are conservative, ex-plant estimates based on prices and projections as of April 1, 1991 (See Section C).

4.3.1.

Sales are recognized when the product is transferred to the buyer. All cash received is in settlement of accounts receivable resulting from sales. No interest earnings are projected for investment of cash balances.

4.3.2.

Sales for Year Zero are Rs 31,200,000. This represents the sale of 5,200 MT of sunflower seed at a price of Rs 6,000 per MT. (See Section A. I. 1.) This is the Year Zero target of the farm extension test program and assumes that the company will be able to sell the oilseed seed at the prevailing price. Year Zero assumes no processing of oilseeds procured.

4.4.1.

Material costs include all physical inputs purchased during the Fiscal Year.

4.4.2.

Material costs of Rs 31,200,000 represent the price paid to farmers for 5,200 MT of Sunflower seed under Year Zero targets of the farm extension test program.

4.5.1.

Marketing and administrative costs for all years include the full cost of the Marketing and Training Programs for each year.

4.5.2.

The first day of Year Three begins Investment Phase Two. (See Table D-9) The Marketing and Administrative expenses rise to accommodate increases in marketing and training expenses.

4.6.1.

Interest charges for all years include interest paid each year on the long term debt plus the interest charges paid on the overdraft.

4.6.2.

No provision for interest payment is made for Year Zero. It is assumed for purposes of this analysis that interest charges will not begin until the first day of Year One.

4.6.3.

By the end of Year Four the need for an overdraft facility has expired.

4.7.

No provision for the payment of income tax has been made in this analysis since the company is to be located in a rural area, (See Section B. I. 2.), according to the Tax Code in effect as of April 1, 1991, no income tax would be due during the period of this analysis. In addition, all imports of equipment and supplies are assumed to be duty free.

4.8.1.

Year Zero shows an operating loss of Rs 37,063,986. This is explained by the fact that Year

Zero is a start-up year and the only operation is the procurement and sale of 5,200 MT of sunflower seed which is then sold at cost.

4.8.2.

All production years are projected to be profitable.

4.8.3.

Year Three is the last year of the production of only basic refined oil. The net income for Year Three is Rs 107,985,494.

4.9.

The first day of Year Four marks the beginning of the production of fully refined oils and the cost of material inputs rise significantly. The purchase price of basic refined oil is assumed to be the sales price of basic refined oil used previously. Additionally other inputs are required; (See Table D-15) and additional utility costs are incurred.

4.10.

Year Six earnings drop when compared to the earnings level of Year Five. This is explained by the assumption in this analysis that revenue projections are held at Year Five prices while personnel and marketing expenses are projected to increase by 10%.

5. RATIO ANALYSIS ASSUMPTIONS

5.1.

The Breakeven Capacity and Revenue Points (See Table D-6) are achieved in Year One of Phase One and Year Three of Phase Two. These include provision for interest charges and principal repayment based upon the Proposed Capital Structure. (See Table D-1)

5.2.

The Return on Assets appear to be satisfactory but would be much greater than they appear in Years Four through Six if retained earnings were invested in money market instruments, an option not included in this analysis.

5.3.

The Current Ratios in this Analysis are equivalent to the Acid Test ratios, as no inventory is assumed to be carried over from one fiscal year to the next. (See Section 3.1.) Year One is the only year where the projected ratio does not meet the desired 2:1 standard.

5.4.

The Gross Profit Margins average 21.5% over the first three years of operation and 31% over the second three years. These are significantly higher than other comparable operations in Pakistan, according to earlier studies performed by the ACSCA project.

5.5.

The Debt/Equity Ratios are larger than most international lenders would wish in the first years of the project. A financially solid transnational corporation would either have to invest more equity than is projected or provide off-shore guarantees to obtain the proposed debt financing if these ratios were to apply in the early years of implementation.

5.6.

The IRR figure of 30.29% for this project is attractive. Despite the high interest costs, low

sales prices, and high personnel and procurement costs projected, the project is a very profitable venture.

6. CONCLUSIONS

6.1.

The proposed company, operating within a vertically integrated oilseed commodity system would seem to be a very attractive investment for financially solid transnationals with experience in such agribusinesses in countries like Pakistan. Nothing in this financial model pre-supposes any changes in the current laws and incentives available to investors in Pakistan. The analysis is based on the current situation.

6.2.

The major financial risk assumption in this analysis is the investment period envisioned for Year Zero. Provision has been made for full fixed cost and overhead expenditures for Year Zero which encompasses only a twelve month period. Should there be hold-ups in construction, clearance and installation of plant machinery from ports, failure to secure permits, etc., that impede the implementation of the project, its profitability and the capital investment required would be adversely effected.

6.3.

The capital structure proposed assumes an initial offshore capital equipment loan of US$ 3,000,000, secured by the transnational, allowing the equipment to be used as collateral in support of local loans for buildings, equipment, and working capital. The alternative to this arrangement is increased up-front equity investment of US$ 3,000,000 by the transnational. Increased equity investment would improve the initial debt/equity ratio, and, given reduced interest payments, would raise the IRR to 33.56% by year seven of the period projected in this analysis.

6.4.

The major risks attendant to this investment are:

a) the projected rate of growth of the cooking oil market;
b) the assumption that the poultry and livestock feed industries will purchase the feed meal output of the processing plant;
c) the effective implementation and operation of the oilseed production and procurement unit;
d) the availability of cottonseed and sunflower seed raw materials from non-contract cotton ginners and growers, as well as the availability of semi-refined edible oil from oilseed processing plants that do not have full refining capability; and
e) the capability of the company to successfully introduce and market fully refined and consumer packaged cooking oil in competition with Lever Brothers, the Ghee Corporation, and other manufacturers and vendors of cooking oil in Pakistan.

6.5.

The major benefits that make the investment an attractive proposition are;

a) The projected return is very attractive. For an initial investment capital outlay of approximately US$ 9 million, the prospective investors can expect complete capital recovery by the end of Year Four and projected annual earnings of over US$ 21 million by the end of Year Six.

b) By the end of Year Six, the net worth of the organization, without including provision for the investment of retained earnings, will be of over US$ 75 million; with projected annual earnings of at least US$ 21 million per year for all subsequent years.

TABLE D-1

PROPOSED CAPITAL STRUCTURE

GM

EQUITY	TERM YRS	Rs	RATE	US $	RATE	TOTAL	TOTAL US $
PLANT				7,122,200		163,810,600	7,122,200
WORKING CAPITAL	↓	28,666,855		375,000		37,291,855	1,621,385
TOTAL EQUITY		28,666,855		7,497,200		201,102,455	8,743,585
DEBT							
LOAN 1							
SUPPLIERS CREDIT	6			3,000,000	15.00%	69,000,000	3,000,000
LOAN 2							
LMM THRU DFI	10	59,934,400	7.00%			59,934,400	2,605,843
LOAN 3							
LONG TERM CONSTRUCTION	10	39,922,200	16.00%			39,922,200	1,735,748
LOAN 4							
OVERDRAFT FACILITY		40,301,254	18.00%			40,301,254	1,752,228
TOTAL DEBT						209,157,854	9,093,820
TOTAL DEBT PLUS EQUITY						410,260,309	17,837,405

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TABLE D-2

BALANCE SHEET

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
CURRENT ASSETS							
CASH	2,300,000	5,261,231	39,278,301	134,835,845	421,241,262	839,187,598	1,225,365,448
ACCOUNTS RECEIVABLE	0	4,878,600	61,043,483	100,401,588	209,871,712	315,555,748	420,990,989
TOTAL CURRENT ASSETS	2,300,000	10,139,831	100,321,784	235,237,433	631,112,974	1,154,743,346	1,646,356,437
FIXED ASSETS							
LAND	6,750,000	6,750,000	6,750,000	6,750,000	6,750,000	6,750,000	6,750,000
PLANT & EQUIPMENT	364,146,323	364,146,323	364,146,323	563,326,176	563,326,176	563,326,176	563,326,176
LESS: ACCUMULATED DEPRECIATION	0	36,802,741	73,605,483	110,408,224	167,628,950	224,849,677	280,608,004
NET PLANT & EQUIPMENT	364,146,323	327,343,582	290,540,840	452,917,952	395,697,226	338,476,499	282,718,172
TOTAL FIXED ASSETS	370,896,323	334,093,582	297,290,840	459,667,952	402,447,226	345,226,499	289,468,172
TOTAL ASSETS	373,196,323	344,233,413	397,612,624	694,905,385	1,033,560,200	1,499,969,845	1,935,824,609
LIABILITIES							
CURRENT LIABILITIES							
OVERDRAFT	40,301,254	0	0	0	0	0	0
DEBT PAYABLE ONE YEAR	13,725,503	15,572,625	17,692,734	39,318,204	44,976,782	51,502,159	40,268,102
TOTAL CURRENT LIABILITIES	54,026,757	15,572,625	17,692,734	39,318,204	44,976,782	51,502,159	40,268,102
LONG TERM DEBT	155,131,097	139,558,472	121,865,738	289,547,534	244,570,752	193,068,593	152,800,491
TOTAL LIABILITES	209,157,854	155,131,097	139,558,472	328,865,738	289,547,534	244,570,752	193,068,593
EQUITY	201,102,455	201,102,455	201,102,455	201,102,455	201,102,455	201,102,455	201,102,455
RETAINED EARNINGS	(37,063,986)	(12,000,139)	56,951,697	164,937,191	542,910,210	1,054,296,637	1,541,653,560
NET WORTH	164,038,469	189,102,316	258,054,152	366,039,646	744,012,665	1,255,399,092	1,742,756,015
TOTAL LIABILITIES & NET WORTH	373,196,323	344,233,413	397,612,624	694,905,385	1,033,560,200	1,499,969,845	1,935,824,609

TABLE D-3

INCOME STATEMENT

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
SALES	31,200,000	546,801,750	664,083,263	806,019,007	1,632,532,291	1,978,090,156	2,141,884,649
LESS COST OF SALES							
MATERIAL	31,200,000	344,338,950	420,556,985	512,483,204	989,873,468	1,195,832,026	1,375,341,833
LABOR	12,118,500	59,171,200	62,129,760	65,236,248	81,204,188	89,324,606	98,257,067
DEPRECIATION	0	36,802,741	36,802,741	36,802,741	57,220,727	57,220,727	55,758,327
TOTAL	43,318,500	440,312,891	519,489,386	614,522,194	1,124,298,383	1,342,377,359	1,529,357,227
GROSS PROFIT (LOSS)	(12,118,500)	106,488,859	144,593,877	191,496,813	508,233,908	635,712,798	612,527,422
MARKETING & ADMINISTATIVE EXPENSE	24,945,486	34,286,232	33,687,034	52,347,679	76,379,347	89,112,967	96,482,473
GROSS OPERATING PROFIT	(37,063,986)	72,202,627	110,906,843	139,149,134	431,854,561	546,599,831	516,044,949
INTEREST	0	47,138,780	41,955,008	31,163,640	53,881,542	35,213,404	28,688,027
PROFIT (LOSS) BEFORE TAX	(37,063,986)	25,063,847	68,951,836	107,985,494	377,973,019	511,386,427	487,356,922
TAX	0	0	0	0	0	0	0
NET INCOME (OVERDRAFT)	(37,063,986)	25,063,847	68,951,836	107,985,494	377,973,019	511,386,427	487,356,922

TABLE D-4

RATIO ANALYSIS

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
COST OF GOODS SOLD	NA	80.53%	78.23%	76.24%	68.87%	67.86%	71.40%
GROSS PROFIT MARGIN	NA	19.47%	21.77%	23.76%	31.13%	32.14%	28.60%
OPERATING MARGIN	NA	13.20%	16.70%	17.26%	26.45%	27.63%	24.09%
ASSET (NET) TURNOVER	NA	166.37%	174.80%	122.95%	165.14%	136.56%	113.00%
CURRENT RATIO	NA	65.11%	567.02%	548.29%	1403.20%	2242.13%	4088.49%
DEBT EQUITY (TOTAL DEBT/NET WORTH)	56.04%	45.07%	35.10%	47.33%	28.01%	16.31%	9.97%
DEBT EQUITY (LONG TERM DEBT/NET WORTH)	48.60%	42.46%	32.08%	44.17%	24.74%	13.33%	-8.06%
DEBT COVERAGE	NA	153.17%	264.35%	446.51%	801.49%	1552.25%	1798.82%
RETURN ON CAPITAL	NA	7.63%	18.15%	16.47%	38.23%	35.31%	25.71%
RETURN ON EQUITY	NA	12.46%	34.29%	53.70%	187.95%	254.29%	242.34%
RETURN ON ASSETS (EBIT)	NA	21.97%	29.19%	21.23%	43.68%	37.74%	27.22%
BREAKEVEN CAPACITY	NA	47.12%	45.44%	44.00%	40.05%	40.94%	45.92%
BREAKEVEN REVENUE	NA	429,362,291	439,337,719	457,776,865	619,014,503	675,647,084	748,806,874

NET PRESENT VALUE @ 37% (EBIT)	6,388,765
INTERNAL RATE OF RETURN (EBIT)	37.49%
NET PRESENT VALUE @ 30%	4,596,888
INTERNAL RATE OF RETURN	30.29%

TABLE D-5

STATEMENT OF CHANGES IN FINANCIAL POSITION

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
Sources of funds:							
Net Income (Loss)	(37,063,986)	25,063,847	68,951,834	107,985,494	377,973,019	511,386,427	487,356,922
Add: Non-cash expenses: depreciation		36,802,741	36,802,741	36,802,741	57,220,727	57,220,727	55,758,327
Total funds from operations	(37,063,986)	61,866,589	105,754,577	144,788,236	435,193,745	568,607,154	543,115,249
Funds received from:							
Debt	209,157,854			199,179,853			
Sale of stock	201,102,455						
Total funds available	373,196,323	61,866,589	105,754,577	343,968,089	435,193,745	568,607,154	543,115,249
Application of funds							
Purchase of capital assets	370,896,323			199,179,853			
Repayment of loans		54,026,757	15,572,625	17,692,734	39,318,204	44,976,782	51,502,159
Increase in accounts receivable		4,878,600	56,164,883	39,358,105	109,470,124	105,684,036	105,435,241
Total applications of funds	370,896,323	58,905,357	71,737,508	256,230,692	148,788,328	150,660,818	156,937,400
Increase(decrease) in cash	2,300,000	2,961,231	34,017,069	87,737,397	286,405,417	417,946,336	386,177,849
Beginning cash	0	2,300,000	5,261,231	39,278,301	127,015,697	413,421,114	831,367,450
Ending cash	2,300,000	5,261,231	39,278,301	127,015,697	413,421,114	831,367,450	1,217,545,300

TABLE D-6

BREAKEVEN ANALYSIS - FULLY REFINED OIL

		INPUT TONS	ELECTRICITY PER TON	STEAM PER TON	COPRA PER TON	HEXANE PER TON	SEED PER TON	OIL PER TON	FILTER PER TON	BLEACHING EARTH PER TON	TOTAL VARIABLE COST PER YEAR	TOTAL VARIABLE COSTS PER TON	REVENUE PER TON	NET REVENUE PER TON	FIXED COSTS TOTAL	FIXED COSTS ALLOCATED	B.E. TONS	B.E. %	B.E. REVENUE
YEAR 1	COTTON	78,750	37.44	19.00	7.92	31.25	2,750				208,029,218	2,896	5,085	2,189	157,021,719	122,128,004	55,782	47.12%	479,343,291
	SUNFLOWER	18,000	89.74	41.18	15.44	37.50	6,000				111,309,637	6,184	8,131	1,947		34,893,715	17,921		
											339,338,855								
YEAR 2	COTTON	88,000	91.82	19.87	8.32	32.81	2,888				247,592,058	3,041	5,339	2,298	158,594,431	120,313,017	52,346	45.44%	439,337,719
	SUNFLOWER	22,750	94.18	43.15	16.25	39.38	6,300				147,714,842	6,493	8,538	2,045		38,281,414	18,723		
											415,306,900								
YEAR 3	COTTON	99,000	96.43	21.00	8.73	34.45	3,032				376,068,262	3,193	5,678	2,485	164,132,657	120,363,948	48,430	44.00%	457,776,844
	SUNFLOWER	28,500	98.94	45.58	17.09	41.34	6,615				190,972,683	6,818	8,964	2,146		43,768,709	20,391		
											567,040,945						68,821		
YEAR 4	COTTON	104,500	110.25	24.64	9.17	36.18	3,184				351,553,459	3,364	7,550	4,236	217,231,236	82,941,675	19,687	40.05%	679,074,573
	SUNFLOWER	33,750	122.55	49.04	17.85	43.41	6,946				240,287,885	7,119	12,078	4,900		71,172,428	14,526		
	BR OIL (COT)	15,235	24.28	3.24				16,207	3,534	202	304,254,286	19,971	25,599	5,628		58,339,434	10,365		
	BR OIL (SUN)	1,012	3.91	6.40				19,101	3,534	202	23,121,434	22,847	27,300	4,453		4,727,699	1,062		
											921,247,064								
YEAR 5	COTTON	104,500	115.77	26.83	9.63	37.98	3,343				369,220,723	3,533	8,066	4,532	219,710,094	71,749,078	15,830	40.94%	675,647,084
	SUNFLOWER	40,000	129.57	51.91	18.77	45.58	7,293				301,553,663	7,539	12,927	5,388		59,774,070	11,093		
	BR OIL (COT)	19,635	29.05	3.50				17,017	3,648	208	410,495,120	20,906	26,880	5,974		79,301,612	13,275		
	BR OIL (SUN)	2,200	7.14	6.77				20,056	3,648	208	52,638,646	23,927	29,400	5,473		8,885,335	1,623		
											1,133,908,153								
YEAR 6	COTTON	99,750	115.77	27.59	9.63	37.98	3,343				352,513,365	3,534	7,121	3,588	229,505,103	62,072,528	17,302	45.92%	748,806,874
	SUNFLOWER	54,000	129.66	52.00	18.83	45.58	7,293				401,109,561	7,539	13,347	5,807		73,134,162	12,593		
	BR OIL (COT)	22,942	31.77	3.60				17,017	3,941	225	486,846,980	21,219	26,880	5,661		83,976,173	14,834		
	BR OIL (SUN)	2,820	6.74	6.78				20,056	3,941	225	68,346,037	24,236	29,400	5,164		10,322,239	1,999		

Table D-7 SUMMARY FUNDS FLOW SCHEDULE

YEAR ONE	TOTAL	TOTAL US$	YEAR TWO	TOTAL	TOTAL US$	YEAR THREE	TOTAL	TOTAL US$
OUTFLOW								
PERSONNEL	79,988,200	3,477,748		83,987,610	3,651,635		90,290,561	3,925,677
AUX. INPUTS	14,776,446	642,454		17,837,880	775,560		21,582,700	938,378
SPARES	5,000,004	217,391		5,250,004	228,261		5,512,504	239,674
TRAINING	5,750,000	250,000		5,750,000	250,000		4,140,000	180,000
MARKETING	5,419,232	235,619		6,077,184	264,312		15,333,218	666,662
INTEREST	47,138,780	2,049,512		41,955,008	1,824,131		31,163,640	1,354,941
PRIN. REPAY	13,725,583	596,761		15,572,628	677,071		17,692,734	769,249
TOTAL DEBT SERVICE	60,864,279	2,646,273		57,527,628	2,501,201		48,856,374	2,124,190
PROC. DAYS	150			150			150	
PROC. DAYS	220			220			220	
COTTONSEED	216,562,500	9,415,761		254,144,000	11,049,739		300,168,000	13,050,783
PROC. DAYS	45			45			45	
PROC. DAYS	80			80			80	
FARM INPUTS	33,749,650	1,467,359		42,301,153	1,839,181		51,789,042	2,251,697
SUNFLOWERSEED	74,250,750	3,228,293		101,023,847	4,392,341		133,430,958	5,801,346
TOTAL	496,360,[illegible]	21,580,898		631,428,939	27,453,432		671,103,357	29,178,407
INFLOW								
REV DAYS	210			220			220	
COTTONSEED	400,443,750	17,410,598		469,854,000	20,428,435		555,015,038	24,131,089
REV DAYS	58			50			70	
SUNFLOWERSEED	141,479,400	6,151,278		138,064,380	6,002,799		211,645,865	9,201,994
TOTAL	541,923,150	23,561,876		607,918,380	26,431,234		766,660,902	33,333,083
EARNINGS	45,562,[illegible]	1,980,978		(23,510,557)	(1,022,198)		95,557,545	4,154,676
BALANCE	5,261,241			39,278,301			134,835,845	
BALANCE$	228,749			1,707,752			5,862,428	

YEAR FOUR	TOTAL	TOTAL US$	YEAR FIVE	TOTAL	TOTAL US$	YEAR SIX	TOTAL	TOTAL US$
OUTFLOW								
PERSONNEL	109,821,670	4,774,855		120,195,389	5,225,886		131,576,058	5,720,698
AUX. INPUTS	146,689,980	6,377,825		170,437,600	7,410,330		195,014,520	8,478,892
SPARES	5,788,130	251,658		6,077,536	264,241		6,077,536	264,241
TRAINING	2,070,000	90,000		2,070,000	90,000		2,070,000	90,000
MARKETING	45,691,865	1,986,603		56,172,184	2,442,269		61,093,482	2,656,238
INTEREST	53,881,542	2,342,676		35,213,404	1,531,018		28,688,027	1,247,306
PRIN. REPAY	39,318,204	1,709,487		44,976,782	1,955,512		51,502,159	2,239,224
TOTAL DEBT SERVICE	93,199,746	4,052,163		80,190,186	3,486,530		80,190,186	3,486,530
PROC. DAYS	150			150			150	
PROC. DAYS	220			220			210	
COTTONSEED	332,728,000	14,466,435		349,343,500	15,188,848		333,464,250	14,498,446
COTTONSEED B.R. OIL	246,909,836	10,735,210		334,130,513	14,527,414		390,406,021	
PROC. DAYS	45			45			45	
PROC. DAYS	90			100			120	
FARM INPUTS	62,267,563	2,707,285		73,800,070	3,208,699		95,101,665	4,134,855
SUNFLOWERSEED	172,159,937	7,485,215		217,919,939	9,474,780		298,720,335	12,987,841
SUNFLOWERSEED B.R. OIL	19,330,022	840,436		44,122,877	1,918,386		56,557,506	2,459,022
TOTAL	1,236,656,749	53,767,685		1,454,459,784	63,237,382		1,650,271,559	71,750,937
INFLOW								
REV DAYS	220			220			210	
COTTONSEED	1,182,105,540	51,395,893		1,370,638,233	59,592,967		1,327,063,381	57,698,408
REV DAYS	80			90			110	
SUNFLOWERSEED	340,956,627	14,824,201		501,767,887	21,815,995		709,386,027	30,842,871
TOTAL	1,523,062,167	66,220,094		1,872,406,120	81,408,962		2,036,449,408	88,541,279
EARNINGS	286,405,417	12,452,409		417,946,336	18,171,580		386,177,849	16,790,341
BALANCE	421,241,262			839,187,598			1,225,365,448	
BALANCE$	18,314,837			36,486,417			53,276,759	

PLUS 62 DAYS	420,990,989	
TOTAL	1,646,356,436	
TOTAL US$	71,580,715	

TABLE 8 SUMMARY INVESTMENT PHASE ONE

SUMMARY INVESTMENT PHASE ONE (YEAR ZERO)	LOCAL	IMPORTED	Rs	US$	TOTAL Rs	TOTAL US$
A. PLANT						
LAND	X		5,000,000		5,000,000	217,391
BUILDINGS	X		37,700,000		37,700,000	1,639,130
EQUIPMENT & MACHINERY		X		8,529,700	196,183,100	8,529,700
ADDITIONAL CHARGES	X		34,332,043		34,332,043	1,492,698
LOCAL PROCUREMENT	X		54,045,775		54,045,775	2,349,816
TOTAL A.			131,077,818	8,529,700	327,260,918	14,228,736
B. PROCUREMENT CENTER (PLANT)						
LAND	X		1,250,000		1,250,000	54,348
BUILDINGS	X		1,000,000		1,000,000	43,478
EQUIPMENT & MACHINERY		X		1,001,570	23,036,110	1,001,570
ADDITIONAL CHARGES	X		3,430,910		3,430,910	149,170
LOCAL PROCUREMENT	X		2,599,875		2,599,875	113,038
TOTAL B.			8,280,785	1,001,570	31,316,895	1,361,604
C. PROCUREMENT CENTER (FIELD)						
LAND	X		500,000		500,000	21,739
BUILDINGS	X		1,222,200		1,222,200	53,139
EQUIPMENT & MACHINERY		X		270,400	6,219,200	270,400
ADDITIONAL CHARGES	X		1,088,360		1,088,360	47,320
LOCAL PROCUREMENT	X		3,288,750		3,288,750	142,989
TOTAL C.			6,099,310	270,400	12,318,510	535,587
TOTAL A. B. C. CAPITAL ASSETS			145,457,913	9,801,670	370,896,323	16,125,927

TABLE D-8

SUMMARY INVESTMENT PHASE ONE (YEAR ZERO)	LOCAL	IMPORTED	Rs	US$	TOTAL Rs	TOTAL US$
YEAR ZERO ADDITIONAL COSTS						
SALARIES	X		23,019,750		23,019,750	1,000,859
MARKETING PROGRAM	X		5,419,236		5,419,236	235,619
TRAINING PROGRAM US$		X		375,000	8,625,000	375,000
CONTINGENCY FUND Rs	X		2,300,000		2,300,000	100,000
TOTAL ADDITIONAL COSTS			30,738,986	375,000	39,363,986	1,711,478
TOTAL YEAR ZERO			176,196,899	10,176,670	410,260,309	17,837,405

TABLE D-9 INVESTMENT SUMMARY PHASE TWO GM

INVESTMENT PHASE TWO	LOCAL	IMPORTED	Rs	US$	TOTAL Rs	TOTAL US$
A. PLANT						
BUILDINGS	X		3,000,000		3,000,000	130,435
EQUIPMENT & MACHINERY		X		5,833,100	134,161,300	5,833,100
ADDITIONAL CHARGES	X		23,478,228		23,478,228	1,020,793
LOCAL PROCUREMENT	X		38,540,325		38,540,325	1,675,666
TOTAL A. CAPITAL ASSETS			65,018,553	5,833,100	199,179,853	8,659,994
PHASE TWO ADDITIONAL COSTS						
CONTINGENCY FUND	X				7,820,148	340,006
TOTAL PHASE TWO					207,000,000	9,000,000

TABLE D-10 GM

INVESTMENT PHASES 1 & 2

LAND REQUIREMENTS AND COSTS:	ACRES	R$ PER ACRE	TOTAL
* A. PLANT, RAW MATERIAL, INVENTORY STORAGE, AND COMPLETE REFINING PLANT	20	250,000	5,000,000
* B. PLANT SITE PROCUREMENT CENTER	5	250,000	1,250,000
* C. RURAL PROCUREMENT CENTER	5	100,000	500,000
TOTAL PLANT SITE (A. B.)	25		6,250,000
TOTAL RURAL PROCUREMENT CENTER (C.)	5		500,000
TOTAL (A. B. C.)	30		6,750,000
TOTAL US$			293,478

* INCLUDES GAS AND WATER INSTALLATION

TABLE D-11

GM

BUILDING REQUIREMENTS AND CONSTRUCTION COSTS

INVESTMENT PHASE 1 BUILDING DESIGNATION	AREA (SQ FT)	LENGTH (RN FT)	UNIT COST	COST Rs
A. PLANT SITE				
(1) WAREHOUSES	45,000		180	8,100,000
(2) MACHINERY	50,000		300	15,000,000
(3) SOLVENT EXTRACTION	10,000		350	3,500,000
(4) ADMINISTRATION, RESIDENCE	25,000		300	7,500,000
(5) POWER STATION & MISCELLANEOUS**	10,000		200	2,100,000
(6) BOUNDRY WALL		125,000	12	1,500,000
TOTAL A.	140,000	125,000		37,700,000
B. PLANT PROCUREMENT CENTER				
(1) ADMINISTRATION, STORE	1,500		300	450,000
(2) UNLOADING BAY & RAMP	1		250,000	250,000
(3) PARKING AREA	2,000		150	300,000
TOTAL B.				1,000,000
C. RURAL PROCUREMENT CENTER				
(1) ADMINISTRATION, STORE	1,500		300	450,000
(2) UNLOADING BAY & RAMP	1		250,000	250,000
(3) PARKING AREA	2,000		150	300,000
(4) BOUNDRY WALL		1,850	12	22,200
(5) MISCELLANEOUS (LUMP SUM)**				200,000
TOTAL C.				1,222,200

BUILDING REQUIREMENTS AND CONSTRUCTION COSTS

INVESTMENT PHASE 1 BUILDING DESIGNATION	AREA (SQ FT)	LENGTH (RN FT)	UNIT COST	COST Rs
TOTAL (A.B.C.)	147,000	126,850		
TOTAL PHASE 1 INVESTMENT (A.B.C.)				39,922,200
TOTAL US$				1,735,748
INVESTMENT PHASE 2				
BUILDING DESIGNATION				
A. PLANT SITE				
(1) REFINERY & PACKAGING PLANT	10,000		300	3,000,000
TOTAL A.	10,000			3,000,000
TOTAL (A.B.C.)	10,000			
TOTAL PHASE 2 INVESTMENT (A.B.C.)				3,000,000
TOTAL US$				130,435
TOTAL PHASE 1 & 2 (A.B.C.)	157,000			
TOTAL PHASES 1 & 2 INVESTMENT (A.B.C.)				42,922,200
TOTAL US$				1,866,183

** INCLUDES Rs 100.000 FOR WAPDA CONNECTION

TABLE D-12

EQUIPMENT & MACHINERY REQUIREMENTS & COSTS

INVESTMENT PHASE 1

	UNITS	UNIT COST US$	UNIT COST Rs	TOTAL COST US$	TOTAL COST Rs
EQUIPMENT SPECIFICATIONS (IMPORTED CIF KARACHI)					
A. PLANT SITE					
[1] CLEANING, DELINTING, DEHULLING PLANT	1	2,326,100	53,500,300	2,326,100	53,500,300
[2] PRE-PRESSING AND SOLVENT EXTRACTION PLANT	1	3,685,500	84,766,500	3,685,500	84,766,500
[3] NEUTRALIZATION PLANT	1	1,110,600	25,543,800	1,110,600	25,543,800
[4] QUALITY CONTROL EQUIPMENT	1	20,200	464,600	20,200	464,600
	1	11,000	253,000	11,000	253,000
[5] WATER TREATMENT PLANT	1	39,900	917,700	39,900	917,700
[6] POWER GENERATORS, 750 KVA	5	260,000	5,980,000	1,300,000	29,900,000
TOTAL A. (IMPORTED CIF KARACHI)				8,493,300	195,346,900
ADDITIONAL CHARGES: (LUMP SUM) [1] IGRA, LICENSES, FEES, INLAND FREIGHT, OCTROI, INSURANCE ETC.	15%			1,274,002	29,302,035
[2] ERECTION INSTALLATION & COMMISSIONING [LUMPSUM]	2.5%			212,334	4,883,673
TOTAL A. (DELIVERED & ERECTED)				10,022,398	230,515,143
B. PLANT PROCUREMENT CENTER					
[1] THERMOFLEX BUILDING	2	384,200	8,836,600	768,400	17,673,200
[2] CONVEYER (40 TON)	8	6,000	138,000	48,000	1,104,000
[3] CONVEYER (100 TON)	4	9,000	207,000	36,000	828,000
[4] TRUCK DUMPER	1	36,400	837,200	36,400	837,200
TOTAL B. (IMPORTED CIF KARACHI)				888,800	20,442,400
ADDITIONAL CHARGES: (LUMP SUM) [1] IGRA, LICENSES, FEES, INLAND FREIGHT, OCTROI, INSURANCE ETC.	15%			133,320	3,066,360
[2] ERECTION INSTALLATION & COMMISSIONING [LUMPSUM]	2.5%			22,220	511,060
TOTAL B. (DELIVERED & ERECTED)				1,044,340	24,019,820

TABLE D-12
INVESTMENT PHASE 1

	UNITS	UNIT COST US$	UNIT COST Rs	TOTAL COST US$	TOTAL COST Rs
C. FIELD PROCUREMENT CENTER					
[1] THERMOFLEX BUILDING / SMALL CAPACITY	2	60,000	1,380,000	120,000	2,760,000
[2] CONVEYER (40 TON)	8	6,000	138,000	48,000	1,104,000
[3] CONVEYER (100 TON)	4	9,000	207,000	36,000	828,000
[4] ASPIRATOR	2	15,000	345,000	30,000	690,000
[5] TRUCK DUMPER	1	36,400	837,200	36,400	837,200
TOTAL C. (IMPORTED CIF KARACHI)				270,400	6,219,200
ADDITIONAL CHARGES: (LUMP SUM) [1] IORA, LICENSES, FEES, INLAND FREIGHT, OCTROI, INSURANCE ETC.	15%			40,560	932,880
[2] ERECTION INSTALLATION & COMMISSIONING [LUMPSUM]	2.5%			6,760	155,480
TOTAL C. (DELIVERED & ERECTED)				317,720	7,307,560
TOTAL EQUIPMENT (A.B.C.) [IMPORTED CIF KARACHI DELIVERED & ERECTED]				11,341,688	260,858,813
EQUIPMENT SPECIFICATION [LOCAL]					
A. PLANT SITE					
[1] ALL LOCAL EQUIPMENT & MACHINERY [LUMP SUM]	1		49,045,775		49,045,775
[2] MISCELLANEOUS EQUIPMENT [LUMP SUM]	1		5,000,000		5,000,000
TOTAL A.					54,045,775
B. PLANT PROCUREMENT CENTER					
[1] WEIGHBRIDGE	1		30,000		30,000
[2] VEHICLES	3		500,000		1,500,000
[3] TRACTOR	3		30,000		90,000
	2		240,000		480,000
[4] IMPLEMENTS	1		63,875		63,875
[5] SUNFLOWER HARVESTING KIT	8		22,000		176,000
[6] OFFICE EQUIPMENT & ACs [LUMP SUM]	1		160,000		160,000
[7] FIELD EQUIPMENT [LUMP SUM]	1		100,000		100,000
TOTAL B.					2,599,875

TABLE D-12
INVESTMENT PHASE 1

	UNITS	UNIT COST US$	UNIT COST Rs	TOTAL COST US$	TOTAL COST Rs
FIELD PROCUREMENT CENTER					
[1] CONVEYER & AERATION [LUMP SUM]	1		200,000		200,000
[2] WEIGHBRIDGE	1		30,000		30,000
[3] VEHICLES	3		500,000		1,500,000
	3		30,000		90,000
[4] TRACTOR	2		240,000		480,000
[5] IMPLEMENTS	2		63,875		127,750
[6] SUNFLOWER HARVESTING KIT	8		22,000		176,000
[7] OFFICE EQUIPMENT & ACs [LUMP SUM]	1		160,000		160,000
[8] FIELD EQUIPMENT [LUMP SUM]	2		50,000		100,000
[9] GENERATOR	1		425,000		425,000
TOTAL C.					3,288,750
TOTAL A.B.C. [LOCAL]				2,605,843	59,934,400
TOTAL A.B.C. [IMPORTED]				11,341,688	260,858,813
TOTAL PHASE 1 INVESTMENT A.B.C (LOCAL & IMPORTED)				13,947,531	320,793,213

TABLE D-12
INVESTMENT PHASE 2

EQUIPMENT SPECIFICATIONS [IMPORTED CIF KARACHI]	UNITS	UNIT COST US$	UNIT COST Rs	TOTAL COST US$	TOTAL COST Rs
A. PLANT SITE					
[1] BLEACHING PLANT	1	530,400	12,199,200	530,400	12,199,200
[2] DEODORIZATION PLANT	1	1,342,700	30,882,100	1,342,700	30,882,100
[3] POWER GENERATOR, 750 KVA	1	260,000	5,980,000	260,000	5,980,000
[4] BLOW MOLDING EQUIPMENT	1	2,000,000	46,000,000	2,000,000	46,000,000
[5] FILLING LINE	1	1,300,000	29,900,000	1,300,000	29,900,000
[6] CAPPING MACHINE	1	400,000	9,200,000	400,000	9,200,000
TOTAL A. (IMPORTED CIF KARACHI)				5,833,100	134,161,300
ADDITIONAL CHARGES: (LUMP SUM)					
[1] IQRA, LICENSES, FEES, INLAND FREIGHT, OCTROI, INSURANCE ETC.	15%			874,965	20,124,195
[2] ERECTION INSTALLATION & COMMISSIONING (LUMPSUM)	2.5%			145,828	3,354,033
TOTAL A. (DELIVERED & ERECTED)				6,853,893	157,639,528
B. PLANT PROCUREMENT CENTER					
[1] THERMOFLEX BUILDING LARGE CAPACITY	1	338,700	7,790,100	338,700	7,790,100
[2] TEMPERATURE, HUMIDITY MONITORING & CONTROL SYSTEM	1	45,500	1,046,500	45,500	1,046,500
TOTAL B. (IMPORTED CIF KARACHI)				384,200	8,836,600
ADDITIONAL CHARGES: (LUMP SUM)					
[1] IQRA, LICENSES, FEES, INLAND FREIGHT, OCTROI, INSURANCE ETC.	15%			6,825	156,975
[2] ERECTION INSTALLATION & COMMISSIONING (LUMPSUM)	2.5%			1,138	26,163
TOTAL B. (DELIVERED & ERECTED)				392,163	9,019,738
C. FIELD PROCUREMENT CENTER	0	0	0	0	0
TOTAL C.	0	0	0	0	0
TOTAL EQUIPMENT (A.B.C.) [IMPORTED CIF KARACHI DELIVERED & ERECTED]				7,246,055	166,659,265

TABLE D-12
INVESTMENT PHASE 2

	UNITS	UNIT COST US$	UNIT COST Rs	TOTAL COST US$	TOTAL COST Rs
[LOCAL]					
A. PLANT SITE					
[1] ALL LOCAL EQUIPMENT & MACHINERY [LUMP SUM]	1		33,540,325		33,540,325
[2] MISCELLANEOUS EQUIPMENT (LUMP SUM)	1		5,000,000		5,000,000
TOTAL A.					38,540,325
B. PLANT PROCUREMENT CENTER	0	0	0	0	0
TOTAL B.	0	0	0	0	0
C. FIELD PROCUREMENT CENTER	0	0	0	0	0
TOTAL C.	0	0	0	0	0
TOTAL A.B.C. [LOCAL]					38,540,325
TOTAL A.B.C. [IMPORTED]					166,659,265
TOTAL PHASE 2 INVESTMENT A.B.C (LOCAL & IMPORTED)					205,199,590
TOTAL PHASES 1 & 2 INVESTMENT A.B.C				22,869,252	525,992,803

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TABLE D-13

SALES REVENUE YEAR ONE GROSS

	COTTONSEED	%	SUNFLOWERSEED	%	TOTAL RUPEES	%
OIL	187,425,000	34.28%	109,890,000	20.10%	297,315,000	54.37%
MEAL	138,206,250	25.28%	32,400,000	5.93%	170,606,250	31.20%
HULLS	24,412,500	4.46%	2,268,000	0.41%	26,680,500	4.88%
LINTERS	38,587,500	7.06%	NA	0.00%	38,587,500	7.06%
SOAP STOCK	11,812,500	2.16%	1,800,000	0.33%	13,612,500	2.49%
TOTAL	400,443,750	73.23%	146,358,000	26.77%	546,801,750	100.00%

SALES REVENUE YEAR TWO GROSS

	COTTONSEED	%	SUNFLOWERSEED	%	TOTAL RUPEES	%
OIL	219,912,000	33.1[illegible]	145,833,1[illegible]	21.96%	365,745,188	55.08%
MEAL	162,162,000	24.4[illegible]	4[illegible],997,50[illegible]	6.47%	205,159,500	30.89%
HULLS	28,644,000	4.31%	3,009,825	0.45%	31,653,825	4.77%
LINTERS	45,276,000	6.82%	NA	0.00%	45,276,000	6.82%
SOAP STOCK	13,860,000	2.09%	2,388,750	0.36%	16,248,750	2.45%
TOTAL	469,854,000	70.75%	194,229,263	29.25%	664,083,263	100.00%

SALES REVENUE YEAR THREE GROSS

	COTTONSEED	%	SUNFLOWERSEED	%	TOTAL RUPEES	%
OIL	259,771,050	32.23%	188,461,350	23.38%	448,232,400	55.61%
MEAL	191,553,863	23.77%	55,566,000	6.89%	247,119,863	30.66%
HULLS	33,835,725	4.20%	3,889,620	0.48%	37,725,345	4.68%
LINTERS	53,482,275	6.64%	NA	0.00%	53,482,275	6.64%
SOAP STOCK	16,372,125	2.03%	3,087,000	0.38%	19,459,125	2.41%
TOTAL	555,015,038	68.86%	251,003,970	31.14%	806,019,008	100.00%

SALES REVENUE YEAR FOUR GROSS

	COTTONSEED	%	SUNFLOWERSEED	%	TOTAL RUPEES	%
OIL	454,766,235	27.85%	340,908,750	20.87%	795,674,985	48.72%
MEAL	222,415,318	13.62%	73,674,563	4.51%	296,089,881	18.13%
HULLS	37,501,262	2.30%	4,922,800	0.30%	42,424,062	2.60%
LINTERS	59,276,188	3.63%	NA	0.00%	59,276,188	3.63%
SOAP STOCK	18,145,772	1.11%	3,906,984	0.24%	22,052,756	1.35%
REFINED OIL	390,000,765	23.88%	27,627,600	1.69%	417,628,365	25.57%
TOTAL	1,182,105,540	72.38%	451,040,697	27.62%	1,633,146,237	100.00%

SALES REVENUE YEAR FIVE GROSS

	COTTONSEED	%	SUNFLOWERSEED	%	TOTAL RUPEES	%
OIL	477,523,200	24.15%	435,120,000	22.00%	912,643,200	46.15%
MEAL	244,656,850	12.37%	96,049,800	4.86%	340,706,650	17.23%
HULLS	39,376,325	1.99%	6,126,152	0.31%	45,502,476	2.30%
LINTERS	62,239,998	3.15%	NA	0.00%	62,239,998	3.15%
SOAP STOCK	19,053,060	0.96%	4,862,025	0.25%	23,915,085	1.21%
REFINED OIL	527,788,800	26.69%	64,680,000	3.27%	592,468,800	29.96%
TOTAL	1,370,638,233	69.31%	606,837,977	30.69%	1,977,476,209	100.00%

SALES REVENUE YEAR SIX GROSS

	COTTONSEED	%	SUNFLOWERSEED	%	TOTAL RUPEES	%
OIL	455,817,600	21.28%	587,412,000	27.43%	1,043,229,600	48.71%
MEAL	129,667,230	6.05%	129,667,230	6.05%	259,334,460	12.11%
HULLS	47,286,232	2.21%	8,270,305	0.39%	55,556,536	2.59%
LINTERS	59,410,907	2.77%	NA	0.00%	59,410,907	2.77%
SOAP STOCK	18,187,012	0.85%	6,563,734	0.31%	24,750,746	1.16%
REFINED OIL	616,694,400	28.79%	82,908,000	3.87%	699,602,400	32.66%
TOTAL	1,327,063,381	61.96%	814,821,268	38.04%	2,141,884,649	100.00%

Table D-14

FUNDS FLOW SCHEDULE

YEAR ONE	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	TOTAL	TOTAL US$
OUTFLOW														
PERSONNEL	6,665,683	6,665,683	6,665,683	6,665,683	6,665,683	6,665,683	6,665,683	6,665,683	6,665,683	6,665,683	6,665,683	6,665,683	79,988,200	3,477,748
AUX. INPUTS	1,638,119	1,692,723	1,692,723	1,528,911	1,692,723	1,638,119	1,583,515	1,323,846	1,654,807	330,961	0	0	14,776,446	642,454
SPARES	416,667	416,667	416,667	416,667	416,667	416,667	416,667	416,667	416,667	416,667	416,667	416,667	5,000,004	217,391
TRAINING	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	5,750,000	250,000
MARKETING	451,603	451,603	451,603	451,603	451,603	451,603	451,603	451,603	451,603	451,603	451,603	451,603	5,419,232	235,619
INTEREST	1,744,413	1,733,118	1,721,693	1,710,137	1,698,449	1,686,627	1,674,670	1,662,575	1,650,341	1,637,967	1,625,450	28,593,340	47,138,780	2,049,512
PRIN. REPAY	1,079,231	1,090,527	1,101,952	1,113,507	1,125,195	1,137,017	1,148,975	1,161,070	1,173,303	1,185,678	1,198,194	1,210,855	13,725,503	596,761
TOTAL DEBT SERVICE	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	29,804,195	60,864,279	2,646,273
PROC. DAYS	30	31	31	28	30	0	0	0	0	0	0	0	150	
PROD. DAYS	30	31	31	28	31	30	29	0	0	0	0	0	210	
COTTONSEED	43,312,500	44,756,250	44,756,250	40,425,000	43,312,500	0	0	0	0	0	0	0	216,562,500	9,415,761
PROC. DAYS	0	0	0	0	0	0	16	29	0	0	0	0	45	
PROD. DAYS	0	0	0	0	0	0	0	24	30	6	0	0	60	
FARM INPUTS	11,999,733	21,749,517	0	0	0	0	0	0	0	0	0	0	33,749,250	1,467,359
SUNFLOWERSEED	0	0	0	0	0	0	26,400,267	47,850,483	0	0	0	0	74,250,750	3,228,293
TOTAL	67,787,116	79,035,253	57,285,737	52,790,675	55,841,987	12,474,883	38,820,545	60,011,093	12,491,571	11,167,725	10,836,764	37,817,315	496,360,665	21,580,898
INFLOW														
REV DAYS	0	0	2	28	31	30	31	30	31	27	0	0	210	
COTTONSEED	0	0	3,813,750	53,392,500	59,113,125	57,206,250	59,113,125	57,206,250	59,113,125	51,485,625	0	0	400,443,750	17,410,598
REV DAYS	0	0	0	0	0	0	0	0	0	0	27	31	58	
SUNFLOWERSEED	0	0	0	0	0	0	0	0	0	0	65,861,100	75,618,300	141,479,400	6,151,278
TOTAL	0	0	3,813,750	53,392,500	59,113,125	57,206,250	59,113,125	57,206,250	59,113,125	51,485,625	65,861,100	75,618,300	541,923,150	23,561,876
EARNINGS	(67,787,116)	(79,035,253)	(53,471,987)	601,825	3,271,138	44,731,367	20,292,580	(2,804,843)	46,621,554	40,317,900	55,024,336	37,800,985	45,562,485	1,980,978
BALANCE	(108,088,370)	(187,123,624)	(240,595,610)	(239,993,785)	(236,722,647)	(191,991,280)	(171,698,700)	(174,503,543)	(127,881,989)	(87,564,090)	(32,539,754)	5,261,231		
BALANCES	(4,699,494)	(8,135,810)	(10,460,679)	(10,434,512)	(10,292,289)	(8,347,447)	(7,465,161)	(7,587,111)	(5,560,086)	(3,807,134)	(1,414,772)	228,749		

Table D-14

YEAR TWO	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	TOTAL	TOTAL US$
OUTFLOW														
PERSONNEL	6,998,968	6,998,968	6,998,968	6,998,968	6,998,968	6,998,968	6,998,968	6,998,968	6,998,968	6,998,968	6,998,968	6,998,968	83,987,610	3,651,635
AUX. INPUTS	1,833,815	1,894,942	1,894,942	1,711,560	1,894,942	1,833,815	1,894,942	1,429,711	1,944,101	1,505,110	0	0	17,837,880	775,560
SPARES	437,500	437,500	437,500	437,500	437,500	437,500	437,500	437,500	437,500	437,500	437,500	437,500	5,250,004	228,261
TRAINING	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	479,167	5,750,000	250,000
MARKETING	506,599	506,599	506,599	506,599	506,599	506,599	506,599	506,599	506,599	506,599	506,599	506,599	6,079,184	264,312
INTEREST	1,599,983	1,587,030	1,573,927	1,560,673	1,547,266	1,533,704	1,519,986	1,506,109	1,492,072	1,477,872	1,463,508	25,092,878	41,955,008	1,824,131
PRIN. REPAY	1,223,661	1,236,615	1,249,718	1,262,972	1,276,379	1,289,940	1,303,659	1,317,535	1,331,573	1,345,772	1,360,136	1,374,666	15,572,625	677,071
TOTAL DEBT SERVICE	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	26,467,544	57,527,628	2,501,201
PROC. DAYS	30	31	31	28	30	0	0	0	0	0	0	0	150	
PROD. DAYS	30	31	31	28	31	30	31	8	0	0	0	0	220	
COTTONSEED	50,828,800	52,523,093	52,523,093	47,440,213	50,828,800	0	0	0	0	0	0	0	254,144,000	11,049,739
PROC. DAYS	0	0	0	0	0	0	16	29	0	0	0	0	45	
PROD. DAYS	0	0	0	0	0	0	0	15	31	24	0	0	70	
FARM INPUTS	15,040,410	27,260,743	0	0	0	0	0	0	0	0	0	0	42,301,153	1,839,181
SUNFLOWERSEED	0	0	0	0	0	0	35,919,590	65,104,257	0	0	0	0	101,023,847	4,392,341
TOTAL	78,948,902	92,924,656	45,663,913	60,397,651	63,969,619	13,079,692	49,060,410	77,779,846	13,189,978	12,750,988	11,245,878	34,889,778	631,428,939	27,453,432
INFLOW														
REV DAYS	0	0	2	28	31	30	31	30	31	31	6	0	220	
COTTONSEED	0	0	4,271,400	59,799,600	66,206,700	64,071,000	66,206,700	64,071,000	66,206,700	66,206,700	12,814,200	0	469,854,000	20,428,435
REV DAYS	2	0	0	0	0	0	0	0	0	0	17	31	50	
SUNFLOWERSEED	4,878,600	0	0	0	0	0	0	0	0	0	47,169,964	86,015,816	138,064,380	6,002,799
TOTAL	4,878,600	0	4,271,400	59,799,600	66,206,700	64,071,000	66,206,700	64,071,000	66,206,700	66,206,700	59,984,164	86,015,816	607,918,380	26,431,234
EARNINGS	(74,070,302)	(92,924,656)	(61,392,513)	(598,051)	2,237,081	50,991,308	17,146,290	(13,708,846)	53,016,722	53,455,712	48,738,286	51,126,039	(23,510,559)	(1,022,198)
BALANCE	(68,809,071)	(161,733,727)	(223,126,240)	(223,724,291)	(221,487,210)	(170,495,903)	(153,349,612)	(167,058,458)	(114,041,736)	(60,586,024)	(11,847,738)	39,278,301		
BALANCE$	(2,991,699)	(7,031,901)	(9,701,141)	(9,727,143)	(9,629,879)	(7,412,865)	(6,667,374)	(7,263,411)	(4,958,336)	(2,634,175)	(515,119)	1,707,752		

Table D-14

YEAR THREE	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	TOTAL	TOTAL US$
OUTFLOW														
PERSONNEL	7,524,213	7,524,213	7,524,213	7,524,213	7,524,213	7,524,213	7,524,213	7,524,213	7,524,213	7,524,213	7,524,213	7,524,213	90,290,561	3,925,677
AUX. INPUTS	2,168,190	2,240,463	2,240,463	2,023,644	2,240,463	2,168,190	2,240,463	1,643,679	2,202,023	2,202,023	213,099	0	21,582,700	938,378
SPARES	459,375	459,375	459,375	459,375	459,375	459,375	459,375	459,375	459,375	459,375	459,375	459,375	5,512,504	239,674
TRAINING	345,000	345,000	345,000	345,000	345,000	345,000	345,000	345,000	345,000	345,000	345,000	345,000	4,140,000	180,000
MARKETING	1,277,768	1,277,768	1,277,768	1,277,768	1,277,768	1,277,768	1,277,768	1,277,768	1,277,768	1,277,768	1,277,768	1,277,768	15,333,218	666,662
INTEREST	1,434,279	1,419,410	1,404,369	1,389,153	1,373,760	1,358,189	1,342,436	1,326,500	1,310,379	1,294,070	1,277,572	16,233,522	31,163,640	1,354,941
PRIN. REPAY	1,389,365	1,404,234	1,419,075	1,434,492	1,449,884	1,465,456	1,481,208	1,497,144	1,513,265	1,529,574	1,546,073	1,562,764	17,692,734	769,249
TOTAL DEBT SERVICE	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	2,823,644	17,796,286	48,856,374	2,124,190
PROC. DAYS	30	31	31	28	30	0	0	0	0	0	0	0	150	
PROD. DAYS	30	31	31	28	31	30	31	8	0	0	0	0	220	
COTTONSEED	60,033,600	62,034,720	62,034,720	56,031,360	60,033,600	0	0	0	0	0	0	0	300,168,000	13,050,783
PROC. DAYS	0	0	0	0	0	0	16	29	0	0	0	0	45	
PROD. DAYS	0	0	0	0	0	0	0	15	31	31	3	0	80	
FARM INPUTS	18,413,882	33,375,160	0	0	0	0	0	0	0	0	0	0	51,789,042	2,251,697
SUNFLOWERSEED	0	0	0	0	0	0	47,442,118	85,985,840	0	0	0	0	133,430,958	5,801,346
TOTAL	93,045,673	110,080,345	76,705,184	70,485,005	74,704,064	14,598,191	62,112,583	100,062,520	14,632,024	14,632,024	12,643,100	27,402,643	671,103,357	29,178,407
INFLOW														
DAYS	0	0	2	28	31	30	31	30	31	31	6	0	220	
COTTONSEED	0	0	5,045,591	70,638,278	78,206,664	75,683,869	78,206,664	75,683,869	78,206,664	78,206,664	15,136,774	0	555,015,038	24,131,089
DAYS	22	0	0	0	0	0	0	0	0	0	17	31	70	
SUNFLOWERSEED	61,043,483	0	0	0	0	0	0	0	0	0	53,338,344	97,264,038	211,645,865	9,201,994
TOTAL	61,043,483	0	5,045,591	70,638,278	78,206,664	75,683,869	78,206,664	75,683,869	78,206,664	78,206,664	68,475,117	97,264,038	766,660,902	33,333,083
EARNINGS	(32,002,190)	(110,080,345)	(71,659,593)	153,272	3,502,600	61,085,677	16,094,082	(24,378,651)	63,574,640	63,574,640	55,832,017	69,861,396	95,557,545	4,154,676
BALANCE	7,276,110	(102,804,235)	(174,463,828)	(174,310,555)	(170,807,955)	(109,722,278)	(93,628,196)	(118,006,847)	(54,432,207)	9,142,433	64,974,450	134,835,845		
BALANCES	316,353	(4,469,749)	(7,585,384)	(7,578,720)	(7,426,433)	(4,770,534)	(4,070,791)	(5,130,732)	(2,366,618)	397,497	2,824,976	5,862,428		

Table D-14

YEAR FOUR	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	TOTAL	TOTAL US$
OUTFLOW														
PERSONNEL	9,151,806	9,151,806	9,151,806	9,151,806	9,151,806	9,151,806	9,151,806	9,151,806	9,151,806	9,151,806	9,151,806	9,151,806	109,821,670	4,774,855
AUX. INPUTS	14,013,450	14,480,565	14,480,565	13,079,220	14,480,565	14,013,450	14,480,565	11,057,700	15,129,612	15,129,612	6,344,676	0	146,689,980	6,377,825
SPARES	482,344	482,344	482,344	482,344	482,344	482,344	482,344	482,344	482,344	482,344	482,344	482,344	5,788,130	251,658
TRAINING	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	2,070,000	90,000
MARKETING	3,807,655	3,807,655	3,807,655	3,807,655	3,807,655	3,807,655	3,807,655	3,807,655	3,807,655	3,807,655	3,807,655	3,807,655	45,691,865	1,986,603
INTEREST	3,603,141	3,568,699	3,533,848	3,498,582	3,462,898	3,426,789	3,390,250	3,353,277	3,315,864	3,278,006	3,239,696	16,210,491	53,881,542	2,342,676
PRIN. REPAY	3,079,374	3,113,816	3,148,668	3,183,933	3,219,618	3,255,727	3,292,265	3,329,238	3,366,651	3,404,510	3,442,819	3,481,585	39,318,204	1,709,487
TOTAL DEBT SERVICE	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	19,692,076	93,199,746	4,052,163
PROC. DAYS	30	31	31	28	30	0	0	0	0	0	0	0	150	
PROD. DAYS	30	31	31	28	31	30	31	0	0	0	0	0	220	
COTTONSEED	66,545,600	68,763,787	68,763,787	62,109,227	66,545,600	0	0	0	0	0	0	0	332,728,000	14,466,435
COTTONSEED B.R. OIL	33,669,523	34,791,841	34,791,841	31,424,888	34,791,841	33,669,523	34,791,841	8,978,540	0	0	0	0	246,909,836	10,735,210
PROC. DAYS	0	0	0	0	0	0	16	29	0	0	0	0	45	
PROD. DAYS	0	0	0	0	0	0	0	15	31	31	13	0	90	
FARM INPUTS	22,139,578	40,127,985	0	0	0	0	0	0	0	0	0	0	62,267,563	2,707,285
SUNFLOWERSEED	0	0	0	0	0	0	61,212,422	110,947,515	0	0	0	0	172,159,937	7,485,215
SUNFLOWERSEED B.R. OIL	0	0	0	0	0	0	0	3,221,670	6,658,119	6,658,119	2,792,114	0	19,330,022	840,436
TOTAL	156,664,972	178,460,998	138,333,013	126,910,156	136,114,826	67,979,794	130,781,648	154,502,246	42,084,552	42,084,552	29,433,611	33,306,381	1,236,656,749	53,767,685
INFLOW														
REV DAYS	0	0	2	28	31	30	31	30	31	31	6	0	220	
COTTONSEED	0	0	10,746,414	150,449,796	166,569,417	161,196,210	166,569,417	161,196,210	166,569,417	166,569,417	32,239,242	0	1,182,105,540	51,395,893
REV DAYS	30	2	0	0	0	0	0	0	0	0	17	31	80	
SUNFLOWERSEED	94,126,489	6,275,099	0	0	0	0	0	0	0	0	85,196,576	155,358,462	340,956,627	14,824,201
TOTAL	94,126,489	6,275,099	10,746,414	150,449,796	166,569,417	161,196,210	166,569,417	161,196,210	166,569,417	166,569,417	117,435,818	155,358,462	1,523,062,167	66,220,094
EARNINGS	(62,538,483)	(172,185,899)	(127,586,599)	23,539,640	30,454,591	93,216,416	35,787,769	6,693,964	124,484,865	124,484,865	88,002,207	122,052,081	286,405,417	12,452,409
BALANCE	72,297,362	(99,888,537)	(227,475,136)	(203,935,496)	(173,480,905)	(80,264,489)	(44,476,720)	(37,782,756)	86,702,109	211,186,975	299,189,182	421,241,262		
BALANCE$	3,143,364	(4,342,980)	(9,890,223)	(8,866,761)	(7,542,648)	(3,489,760)	(1,933,770)	(1,642,729)	3,769,657	9,182,042	13,008,225	18,314,837		

Table D-14

YEAR FIVE	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	TOTAL	TOTAL US$
OUTFLOW														
PERSONNEL	10,016,282	10,016,282	10,016,282	10,016,282	10,016,282	10,016,282	10,016,282	10,016,282	10,016,282	10,016,282	10,016,282	10,016,282	120,195,339	5,225,886
AUX. INPUTS	15,700,350	16,223,695	16,223,695	14,653,660	16,223,695	15,700,350	16,223,695	12,482,015	17,143,527	17,143,527	10,719,391	0	170,437,600	7,410,330
SPARES	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	6,077,536	264,241
TRAINING	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	2,070,000	90,000
MARKETING	4,681,015	4,681,015	4,681,015	4,681,015	4,681,015	4,681,015	4,681,015	4,681,015	4,681,015	4,681,015	4,681,015	4,681,015	56,172,184	2,442,269
INTEREST	3,161,703	3,122,007	3,081,836	3,041,189	3,000,055	2,958,430	2,916,308	2,873,683	2,830,548	2,786,897	2,742,774	2,698,023	35,213,404	1,531,018
PRIN. REPAY	3,520,813	3,560,509	3,600,678	3,641,326	3,682,460	3,724,055	3,766,207	3,808,833	3,851,968	3,895,619	3,939,791	3,984,493	44,976,782	1,955,512
DEBT SERVICE	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	80,190,186	3,486,530
PROC. DAYS	30	31	31	28	30	0	0	0	0	0	0	0	150	
PROD. DAYS	30	31	31	28	31	30	31	8	0	0	0	0	220	
COTTONSEED	69,868,700	72,197,657	72,197,657	65,210,787	69,868,700	0	0	0	0	0	0	0	349,343,500	15,188,848
COTTONSEED B.R. OIL	45,563,252	47,082,027	47,082,027	42,525,702	47,082,027	45,563,252	47,082,027	12,150,200	0	0	0	0	334,130,513	14,527,414
PROC.DAYS	0	0	0	0	0	0	16	29	0	0	0	0	45	
PROD. DAYS	0	0	0	0	0	0	0	15	31	31	23	0	100	
FARM INPUTS	26,240,025	47,560,045	0	0	0	0	0	0	0	0	0	0	73,800,070	3,208,699
SUNFLOWERSEED	0	0	0	0	0	0	77,482,642	140,437,288	0	0	0	0	217,919,930	9,474,780
SUNFLOWERSEED B.R. OIL	0	0	0	0	0	0	0	6,618,432	13,678,092	13,678,092	10,148,262	0	44,122,877	1,918,386
TOTAL	179,431,101	205,122,198	157,562,153	144,448,923	155,233,196	83,322,376	162,847,138	193,746,710	52,680,393	52,680,393	44,926,427	22,058,775	1,454,459,764	63,237,382
INFLOW														
DAYS	0	0	2	28	31	30	31	30	31	31	6	0	220	
COTTONSEED	0	0	12,460,348	174,444,866	193,135,387	186,905,214	193,135,387	186,905,214	193,135,387	193,135,387	37,381,043	0	1,370,638,233	59,592,967
DAYS	30	12	0	0	0	0	0	0	0	0	17	31	90	
SUNFLOWERSEED	150,346,899	60,138,760	0	0	0	0	0	0	0	0	103,162,456	188,119,773	501,767,887	21,815,995
TOTAL	150,346,899	60,138,760	12,460,348	174,444,866	193,135,387	186,905,214	193,135,387	186,905,214	193,135,387	193,135,387	140,543,499	188,119,773	1,872,406,120	81,408,962
EARNINGS	(29,084,202)	(144,983,439)	(145,101,805)	29,995,943	37,902,191	103,582,837	30,288,249	(6,841,496)	140,254,994	140,254,994	95,617,072	166,060,998	417,946,336	18,171,580
BALANCE	392,157,060	247,173,622	102,071,816	132,067,759	169,969,950	273,552,788	303,841,037	296,999,541	437,254,535	577,509,529	673,126,600	839,187,598		
BALANCES	17,050,307	10,746,679	4,437,905	5,742,076	7,389,998	11,893,599	13,210,480	12,913,024	19,011,067	25,109,110	29,266,374	36,486,417		

Table D-14

YEAR SIX	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	TOTAL	TOTAL US$
OUTFLOW														
PERSONNEL	10,964,672	10,964,672	10,964,672	10,964,672	10,964,672	10,964,672	10,964,672	10,964,672	10,964,672	10,964,672	10,964,672	10,964,672	131,576,058	5,720,698
AUX. INPUTS	17,250,360	17,825,372	17,825,372	16,100,336	17,825,372	17,250,360	16,675,348	15,471,250	19,184,350	19,184,350	18,565,500	1,856,550	195,014,520	8,478,892
SPARES	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	506,461	6,077,536	264,241
TRAINING	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	172,500	2,070,000	90,000
MARKETING	5,091,124	5,091,124	5,091,124	5,091,124	5,091,124	5,091,124	5,091,124	5,091,124	5,091,124	5,091,124	5,091,124	5,091,124	61,093,482	2,656,238
INTEREST	2,652,786	2,607,008	2,560,681	2,513,800	2,466,356	2,418,344	2,369,755	2,320,584	2,270,823	2,220,464	2,169,501	2,117,925	28,688,027	1,247,306
PRIN. REPAY	4,029,729	4,075,508	4,121,834	4,168,716	4,216,159	4,264,172	4,312,760	4,361,931	4,411,693	4,462,051	4,513,015	4,564,591	51,501,159	2,239,224
TOTAL DEBT SERVICE	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	6,682,515	80,190,186	3,488,530
PROC. DAYS	30	31	31	28	30	0	0	0	0	0	0	0	150	
PROD. DAYS	30	31	31	28	31	30	29	0	0	0	0	0	210	
COTTONSEED	66,692,850	68,915,945	68,915,945	62,246,660	66,692,850	0	0	0	0	0	0	0	333,464,250	14,498,446
COTTONSEED B.R. OIL	55,772,289	57,631,365	57,631,365	52,054,136	57,631,365	55,772,289	53,913,212	0	0	0	0	0	370,406,021	
PROC. DAYS	0	0	0	0	0	0	16	29	0	0	0	0	45	
PROD. DAYS	0	0	0	0	0	0	0	25	31	31	30	3	120	
FARM INPUTS	33,813,925	61,287,740	0	0	0	0	0	0	0	0	0	0	95,101,665	4,134,855
SUNFLOWERSEED	0	0	0	0	0	0	106,211,675	192,508,660	0	0	0	0	298,720,335	12,987,841
SUNFLOWERSEED B.R. OIL	0	0	0	0	0	0	0	11,782,814	14,610,689	14,610,689	14,139,376	1,413,938	55,557,506	2,459,022
TOTAL	196,946,696	229,077,694	167,789,954	153,818,404	165,566,859	96,439,921	200,217,507	243,179,996	57,212,311	57,212,311	56,122,148	26,687,759	1,650,271,559	71,750,937
INFLOW														
DAYS	0	0	2	28	31	30	31	30	31	27	0	0	210	
COTTONSEED	0	0	12,638,699	176,941,784	195,899,832	189,580,483	195,899,832	189,580,483	195,899,832	170,622,435	0	0	1,327,063,381	57,698,408
DAYS	30	22	0	0	0	0	0	0	0	0	27	31	110	
SUNFLOWERSEED	182,051,393	133,504,355	0	0	0	0	0	0	0	0	183,334,785	210,495,494	709,386,027	30,842,871
TOTAL	182,051,393	133,504,355	12,638,699	176,941,784	195,899,832	189,580,483	195,899,832	189,580,483	195,899,832	170,622,435	183,334,785	210,495,494	2,036,449,408	88,541,279
EARNINGS	(14,895,303)	(95,573,339)	(155,151,255)	23,123,380	30,332,974	93,140,562	(4,317,675)	(53,599,513)	138,687,522	113,410,124	127,212,637	183,807,735	386,177,849	16,790,341
BALANCE	824,292,295	728,718,957	573,567,702	596,691,082	627,024,055	720,164,618	715,846,943	662,247,430	800,934,952	914,345,076	1,041,557,713	1,225,365,448		
BALANCES	35,338,795	31,683,433	24,937,726	25,943,091	27,261,915	31,311,505	31,123,780	28,793,367	34,823,259	39,754,134	45,285,118	53,276,759		

PLUS 62 DAYS	420,990,989
TOTAL	1,646,356,436
TOTAL US$	71,580,715

TABLE D-15

AMORTIZATION TABLE
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LOAN ONE SUPPLIER'S CREDIT

	Rs
Principal:	69,000,000
(Annual) Interest:	15.00%
(Months) Term:	72
Payment:	1,459,006

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
1	862,500	596,506	68,403,494	862,500	596,506
2	855,044	603,962	67,799,532	1,717,544	1,200,468
3	847,494	611,512	67,188,020	2,565,038	1,811,980
4	839,850	619,156	66,568,864	3,404,888	2,431,136
5	832,111	626,895	65,941,969	4,236,999	3,058,031
6	824,275	634,731	65,307,238	5,061,273	3,692,762
7	816,340	642,665	64,664,573	5,877,614	4,335,427
8	808,307	650,699	64,013,874	6,685,921	4,986,126
9	800,173	658,832	63,355,041	7,486,095	5,644,959
10	791,938	667,068	62,687,973	8,278,033	6,312,027
11	783,600	675,406	62,012,567	9,061,632	6,987,433
12	775,157	683,849	61,328,718	9,836,789	7,671,282
13	766,609	692,397	60,636,321	766,609	692,397
14	757,954	701,052	59,935,269	1,524,563	1,393,449
15	749,191	709,815	59,225,454	2,273,754	2,103,264
16	740,318	718,688	58,506,767	3,014,072	2,821,952
17	731,335	727,671	57,779,095	3,745,407	3,549,623
18	722,239	736,767	57,042,328	4,467,645	4,286,390
19	713,029	746,977	56,296,351	5,180,674	5,032,367
20	703,704	755,302	55,541,050	5,884,379	5,787,669
21	694,263	764,743	54,776,307	6,578,642	6,552,411
22	684,704	774,302	54,002,005	7,263,346	7,326,713
23	675,025	783,981	53,218,024	7,938,371	8,110,694
24	665,225	793,781	52,424,243	8,603,596	8,904,475
25	655,303	803,703	51,620,540	655,303	803,703
26	645,257	813,749	50,806,791	1,300,560	1,617,452
27	635,085	823,921	49,982,870	1,935,645	2,441,373
28	624,786	834,220	49,148,650	2,560,431	3,275,593
29	614,358	844,648	48,304,002	3,174,789	4,120,241
30	603,800	855,206	47,448,797	3,778,589	4,975,447
31	593,110	865,896	46,582,901	4,371,699	5,841,343
32	582,286	876,720	45,706,181	4,953,985	6,718,062
33	571,327	887,679	44,818,502	5,525,312	7,605,741
34	560,231	898,775	43,919,728	6,085,543	8,504,516
35	548,997	910,009	43,009,718	6,634,540	9,414,525
36	537,621	921,384	42,088,334	7,172,162	10,335,909
37	526,104	932,902	41,155,432	526,104	932,902
38	514,443	944,563	40,210,869	1,040,547	1,877,465
39	502,636	956,370	39,254,499	1,543,183	2,833,835

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
40	490,681	968,325	38,286,174	2,033,864	3,802,160
41	478,577	980,429	37,305,746	2,512,441	4,782,588
42	466,322	992,684	36,313,062	2,978,763	5,775,272
43	453,913	1,005,093	35,307,969	3,432,676	6,780,365
44	441,350	1,017,656	34,290,313	3,874,026	7,798,021
45	428,629	1,030,377	33,259,936	4,302,655	8,828,398
46	415,749	1,043,257	32,216,679	4,718,404	9,871,655
47	402,708	1,056,297	31,160,381	5,121,113	10,927,952
48	389,505	1,069,501	30,090,880	5,510,617	11,997,454
49	376,136	1,082,870	29,008,010	376,136	1,082,870
50	362,600	1,096,406	27,911,605	738,736	2,179,276
51	348,895	1,110,111	26,801,494	1,087,631	3,289,387
52	335,019	1,123,987	25,677,506	1,422,650	4,413,374
53	320,969	1,138,037	24,539,469	1,743,619	5,551,411
54	306,743	1,152,263	23,387,207	2,050,362	6,703,673
55	292,340	1,166,666	22,220,541	2,342,702	7,870,339
56	277,757	1,181,249	21,039,292	2,620,459	9,051,588
57	262,991	1,196,015	19,843,277	2,883,450	10,247,603
58	248,041	1,210,965	18,632,312	3,131,491	11,458,568
59	232,904	1,226,102	17,406,210	3,364,395	12,684,670
60	217,578	1,241,428	16,164,782	3,581,973	13,926,099
61	202,060	1,256,946	14,907,836	202,060	1,256,946
62	186,348	1,272,658	13,635,178	388,408	2,529,604
63	170,440	1,288,566	12,346,611	558,847	3,818,170
64	154,333	1,304,673	11,041,938	713,180	5,122,844
65	138,024	1,320,982	9,720,956	851,204	6,443,825
66	121,512	1,337,494	8,383,462	972,716	7,781,319
67	104,793	1,354,213	7,029,250	1,077,510	9,135,532
68	87,866	1,371,140	5,658,110	1,165,375	10,506,672
69	70,726	1,388,280	4,269,830	1,236,102	11,894,952
70	53,373	1,405,633	2,864,197	1,289,474	13,300,585
71	35,802	1,423,203	1,440,994	1,325,277	14,723,788
72	18,012	1,440,994	(0)	1,343,289	16,164,782

Table D-15

AMORTIZATION TABLE

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LOAN TWO LMM THROUGH DFI

	Rs
Principal:	59,934,400
(Annual) Interest:	7.00%
(Months) Term:	120
Payment:	695,889

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
1	349,617	346,272	59,588,128	349,617	346,272
2	347,597	348,292	59,239,836	697,215	694,564
3	345,566	350,323	58,889,513	1,042,780	1,044,887
4	343,522	352,367	58,537,146	1,386,303	1,397,254
5	341,467	354,423	58,182,723	1,727,769	1,751,677
6	339,399	356,490	57,826,233	2,067,169	2,108,167
7	337,320	358,570	57,467,664	2,404,488	2,466,736
8	335,228	360,661	57,107,003	2,739,716	2,827,397
9	333,124	362,765	56,744,238	3,072,840	3,190,162
10	331,008	364,881	56,379,356	3,403,848	3,555,044
11	328,880	367,010	56,012,347	3,732,728	3,922,053
12	326,739	369,151	55,643,196	4,059,467	4,291,204
13	324,585	371,304	55,271,892	324,585	371,304
14	322,419	373,470	54,898,423	647,005	744,774
15	320,241	375,648	54,522,774	967,245	1,120,422
16	318,050	377,840	54,144,934	1,285,295	1,498,262
17	315,845	380,044	53,764,891	1,601,140	1,878,306
18	313,629	382,261	53,382,630	1,914,769	2,260,566
19	311,399	384,491	52,998,140	2,226,168	2,645,057
20	309,156	386,733	52,611,406	2,535,323	3,031,790
21	306,900	388,989	52,222,417	2,842,223	3,420,779
22	304,631	391,258	51,831,158	3,146,854	3,812,038
23	302,348	393,541	51,437,618	3,449,203	4,205,579
24	300,053	395,836	51,041,781	3,749,255	4,601,415
25	297,744	398,145	50,643,636	297,744	398,145
26	295,421	400,468	50,243,168	593,165	798,613
27	293,085	402,804	49,840,364	886,250	1,201,418
28	290,735	405,154	49,435,210	1,176,986	1,606,571
29	288,372	407,517	49,027,693	1,465,358	2,014,088
30	285,995	409,894	48,617,798	1,751,352	2,423,983
31	283,604	412,285	48,205,513	2,034,956	2,836,268
32	281,199	414,690	47,790,823	2,316,155	3,250,959
33	278,780	417,109	47,373,713	2,594,935	3,668,068
34	276,347	419,543	46,954,171	2,871,282	4,087,610
35	273,899	421,990	46,532,181	3,145,181	4,509,600
36	271,438	424,451	46,107,729	3,416,619	4,934,052
37	268,962	426,927	45,680,802	268,962	426,927
38	266,471	429,418	45,251,384	535,433	856,345
39	263,966	431,923	44,819,461	799,400	1,288,268

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
40	261,447	434,442	44,385,019	1,060,846	1,722,710
41	258,913	436,977	43,948,042	1,319,759	2,159,687
42	256,364	439,526	43,508,517	1,576,123	2,599,213
43	253,800	442,090	43,066,427	1,829,922	3,041,302
44	251,221	444,668	42,621,759	2,081,143	3,485,971
45	248,627	447,262	42,174,496	2,329,770	3,933,233
46	246,018	449,871	41,724,625	2,575,788	4,383,104
47	243,394	452,496	41,272,130	2,819,182	4,835,600
48	240,754	455,135	40,816,995	3,059,936	5,290,735
49	238,099	457,790	40,359,204	238,099	457,790
50	235,429	460,461	39,898,744	473,528	918,251
51	232,743	463,147	39,435,597	706,271	1,381,397
52	230,041	465,848	38,969,749	936,311	1,847,245
53	227,324	468,566	38,501,184	1,163,635	2,315,811
54	224,590	471,299	38,029,885	1,388,225	2,787,110
55	221,841	474,048	37,555,836	1,610,066	3,261,158
56	219,076	476,813	37,079,023	1 829,142	3,737,972
57	216,294	479,595	36,599,428	2,045,436	4,217,567
58	213,497	482,393	36,117,035	2,258,933	4,699,959
59	210,683	485,206	35,631,829	2,469,616	5,185,166
60	207,852	488,037	35,143,792	2,677,468	5,673,202
61	205,005	490,884	34,652,908	205,005	490,884
62	202,142	493,747	34,159,161	407,147	984,631
63	199,262	496,627	33,662,534	606,409	1,481,258
64	196,365	499,524	33,163,009	802,774	1,980,783
65	193,451	502,438	32,660,571	996,225	2,483,221
66	190,520	505,369	32,155,202	1,186,745	2,988,590
67	187,572	508,317	31,646,884	1,374,317	3,496,908
68	184,607	511,282	31,135,602	1,558,924	4,008,190
69	181,624	514,265	30,621,337	1,740,548	4,522,455
70	178,624	517,265	30,104,073	1,919,173	5,039,720
71	175,607	520,282	29,583,790	2,094,780	5,560,002
72	172,572	523,317	29,060,473	2,267,352	6,083,319
73	169,519	526,370	28,534,104	169,519	526,370
74	166,449	529,440	28,004,663	335,968	1,055,810
75	163,361	532,529	27,472,135	499,329	1,588,339
76	160,254	535,635	26,936,500	659,583	2,123,974
77	157,130	538,760	26,397,740	816,713	2,662,733
78	153,987	541,902	25,855,837	970,699	3,204,636
79	150,826	545,063	25,310,774	1,121,525	3,749,699
80	147,646	548,243	24,762,531	1,269,171	4,297,942
81	144,448	551,441	24,211,090	1,413,619	4,849,383
82	141,231	554,658	23,656,432	1,554,851	5,404,041
83	137,996	557,893	23,098,539	1,692,847	5,961,935
84	134,741	561,148	22,537,391	1,827,588	6,523,082
85	131,468	564,421	21,972,970	131,468	564,421
86	128,176	567,714	21,405,256	259,644	1,132,135
87	124,864	571,025	20,834,231	384,508	1,703,160
88	121,533	574,356	20,259,875	506,041	2,277,516
89	118,183	577,707	19,682,168	624,223	2,855,223
90	114,813	581,077	19,101,092	739,036	3,436,299
91	111,423	584,466	18,516,626	850,459	4,020,765
92	108,014	587,876	17,928,750	958,473	4,608,641
93	104,584	591,305	17,337,445	1,063,057	5,199,946

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
94	101,135	594,754	16,742,691	1,164,192	5,794,700
95	97,666	598,224	16,144,468	1,261,858	6,392,923
96	94,176	601,713	15,542,754	1,356,034	6,994,636
97	90,666	605,223	14,937,531	90,666	605,223
98	87,136	608,754	14,328,778	177,802	1,213,977
99	83,585	612,305	13,716,473	261,386	1,826,281
100	80,013	615,876	13,100,597	341,399	2,442,158
101	76,420	619,469	12,481,128	417,819	3,061,627
102	72,807	623,083	11,858,045	490,626	3,684,710
103	69,172	626,717	11,231,328	559,798	4,311,427
104	65,516	630,373	10,600,955	625,314	4,941,800
105	61,839	634,050	9,966,904	687,153	5,575,850
106	58,140	637,749	9,329,155	745,293	6,213,599
107	54,420	641,469	8,687,686	799,713	6,855,068
108	50,678	645,211	8,042,475	850,391	7,500,279
109	46,914	648,975	7,393,500	46,914	648,975
110	43,129	652,760	6,740,740	90,043	1,301,735
111	39,321	656,568	6,084,172	129,364	1,958,303
112	35,491	660,398	5,423,773	164,855	2,618,702
113	31,639	664,251	4,759,523	196,494	3,282,952
114	27,764	668,125	4,091,398	224,258	3,951,077
115	23,866	672,023	3,419,375	248,124	4,623,100
116	19,946	675,943	2,743,432	268,071	5,299,043
117	16,003	679,886	2,063,546	284,074	5,978,929
118	12,037	683,852	1,379,694	296,111	6,662,781
119	8,048	687,841	691,853	304,160	7,350,622
120	4,036	691,853	0	308,195	8,042,475

Table D-15

AMORTIZATION TABLE

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LOAN THREE LONG TERM CONSTRUCTION

	Rs
Principal:	39,922,200
(Annual) Interest:	16.00%
(Months) Term:	120
Payment:	668,749

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
1	532,296	136,453	39,785,747	532,296	136,453
2	530,477	138,273	39,647,474	1,062,773	274,726
3	528,633	140,116	39,507,358	1,591,406	414,842
4	526,765	141,984	39,365,373	2,118,170	556,827
5	524,872	143,878	39,221,496	2,643,042	700,704
6	522,953	145,796	39,075,700	3,165,995	846,500
7	521,009	147,740	38,927,960	3,687,005	994,240
8	519,039	149,710	38,778,250	4,206,044	1,143,950
9	517,043	151,706	38,626,544	4,723,087	1,295,656
10	515,021	153,729	38,472,816	5,238,108	1,449,384
11	512,971	155,778	38,317,037	5,751,079	1,605,163
12	510,894	157,855	38,159,182	6,261,973	1,763,018
13	508,789	159,960	37,999,222	508,789	159,960
14	506,656	162,093	37,837,129	1,015,445	322,053
15	504,495	164,254	37,672,875	1,519,940	486,307
16	502,305	166,444	37,506,430	2,022,245	652,752
17	500,086	168,663	37,337,767	2,522,331	821,415
18	497,837	170,912	37,166,855	3,020,168	992,327
19	495,558	173,191	36,993,663	3,515,726	1,165,519
20	493,249	175,500	36,818,163	4,008,975	1,341,019
21	490,909	177,840	36,640,323	4,499,884	1,518,859
22	488,538	180,212	36,460,111	4,988,421	1,699,071
23	486,135	182,614	36,277,497	5,474,556	1,881,685
24	483,700	185,049	36,092,447	5,958,256	2,066,735
25	481,233	187,517	35,904,931	481,233	187,517
26	478,732	190,017	35,714,914	959,965	377,533
27	476,199	192,550	35,522,364	1,436,164	570,084
28	473,632	195,118	35,327,246	1,909,795	765,202
29	471,030	197,719	35,129,527	2,380,825	962,921
30	468,394	200,356	34,929,171	2,849,219	1,163,276
31	465,722	203,027	34,726,144	3,314,941	1,366,303
32	463,015	205,734	34,520,410	3,777,957	1,572,037
33	460,272	208,477	34,311,933	4,238,229	1,780,514
34	457,492	211,257	34,100,676	4,695,721	1,991,771
35	454,676	214,074	33,886,603	5,150,397	2,205,845
36	451,821	216,928	33,669,675	5,602,218	2,422,773
37	448,929	219,820	33,449,855	448,929	219,820
38	445,998	222,751	33,227,103	894,927	442,571
39	443,028	225,721	33,001,382	1,337,955	668,293
40	440,018	228,731	32,772,651	1,777,974	897,023

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
41	436,969	231,761	32,540,871	2,214,942	1,128,804
42	433,878	234,871	32,306,000	2,648,820	1,363,675
43	430,747	238,003	32,067,997	3,079,567	1,601,677
44	427,573	241,176	31,826,821	3,507,140	1,842,853
45	424,358	244,392	31,582,430	3,931,498	2,087,245
46	421,099	247,650	31,334,780	4,352,597	2,334,895
47	417,797	[illegible]	31,[illegible],827	4,770,394	2,585,847
48	414,451	254,293	30,[illegible]	5,184,845	2,840,146
49	411,060	257,689	30,[illegible]	411,060	257,689
50	407,625	261,125	30,310,716	818,685	518,814
51	404,143	264,606	30,046,109	1,222,828	783,420
52	400,615	268,134	29,777,975	1,623,443	1,051,554
53	397,040	271,710	29,506,265	2,020,482	1,323,264
54	393,417	275,332	29,230,933	2,413,899	1,598,596
55	389,746	279,003	28,951,929	2,803,645	1,877,600
56	386,026	282,724	28,669,206	3,189,671	2,160,323
57	382,256	286,493	28,382,713	3,571,927	2,446,816
58	378,436	290,313	28,092,400	3,950,363	2,737,129
59	374,565	[illegible]	[illegible]	4,324,928	3,031,313
60	370,643	[illegible]	[illegible]	4,695,571	3,329,420
61	366,668	302,081	[illegible]	366,668	302,081
62	362,640	306,109	26,[illegible]	729,309	608,190
63	358,559	310,190	26,[illegible]	1,087,867	918,380
64	354,423	314,[illegible]	26,267,403	1,442,290	1,232,706
65	350,232	318,[illegible]	25,[illegible]	1,792,523	1,551,224
66	345,[illegible]	[illegible]	25,[illegible]	2,138,508	1,873,988
67	341,682	327,068	25,249,054	2,480,189	2,201,055
68	337,321	331,[illegible]	24,[illegible]	2,817,510	2,532,484
69	332,[illegible]	[illegible]	[illegible]	3,150,412	2,868,331
70	328,424	[illegible]	24,291,455	3,478,835	3,208,657
71	323,886	344,[illegible]	23,946,589	3,802,721	3,553,520
72	319,288	[illegible]	23,[illegible]	4,122,009	3,902,982
73	314,628	354,121	23,243,007	314,628	354,121
74	309,907	358,842	22,884,165	624,535	712,963
75	305,122	363,627	22,520,538	929,657	1,076,590
76	300,[illegible]	[illegible]	22,152,062	1,229,931	1,445,066
77	295,361	373,388	21,778,674	1,525,292	1,818,454
78	[illegible]	[illegible]	21,[illegible]	1,815,674	2,195,821
79	285,[illegible]	383,412	21,016,895	2,101,012	2,580,233
80	280,[illegible]	388,514	20,628,371	2,381,237	2,968,757
81	275,[illegible]	393,[illegible]	20,[illegible],667	2,656,282	3,362,461
82	269,[illegible]	398,954	19,835,713	2,926,078	3,761,415
83	264,476	404,273	19,431,440	3,190,554	4,165,688
84	259,086	409,663	19,021,777	3,449,640	4,575,351
85	253,624	415,126	18,606,651	253,624	415,126
86	248,089	420,661	18,185,991	501,712	835,786
87	242,480	426,269	17,759,721	744,192	1,262,055
88	236,796	431,953	17,327,768	980,989	1,694,008
89	231,037	437,712	16,890,056	1,212,025	2,131,721
90	225,201	443,548	16,446,508	1,437,226	2,575,269
91	219,287	449,462	15,997,045	1,656,513	3,024,732
92	213,294	455,455	15,541,590	1,869,807	3,480,187
93	207,221	461,528	15,080,062	2,077,028	3,941,715

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
94	201,067	467,682	14,612,380	2,278,096	4,409,397
95	194,832	473,918	14,138,462	2,472,927	4,883,314
96	188,513	480,236	13,658,226	2,661,440	5,363,551
97	182,110	486,640	13,171,587	182,110	486,640
98	175,621	493,128	12,678,458	357,731	979,768
99	169,046	499,703	12,178,755	526,777	1,479,471
100	162,383	506,366	11,672,390	689,160	1,985,837
101	155,632	513,117	11,159,272	844,792	2,498,954
102	148,790	519,959	10,639,313	993,583	3,018,913
103	141,858	526,892	10,112,421	1,135,440	3,545,805
104	134,832	533,917	9,578,505	1,270,272	4,079,722
105	127,713	541,036	9,037,469	1,397,986	4,620,757
106	120,500	548,250	8,489,219	1,518,485	5,169,007
107	113,190	555,560	7,933,659	1,631,675	5,724,567
108	105,782	562,967	7,370,692	1,737,457	6,287,534
109	98,276	570,473	6,800,219	98,276	570,473
110	90,670	578,080	6,222,139	188,945	1,148,553
111	82,962	585,787	5,636,352	271,907	1,734,340
112	75,151	593,598	5,042,754	347,059	2,327,938
113	67,237	601,513	4,441,242	414,295	2,929,451
114	59,217	609,533	3,831,709	473,512	3,538,983
115	51,089	617,660	3,214,049	524,601	4,156,643
116	42,854	625,895	2,588,154	567,455	4,782,538
117	34,509	634,241	1,953,913	601,964	5,416,779
118	26,052	642,697	1,311,216	628,016	6,059,476
119	17,483	651,266	659,950	645,499	6,710,742
120	8,799	659,950	0	654,299	7,370,692

Table D-15

AMORTIZATION TABLE
****
PHASE TWO
LOAN FOUR SUPPLIER'S CREDIT

	Rs
Principal:	134,161,300
(Annual) Interest:	15.00%
(Months) Term:	72
Payment:	2,836,842

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
1	1,677,016	1,159,826	133,001,474	1,677,016	1,159,826
2	1,662,518	1,174,324	131,827,150	3,339,535	2,334,150
3	1,647,839	1,189,003	130,638,147	4,987,374	3,523,153
4	1,632,977	1,203,866	129,434,281	6,620,351	4,727,019
5	1,617,929	1,218,914	128,215,367	8,238,279	5,945,933
6	1,602,692	1,234,150	126,981,217	9,840,971	7,180,083
7	1,587,265	1,249,577	125,731,639	11,428,237	8,429,661
8	1,571,645	1,265,197	124,466,442	12,999,882	9,694,858
9	1,555,831	1,281,012	123,185,430	14,555,713	10,975,870
10	1,539,818	1,297,025	121,888,406	16,095,531	12,272,894
11	1,523,605	1,313,237	120,575,168	17,619,136	13,586,132
12	1,507,190	1,329,653	119,245,516	19,126,325	14,915,784
13	1,490,569	1,346,274	117,899,242	1,490,569	1,346,274
14	1,473,741	1,363,102	116,536,140	2,964,309	2,709,375
15	1,456,702	1,380,141	115,155,999	4,421,011	4,089,516
16	1,439,450	1,397,392	113,758,607	5,860,461	5,486,909
17	1,421,983	1,414,860	112,343,747	7,282,444	6,901,769
18	1,404,297	1,432,546	110,911,201	8,686,741	8,334,314
19	1,386,390	1,450,452	109,460,749	10,073,131	9,784,767
20	1,368,259	1,468,583	107,992,166	11,441,390	11,253,350
21	1,349,902	1,486,940	106,505,225	12,791,292	12,740,290
22	1,331,315	1,505,527	104,999,698	14,122,607	14,245,817
23	1,312,496	1,524,346	103,475,352	15,435,104	15,770,164
24	1,293,442	1,543,401	101,931,951	16,728,546	17,313,564
25	1,274,149	1,562,693	100,369,258	1,274,149	1,562,693
26	1,254,616	1,582,227	98,787,031	2,528,765	3,144,920
27	1,234,838	1,602,005	97,185,027	3,763,603	4,746,924
28	1,214,813	1,622,030	95,562,997	4,978,416	6,368,954
29	1,194,537	1,642,305	93,920,692	6,172,953	8,011,259
30	1,174,009	1,662,834	92,257,858	7,346,962	9,674,093
31	1,153,223	1,683,619	90,574,239	8,500,185	11,357,712
32	1,132,178	1,704,664	88,869,575	9,632,363	13,062,377
33	1,110,870	1,725,973	87,143,602	10,743,233	14,788,349
34	1,089,295	1,747,547	85,396,054	11,832,528	16,535,897
35	1,067,451	1,769,392	83,626,663	12,899,979	18,305,289
36	1,045,333	1,791,509	81,835,153	13,945,312	20,096,798
37	1,022,939	1,813,903	80,021,250	1,022,939	1,813,903
38	1,000,266	1,836,577	78,184,674	2,023,205	3,650,480
39	977,308	1,859,534	76,325,139	3,000,513	5,510,014
40	954,064	1,882,778	74,442,361	3,954,578	7,392,792

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
41	930,530	1,906,313	72,536,048	4,885,107	9,299,105
42	906,701	1,930,142	70,605,906	5,791,808	11,229,247
43	882,574	1,954,269	68,651,638	6,674,382	13,183,516
44	858,145	1,978,697	66,672,941	7,532,527	15,162,213
45	833,412	2,003,431	64,669,510	8,365,939	17,165,643
46	808,369	2,028,474	62,641,036	9,174,308	19,194,117
47	783,013	2,053,830	60,587,207	9,957,321	21,247,947
48	757,340	2,079,502	58,507,705	10,714,661	23,327,449
49	731,346	2,105,496	56,402,208	731,346	2,105,496
50	705,028	2,131,815	54,270,393	1,436,374	4,237,311
51	678,380	2,158,463	52,111,931	2,114,754	6,395,774
52	651,399	2,185,443	49,926,488	2,766,153	8,581,217
53	624,081	2,212,761	47,713,726	3,390,234	10,793,978
54	596,422	2,240,421	45,473,305	3,986,656	13,034,399
55	568,416	2,268,426	43,204,879	4,555,072	15,302,825
56	540,061	2,296,781	40,908,098	5,095,133	17,599,607
57	511,351	2,325,491	38,582,606	5,606,484	19,925,098
58	482,283	2,354,560	36,228,046	6,088,767	22,279,658
59	452,851	2,383,992	33,844,055	6,541,617	24,663,650
60	423,051	2,413,792	31,430,263	6,964,668	27,077,442
61	392,878	2,443,964	28,986,299	392,878	2,443,964
62	362,329	2,474,514	26,511,785	755,207	4,918,478
63	331,397	2,505,445	24,006,340	1,086,604	7,423,923
64	300,079	2,536,763	21,469,576	1,386,684	9,960,686
65	268,370	2,568,473	18,901,104	1,655,053	12,529,159
66	236,264	2,600,579	16,300,525	1,891,317	15,129,738
67	203,757	2,633,086	13,667,439	2,095,074	17,762,824
68	170,843	2,665,999	11,001,440	2,265,917	20,428,823
69	137,518	2,699,324	8,302,115	2,403,435	23,128,148
70	103,776	2,733,066	5,569,049	2,507,211	25,861,214
71	69,613	2,767,229	2,801,820	2,576,824	28,628,443
72	35,023	2,801,820	0	2,611,847	31,430,263

Table D-15

AMORTIZATION TABLE
****
PHASE TWO
LOAN FIVE LMM THROUGH DFI

	Rs
Principal:	38,540,325
(Annual) Interest:	7.00%
(Months) Term:	120
Payment:	447,486

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
1	224,819	222,667	38,317,658	224,819	222,667
2	223,520	223,966	38,093,692	448,338	446,633
3	222,213	225,273	37,868,419	670,551	671,906
4	220,899	226,587	37,641,832	891,451	898,493
5	219,577	227,908	37,413,924	1,111,028	1,126,401
6	218,248	229,238	37,184,686	1,329,276	1,355,639
7	216,911	230,575	36,954,110	1,546,186	1,586,215
8	215,566	231,920	36,722,190	1,761,752	1,818,135
9	214,213	233,273	36,488,917	1,975,965	2,051,408
10	212,852	234,634	36,254,283	2,188,817	2,286,042
11	211,483	236,003	36,018,281	2,400,300	2,522,044
12	210,107	237,379	35,780,902	2,610,407	2,759,423
13	208,722	238,764	35,542,138	208,722	238,764
14	207,329	240,157	35,301,981	416,051	478,921
15	205,928	241,558	35,060,423	621,979	720,478
16	204,519	242,967	34,817,457	826,498	963,445
17	203,102	244,384	34,573,073	1,029,600	1,207,829
18	201,676	245,810	34,327,263	1,231,277	1,453,639
19	200,242	247,243	34,080,020	1,431,519	1,700,882
20	198,800	248,686	33,831,334	1,630,319	1,949,568
21	197,349	250,136	33,581,197	1,827,668	2,199,704
22	195,890	251,596	33,329,602	2,023,559	2,451,300
23	194,423	253,063	33,076,539	2,217,981	2,704,363
24	192,946	254,539	32,821,999	2,410,928	2,958,902
25	191,462	256,024	32,565,975	191,462	256,024
26	189,968	257,518	32,308,457	381,430	513,542
27	188,466	259,020	32,049,438	569,896	772,562
28	186,955	260,531	31,788,907	756,851	1,033,093
29	185,435	262,051	31,526,856	942,286	1,295,143
30	183,907	263,579	31,263,277	1,126,193	1,558,722
31	182,369	265,117	30,998,160	1,308,562	1,823,839
32	180,823	266,663	30,731,497	1,489,385	2,090,502
33	179,267	268,219	30,463,278	1,668,652	2,358,721
34	177,702	269,783	30,193,495	1,846,354	2,628,504
35	176,129	271,357	29,922,138	2,022,483	2,899,862
36	174,546	272,940	29,649,198	2,197,029	3,172,802
37	172,954	274,532	29,374,665	172,954	274,532
38	171,352	276,134	29,098,532	344,306	550,666
39	169,741	277,744	28,820,787	514,047	828,410
40	168,121	279,365	28,541,423	682,169	1,107,775

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
41	166,492	280,994	28,260,429	848,660	1,388,769
42	164,853	282,633	27,977,795	1,013,513	1,671,402
43	163,204	284,282	27,693,513	1,176,717	1,955,684
44	161,545	285,940	27,407,573	1,338,262	2,241,625
45	159,878	287,608	27,119,965	1,498,140	2,529,233
46	158,200	289,286	26,830,678	1,656,339	2,818,519
47	156,512	290,974	26,539,705	1,812,852	3,109,493
48	154,815	292,671	26,247,034	1,967,667	3,402,164
49	153,108	294,378	25,952,656	153,108	294,378
50	151,390	296,095	25,656,560	304,498	590,474
51	149,663	297,823	25,358,738	454,161	888,296
52	147,926	299,560	25,059,178	602,087	1,187,856
53	146,179	301,307	24,757,871	748,266	1,489,163
54	144,421	303,065	24,454,806	892,687	1,792,228
55	142,653	304,833	24,149,973	1,035,340	2,097,061
56	140,875	306,611	23,843,362	1,176,215	2,403,672
57	139,086	308,400	23,534,962	1,315,301	2,712,072
58	137,287	310,199	23,224,764	1,452,588	3,022,270
59	135,478	312,008	22,912,756	1,588,066	3,334,278
60	133,658	313,828	22,598,928	1,721,724	3,648,106
61	131,827	315,659	22,283,269	131,827	315,659
62	129,986	317,500	21,965,769	261,813	633,159
63	128,134	319,352	21,646,417	389,946	952,511
64	126,271	321,215	21,325,201	516,217	1,273,726
65	124,397	323,089	21,002,113	640,614	1,596,815
66	122,512	324,974	20,677,139	763,127	1,921,789
67	120,617	326,869	20,350,270	883,743	2,248,658
68	118,710	328,776	20,021,494	1,002,453	2,577,434
69	116,792	330,694	19,690,800	1,119,245	2,908,128
70	114,863	332,623	19,358,177	1,234,108	3,240,750
71	112,923	334,563	19,023,614	1,347,031	3,575,314
72	110,971	336,515	18,687,099	1,458,002	3,911,828
73	109,008	338,478	18,348,622	109,008	338,478
74	107,034	340,452	18,008,169	216,042	678,930
75	105,048	342,438	17,665,731	321,089	1,021,368
76	103,050	344,436	17,321,295	424,139	1,365,804
77	101,041	346,445	16,974,850	525,180	1,712,249
78	99,020	348,466	16,626,385	624,200	2,060,715
79	96,987	350,499	16,275,886	721,188	2,411,213
80	94,943	352,543	15,923,343	816,130	2,763,757
81	92,886	354,600	15,568,743	909,016	3,118,356
82	90,818	356,668	15,212,075	999,834	3,475,024
83	88,737	358,749	14,853,326	1,088,571	3,833,773
84	86,644	360,841	14,492,485	1,175,216	4,194,615
85	84,539	362,946	14,129,538	84,539	362,946
86	82,422	365,064	13,764,475	166,962	728,010
87	80,293	367,193	13,397,282	247,255	1,095,203
88	78,151	369,335	13,027,947	325,405	1,464,538
89	75,996	371,489	12,656,457	401,402	1,836,028
90	73,829	373,657	12,282,801	475,231	2,209,684
91	71,650	375,836	11,906,964	546,881	2,585,520
92	69,457	378,029	11,528,936	616,338	2,963,549
93	67,252	380,234	11,148,702	683,590	3,343,783

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
94	65,034	382,452	10,766,250	748,624	3,726,234
95	62,803	384,683	10,381,568	811,427	4,110,917
96	60,559	386,927	9,994,641	871,987	4,497,844
97	58,302	389,184	9,605,457	58,302	389,184
98	56,032	391,454	9,214,003	114,334	780,638
99	53,748	393,738	8,820,266	168,082	1,174,375
100	51,452	396,034	8,424,231	219,534	1,570,410
101	49,141	398,345	8,025,887	268,675	1,968,754
102	46,818	400,668	7,625,219	315,493	2,369,422
103	44,480	403,005	7,222,213	359,973	2,772,428
104	42,130	405,356	6,816,857	402,103	3,177,784
105	39,765	407,721	6,409,136	441,868	3,585,505
106	37,387	410,099	5,999,037	479,254	3,995,604
107	34,994	412,491	5,586,545	514,249	4,408,096
108	32,588	414,898	5,171,648	546,837	4,822,993
109	30,168	417,318	4,754,330	30,168	417,318
110	27,734	419,752	4,334,578	57,902	837,070
111	25,285	422,201	3,912,377	83,187	1,259,271
112	22,822	424,664	3,487,713	106,009	1,683,935
113	20,345	427,141	3,060,572	126,354	2,111,075
114	17,853	429,633	2,630,940	144,207	2,540,708
115	15,347	432,139	2,198,801	159,554	2,972,847
116	12,826	434,660	1,764,142	172,381	3,407,506
117	10,291	437,195	1,326,947	182,671	3,844,701
118	7,741	439,745	887,201	190,412	4,284,447
119	5,175	442,311	444,891	195,587	4,726,757
120	2,595	444,891	0	198,182	5,171,648

Table D-15

AMORTIZATION TABLE
****
PHASE TWO
LOAN SIX COMMERCIAL LOAN

	Rs
Principal:	34,298,375
(Annual) Interest:	16.00%
(Months) Term:	120
Payment:	574,543

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
1	457,312	117,231	34,181,144	457,312	117,231
2	455,749	118,794	34,062,350	913,060	236,025
3	454,165	120,378	33,941,972	1,367,225	356,403
4	452,560	121,983	33,819,988	1,819,785	478,387
5	450,933	123,610	33,696,379	2,270,718	601,996
6	449,285	125,258	33,571,121	2,720,003	727,254
7	447,615	126,928	33,444,193	3,167,618	854,182
8	445,923	128,620	33,315,573	3,613,540	982,802
9	444,208	130,335	33,185,238	4,057,748	1,113,137
10	442,470	132,073	33,053,165	4,500,218	1,245,210
11	440,709	133,834	32,919,331	4,940,927	1,379,044
12	438,924	135,618	32,783,713	5,379,851	1,514,662
13	437,116	137,427	32,646,286	437,116	137,427
14	435,284	139,259	32,507,027	872,400	276,686
15	433,427	141,116	32,365,911	1,305,827	417,801
16	431,545	142,997	32,222,914	1,737,372	560,799
17	429,639	144,904	32,078,010	2,167,011	705,703
18	427,707	146,836	31,931,174	2,594,718	852,539
19	425,749	148,794	31,782,380	3,020,467	1,001,332
20	423,765	150,778	31,631,603	3,444,232	1,152,110
21	421,755	152,788	31,478,814	3,865,987	1,304,898
22	419,718	154,825	31,323,989	4,285,704	1,459,723
23	417,653	156,890	31,167,100	4,703,358	1,616,613
24	415,561	158,981	31,008,118	5,118,919	1,775,594
25	413,442	161,101	30,847,017	413,442	161,101
26	411,294	163,249	30,683,768	824,735	324,350
27	409,117	165,426	30,518,342	1,233,852	489,776
28	406,911	167,632	30,350,710	1,640,763	657,408
29	404,676	169,867	30,180,844	2,045,439	827,275
30	402,411	172,132	30,008,712	2,447,851	999,406
31	400,116	174,427	29,834,285	2,847,967	1,173,833
32	397,790	176,752	29,657,533	3,245,757	1,350,585
33	395,434	179,109	29,478,424	3,641,191	1,529,694
34	393,046	181,497	29,296,927	4,034,237	1,711,191
35	390,626	183,917	29,113,010	4,424,862	1,895,108
36	388,173	186,369	28,926,641	4,813,036	2,081,478
37	385,689	188,854	28,737,786	385,689	188,854
38	383,170	191,372	28,546,414	768,859	380,227
39	380,619	193,924	28,352,490	1,149,478	574,150
40	378,033	196,510	28,155,981	1,527,511	770,660

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
41	375,413	199,130	27,956,851	1,902,924	969,790
42	372,758	201,785	27,755,066	2,275,682	1,171,575
43	370,068	204,475	27,550,591	2,645,750	1,376,050
44	367,341	207,202	27,343,389	3,013,091	1,583,251
45	364,579	209,964	27,133,425	3,377,669	1,793,216
46	361,779	212,764	26,920,661	3,739,448	2,005,979
47	358,942	215,601	26,705,061	4,098,391	2,221,580
48	356,067	218,475	26,486,585	4,454,458	2,440,055
49	353,154	221,388	26,265,197	353,154	221,388
50	350,203	224,340	26,040,857	703,357	445,728
51	347,211	227,331	25,813,525	1,050,569	673,060
52	344,180	230,362	25,583,163	1,394,749	903,422
53	341,109	233,434	25,349,729	1,735,858	1,136,856
54	337,996	236,546	25,113,183	2,073,854	1,373,403
55	334,842	239,700	24,873,482	2,408,697	1,613,103
56	331,646	242,896	24,630,586	2,740,343	1,855,999
57	328,408	246,135	24,384,451	3,068,751	2,102,134
58	325,126	249,417	24,135,034	3,393,877	2,351,551
59	321,800	252,743	23,882,292	3,715,677	2,604,294
60	318,431	256,112	23,626,180	4,034,108	2,860,406
61	315,016	259,527	23,366,653	315,016	259,527
62	311,555	262,987	23,103,665	626,571	522,514
63	308,049	266,494	22,837,171	934,620	789,008
64	304,496	270,047	22,567,124	1,239,116	1,059,056
65	300,895	273,648	22,293,476	1,540,011	1,332,703
66	297,246	277,296	22,016,180	1,837,257	1,610,000
67	293,549	280,994	21,735,186	2,130,806	1,890,994
68	289,802	284,740	21,450,446	2,420,608	2,175,734
69	286,006	288,537	21,161,909	2,706,614	2,464,271
70	282,159	292,384	20,869,525	2,988,773	2,756,655
71	278,260	296,282	20,573,242	3,267,034	3,052,937
72	274,310	300,233	20,273,010	3,541,343	3,353,170
73	270,307	304,236	19,968,774	270,307	304,236
74	266,250	308,292	19,660,481	536,557	612,528
75	262,140	312,403	19,348,078	798,697	924,931
76	257,974	316,568	19,031,510	1,056,671	1,241,500
77	253,753	320,789	18,710,720	1,310,425	1,562,289
78	249,476	325,067	18,385,654	1,559,901	1,887,356
79	245,142	329,401	18,056,253	1,805,043	2,216,756
80	240,750	333,793	17,722,460	2,045,793	2,550,549
81	236,299	338,243	17,384,217	2,282,093	2,888,793
82	231,790	342,753	17,041,464	2,513,882	3,231,546
83	227,220	347,323	16,694,141	2,741,102	3,578,869
84	222,589	351,954	16,342,186	2,963,690	3,930,823
85	217,896	356,647	15,985,539	217,896	356,647
86	213,141	361,402	15,624,137	431,036	718,049
87	208,322	366,221	15,257,916	639,358	1,084,270
88	203,439	371,104	14,886,812	842,797	1,455,374
89	198,491	376,052	14,510,760	1,041,288	1,831,426
90	193,477	381,066	14,129,694	1,234,765	2,212,492
91	188,396	386,147	13,743,547	1,423,161	2,598,639
92	183,247	391,295	13,352,252	1,606,408	2,989,934
93	178,030	396,513	12,955,739	1,784,438	3,386,447

Month	Interest	Principal	Balance	YTD Interest	YTD Principal
94	172,743	401,800	12,555,940	1,957,181	3,788,247
95	167,386	407,157	12,148,783	2,124,567	4,195,404
96	161,957	412,586	11,734,197	2,286,524	4,607,989
97	156,456	418,087	11,316,110	156,456	418,087
98	150,881	423,661	10,892,449	307,337	841,748
99	145,233	429,310	10,463,139	452,570	1,271,058
100	139,509	435,034	10,028,104	592,079	1,706,093
101	133,708	440,835	9,587,270	725,787	2,146,927
102	127,830	446,713	9,140,557	853,617	2,593,640
103	121,874	452,669	8,687,889	975,491	3,046,308
104	115,839	458,704	8,229,184	1,091,330	3,505,013
105	109,722	464,820	7,764,364	1,201,052	3,969,833
106	103,525	471,018	7,293,346	1,304,577	4,440,851
107	97,245	477,298	6,816,048	1,401,821	4,918,149
108	90,881	483,662	6,332,386	1,492,702	5,401,811
109	84,432	490,111	5,842,275	84,432	490,111
110	77,897	496,646	5,345,629	162,329	986,757
111	71,275	503,268	4,842,361	233,604	1,490,024
112	64,565	509,978	4,332,383	298,169	2,000,002
113	57,765	516,778	3,815,606	355,934	2,516,780
114	50,875	523,668	3,291,937	406,809	3,040,448
115	43,892	530,650	2,761,287	450,701	3,571,098
116	36,817	537,726	2,223,562	487,518	4,108,824
117	29,647	544,895	1,678,666	517,166	4,653,719
118	22,382	552,161	1,126,506	539,548	5,205,880
119	15,020	559,523	566,983	554,568	5,765,403
120	7,560	566,983	(0)	562,128	6,332,386

Table D-16

DEPRECIATION SCHEDULE
****

STRAIGHT LINE VEHICLES PHASE ONE

Cost:	7,312,000
Salvage Value:	0
Life:	5
Expense:	121,867

Period	Expense	Value	Accumulated Depreciation	Year To Date
1	121,867	7,190,133	121,867	121,867
2	121,867	7,068,267	243,733	243,733
3	121,867	6,946,400	365,600	365,600
4	121,867	6,824,533	487,467	487,467
5	121,867	6,702,667	609,333	609,333
6	121,867	6,580,800	731,200	731,200
7	121,867	6,458,933	853,067	853,067
8	121,867	6,337,067	974,933	974,933
9	121,867	6,215,200	1,096,800	1,096,800
10	121,867	6,093,333	1,218,667	1,218,667
11	121,867	5,971,467	1,340,533	1,340,533
12	121,867	5,849,600	1,462,400	1,462,400
13	121,867	5,727,733	1,584,267	121,867
14	121,867	5,605,867	1,706,133	243,733
15	121,867	5,484,000	1,828,000	365,600
16	121,867	5,362,133	1,949,867	487,467
17	121,867	5,240,267	2,071,733	609,333
18	121,867	5,118,400	2,193,600	731,200
19	121,867	4,996,533	2,315,467	853,067
20	121,867	4,874,667	2,437,333	974,933
21	121,867	4,752,800	2,559,200	1,096,800
22	121,867	4,630,933	2,681,067	1,218,667
23	121,867	4,509,067	2,802,933	1,340,533
24	121,867	4,387,200	2,924,800	1,462,400
25	121,867	4,265,333	3,046,667	121,867
26	121,867	4,143,467	3,168,533	243,733
27	121,867	4,021,600	3,290,400	365,600
28	121,867	3,899,733	3,412,267	487,467
29	121,867	3,777,867	3,534,133	609,333
30	121,867	3,656,000	3,656,000	731,200
31	121,867	3,534,133	3,777,867	853,067
32	121,867	3,412,267	3,899,733	974,933

Period	Expense	Value	Accumulated Depreciation	Year To Date
33	121,867	3,290,400	4,021,600	1,096,800
34	121,867	3,168,533	4,143,467	1,218,667
35	121,867	3,046,667	4,265,333	1,340,533
36	121,867	2,924,800	4,387,200	1,462,400
37	121,867	2,802,933	4,509,067	121,867
38	121,867	2,681,067	4,630,933	243,733
39	121,867	2,559,200	4,752,800	365,600
40	121,867	2,437,333	4,874,667	487,467
41	121,867	2,315,467	4,996,533	609,333
42	121,867	2,193,600	5,118,400	731,200
43	121,867	2,071,733	5,240,267	853,067
44	121,867	1,949,867	5,362,133	974,933
45	121,867	1,828,000	5,484,000	1,096,800
46	121,867	1,706,133	5,605,867	1,218,667
47	121,867	1,584,267	5,727,733	1,340,533
48	121,867	1,462,400	5,849,600	1,462,400
49	121,867	1,340,533	5,971,467	121,867
50	121,867	1,218,667	6,093,333	243,[illegible]
51	121,867	1,096,800	6,215,200	[illegible]
52	121,867	974,933	6,337,067	487,467
53	121,867	853,067	6,458,933	609,333
54	121,867	731,200	6,580,800	731,200
55	121,867	609,333	6,702,667	853,067
56	121,867	487,467	6,824,533	974,933
57	121,867	365,600	6,946,400	1,096,800
58	121,867	243,733	7,068,267	1,218,667
59	121,867	121,867	7,190,133	1,340,533
60	121,867	(0)	7,312,000	1,462,400

Table D-16

DEPRECIATION SCHEDULE
****

STRAIGHT LINE VEHICLES PHASE TWO

Cost:	2,500,000
Salvage Value:	0
Life:	5
Expense:	41,667

Period	Expense	Value	Accumulated Depreciation	Year To Date
1	41,667	2,458,333	41,667	41,667
2	41,667	2,416,667	83,333	83,333
3	41,667	2,375,000	125,000	125,000
4	41,667	2,333,333	166,667	166,667
5	41,667	2,291,667	208,333	208,333
6	41,667	2,250,000	250,000	250,000
7	41,667	2,208,333	291,667	291,667
8	41,667	2,166,667	333,333	333,333
9	41,667	2,125,000	375,000	375,000
10	41,667	2,083,333	416,667	416,667
11	41,667	2,041,667	458,333	458,333
12	41,667	2,000,000	500,000	500,000
13	41,667	1,958,333	541,667	41,667
14	41,667	1,916,667	583,333	83,333
15	41,667	1,875,000	625,000	125,000
16	41,667	1,833,333	666,667	166,667
17	41,667	1,791,667	708,333	208,333
18	41,667	1,750,000	750,000	250,000
19	41,667	1,708,333	791,667	291,667
20	41,667	1,666,667	833,333	333,333
21	41,667	1,625,000	875,000	375,000
22	41,667	1,583,333	916,667	416,667
23	41,667	1,541,667	958,333	458,333
24	41,667	1,500,000	1,000,000	500,000
25	41,667	1,458,333	1,041,667	41,667
26	41,667	1,416,667	1,083,333	83,333
27	41,667	1,375,000	1,125,000	125,000
28	41,667	1,333,333	1,166,667	166,667
29	41,667	1,291,667	1,208,333	208,333
30	41,667	1,250,000	1,250,000	250,000
31	41,667	1,208,333	1,291,667	291,667
32	41,667	1,166,667	1,333,333	333,333
33	41,667	1,125,000	1,375,000	375,000
34	41,667	1,083,333	1,416,667	416,667
35	41,667	1,041,667	1,458,333	458,333
36	41,667	1,000,000	1,500,000	500,000

Period	Expense	Value	Accumulated Depreciation	Year To Date
37	41,667	958,333	1,541,667	41,667
38	41,667	916,667	1,583,333	83,333
39	41,667	875,000	1,625,000	125,000
40	41,667	833,333	1,666,667	166,667
41	41,667	791,667	1,708,333	208,333
42	41,667	750,000	1,750,000	250,000
43	41,667	708,333	1,791,667	291,667
44	41,667	666,667	1,833,333	333,333
45	41,667	625,000	1,875,000	375,000
46	41,667	583,333	1,916,667	416,667
47	41,667	541,667	1,958,333	458,333
48	41,667	500,000	2,000,000	500,000
49	41,667	458,333	2,041,667	41,667
50	41,667	416,667	2,083,333	83,333
51	41,667	375,000	2,125,000	125,000
52	41,667	333,333	2,166,667	166,667
53	41,667	291,667	2,208,333	208,333
54	41,667	250,000	2,250,000	250,000
55	41,667	208,333	2,291,667	291,667
56	41,667	166,667	2,333,333	333,333
57	41,667	125,000	2,375,000	375,000
58	41,667	83,333	2,416,667	416,667
59	41,667	41,667	2,458,333	458,333
60	41,667	(0)	2,500,000	500,000

Table D-16

DEPRECIATION SCHEDULE
****

STRAIGHT LINE BUILDINGS PHASE ONE

Cost:	39,922,200
Salvage Value:	0
Life:	10
Expense:	332,685

Period	Expense	Value	Accumulated Depreciation	Year To Date
1	332,685	39,589,515	332,685	332,685
2	332,685	39,256,830	665,370	665,370
3	332,685	38,924,145	998,055	998,055
4	332,685	38,591,460	1,330,740	1,330,740
5	332,685	38,258,775	1,663,425	1,663,425
6	332,685	37,926,090	1,996,110	1,996,110
7	332,685	37,593,405	2,328,795	2,328,795
8	332,685	37,260,720	2,661,480	2,661,480
9	332,685	36,928,035	2,994,165	2,994,165
10	332,685	36,595,350	3,326,850	3,326,850
11	332,685	36,262,665	3,659,535	3,659,535
12	332,685	35,929,980	3,992,220	3,992,220
13	332,685	35,597,295	4,324,905	332,685
14	332,685	35,264,610	4,657,590	665,370
15	332,685	34,931,925	4,990,275	998,055
16	332,685	34,599,240	5,322,960	1,330,740
17	332,685	34,266,555	5,655,645	1,663,425
18	332,685	33,933,870	5,988,330	1,996,110
19	332,685	33,601,185	6,321,015	2,328,795
20	332,685	33,268,500	6,653,700	2,661,480
21	332,685	32,935,815	6,986,385	2,994,165
22	332,685	32,603,130	7,319,070	3,326,850
23	332,685	32,270,445	7,651,755	3,659,535
24	332,685	31,937,760	7,984,440	3,992,220
25	332,685	31,605,075	8,317,125	332,685
26	332,685	31,272,390	8,649,810	665,370
27	332,685	30,939,705	8,982,495	998,055
28	332,685	30,607,020	9,315,180	1,330,740
29	332,685	30,274,335	9,647,865	1,663,425
30	332,685	29,941,650	9,980,550	1,996,110
31	332,685	29,608,965	10,313,235	2,328,795
32	332,685	29,276,280	10,645,920	2,661,480
33	332,685	28,943,595	10,978,605	2,994,165
34	332,685	28,610,910	11,311,290	3,326,850
35	332,685	28,278,225	11,643,975	3,659,535
36	332,685	27,945,540	11,976,660	3,992,220

Period	Expense	Value	Accumulated Depreciation	Year To Date
33	2,612,343	227,273,879	86,207,334	23,511,091
34	2,612,343	224,661,536	88,819,677	26,123,434
35	2,612,343	222,049,193	91,432,020	28,735,778
36	2,612,343	219,436,849	94,044,364	31,348,121
37	2,612,343	216,824,506	96,656,707	2,612,343
38	2,612,343	214,212,162	99,269,051	5,224,687
39	2,612,343	211,599,819	101,881,394	7,837,030
40	2,612,343	208,987,475	104,493,738	10,449,374
41	2,612,343	206,375,132	107,106,081	13,061,717
42	2,612,343	203,762,788	109,718,425	15,674,061
43	2,612,343	201,150,445	112,330,768	18,286,404
44	2,612,343	198,538,102	114,943,111	20,898,748
45	2,612,343	195,925,758	117,555,455	23,511,091
46	2,612,343	193,313,415	120,167,798	26,123,434
47	2,612,343	190,701,071	122,780,142	28,735,778
48	2,612,343	188,088,728	125,392,485	31,348,121
49	2,612,343	185,476,384	128,004,829	2,612,343
50	2,612,343	182,864,041	130,617,172	5,224,687
51	2,612,343	180,251,697	133,229,516	7,837,030
52	2,612,343	177,639,354	135,841,859	10,449,374
53	2,612,343	175,027,011	138,454,202	13,061,717
54	2,612,343	172,414,667	141,066,546	15,674,061
55	2,612,343	169,802,324	143,678,889	18,286,404
56	2,612,343	167,189,980	146,291,233	20,898,748
57	2,612,343	164,577,637	148,903,576	23,511,091
58	2,612,343	161,965,293	151,515,920	26,123,434
59	2,612,343	159,352,950	154,128,263	28,735,778
60	2,612,343	156,740,607	156,740,606	31,348,121
61	2,612,343	154,128,263	159,352,950	2,612,343
62	2,612,343	151,515,920	161,965,293	5,224,687
63	2,612,343	148,903,576	164,577,637	7,837,030
64	2,612,343	146,291,233	167,189,980	10,449,374
65	2,612,343	143,678,889	169,802,324	13,061,717
66	2,612,343	141,066,546	172,414,667	15,674,061
67	2,612,343	138,454,202	175,027,011	18,286,404
68	2,612,343	135,841,859	177,639,354	20,898,748
69	2,612,343	133,229,516	180,251,697	23,511,091
70	2,612,343	130,617,172	182,864,041	26,123,434
71	2,612,343	128,004,829	185,476,384	28,735,778
72	2,612,343	125,392,485	188,088,728	31,348,121
73	2,612,343	122,780,142	190,701,071	2,612,343
74	2,612,343	120,167,798	193,313,415	5,224,687
75	2,612,343	117,555,455	195,925,758	7,837,030
76	2,612,343	114,943,111	198,538,102	10,449,374
77	2,612,343	112,330,768	201,150,445	13,061,717
78	2,612,343	109,718,425	203,762,788	15,674,061
79	2,612,343	107,106,081	206,375,132	18,286,404
80	2,612,343	104,493,738	208,987,475	20,898,748
81	2,612,343	101,881,394	211,599,819	23,511,091
82	2,612,343	99,269,051	214,212,162	26,123,434
83	2,612,343	96,656,707	216,824,506	28,735,778
84	2,612,343	94,044,364	219,436,849	31,348,121
85	2,612,343	91,432,020	222,049,193	2,612,343

Period	Expense	Value	Accumulated Depreciation	Year To Date
86	2,612,343	88,819,677	224,661,536	5,224,687
87	2,612,343	86,207,334	227,273,879	7,837,030
88	2,612,343	83,594,990	229,886,223	10,449,374
89	2,612,343	80,982,647	232,498,566	13,061,717
90	2,612,343	78,370,303	235,110,910	15,674,061
91	2,612,343	75,757,960	237,723,253	18,286,404
92	2,612,343	73,145,616	240,335,597	20,898,748
93	2,612,343	70,533,273	242,947,940	23,511,091
94	2,612,343	67,920,929	245,560,284	26,123,434
95	2,612,343	65,308,586	248,172,627	28,735,778
96	2,612,343	62,696,243	250,784,970	31,348,121
97	2,612,343	60,083,899	253,397,314	2,612,343
98	2,612,343	57,471,556	256,009,657	5,224,687
99	2,612,343	54,859,212	258,622,001	7,837,030
100	2,612,343	52,246,869	261,234,344	10,449,374
101	2,612,343	49,634,525	263,846,688	13,061,717
102	2,612,343	47,022,182	266,459,031	15,674,061
103	2,612,343	44,409,839	269,071,374	18,286,404
104	2,612,343	41,797,495	271,683,718	20,898,748
105	2,612,343	39,185,152	274,296,061	23,511,091
106	2,612,343	36,572,808	276,908,405	26,123,434
107	2,612,343	33,960,465	279,520,748	28,735,778
108	2,612,343	31,348,121	282,133,092	31,348,121
109	2,612,343	28,735,778	284,745,435	2,612,343
110	2,612,343	26,123,434	287,357,779	5,224,687
111	2,612,343	23,511,091	289,970,122	7,837,030
112	2,612,343	20,898,748	292,582,465	10,449,374
113	2,612,343	18,286,404	295,194,809	13,061,717
114	2,612,343	15,674,061	297,807,152	15,674,061
115	2,612,343	13,061,717	300,419,496	18,286,404
116	2,612,343	10,449,374	303,031,839	20,898,748
117	2,612,343	7,837,030	305,644,183	23,511,091
118	2,612,343	5,224,687	308,256,526	26,123,434
119	2,612,343	2,612,343	310,868,870	28,735,778
120	2,612,343	0	313,481,213	31,348,121

Table D-16

DEPRECIATION SCHEDULE
****

STRAIGHT LINE BUILDINGS PHASE TWO

Cost:	3,000,000
Salvage Value:	0
Life:	10
Expense:	25,000

Period	Expense	Value	Accumulated Depreciation	Year To Date
1	25,000	2,975,000	25,000	25,000
2	25,000	2,950,000	50,000	50,000
3	25,000	2,925,000	75,000	75,000
4	25,000	2,900,000	100,000	100,000
5	25,000	2,875,000	125,000	125,000
6	25,000	2,850,000	150,000	150,000
7	25,000	2,825,000	175,000	175,000
8	25,000	2,800,000	200,000	200,000
9	25,000	2,775,000	225,000	225,000
10	25,000	2,750,000	250,000	250,000
11	25,000	2,725,000	275,000	275,000
12	25,000	2,700,000	300,000	300,000
13	25,000	2,675,000	325,000	25,000
14	25,000	2,650,000	350,000	50,000
15	25,000	2,625,000	375,000	75,000
16	25,000	2,600,000	400,000	100,000
17	25,000	2,575,000	425,000	125,000
18	25,000	2,550,000	450,000	150,000
19	25,000	2,525,000	475,000	175,000
20	25,000	2,500,000	500,000	200,000
21	25,000	2,475,000	525,000	225,000
22	25,000	2,450,000	550,000	250,000
23	25,000	2,425,000	575,000	275,000
24	25,000	2,400,000	600,000	300,000
25	25,000	2,375,000	625,000	25,000
26	25,000	2,350,000	650,000	50,000
27	25,000	2,325,000	675,000	75,000
28	25,000	2,300,000	700,000	100,000
29	25,000	2,275,000	725,000	125,000
30	25,000	2,250,000	750,000	150,000
31	25,000	2,225,000	775,000	175,000
32	25,000	2,200,000	800,000	200,000
33	25,000	2,175,000	825,000	225,000
34	25,000	2,150,000	850,000	250,000
35	25,000	2,125,000	875,000	275,000
36	25,000	2,100,000	900,000	300,000

Period	Expense	Value	Accumulated Depreciation	Year To Date
37	25,000	2,075,000	925,000	25,000
38	25,000	2,050,000	950,000	50,000
39	25,000	2,025,000	975,000	75,000
40	25,000	2,000,000	1,000,000	100,000
41	25,000	1,975,000	1,025,000	125,000
42	25,000	1,950,000	1,050,000	150,000
43	25,000	1,925,000	1,075,000	175,000
44	25,000	1,900,000	1,100,000	200,000
45	25,000	1,875,000	1,125,000	225,000
46	25,000	1,850,000	1,150,000	250,000
47	25,000	1,825,000	1,175,000	275,000
48	25,000	1,800,000	1,200,000	300,000
49	25,000	1,775,000	1,225,000	25,000
50	25,000	1,750,000	1,250,000	50,000
51	25,000	1,725,000	1,275,000	75,000
52	25,000	1,700,000	1,300,000	100,000
53	25,000	1,675,000	1,325,000	125,000
54	25,000	1,650,000	1,350,000	150,000
55	25,000	1,625,000	1,375,000	175,000
56	25,000	1,600,000	1,400,000	200,000
57	25,000	1,575,000	1,425,000	225,000
58	25,000	1,550,000	1,450,000	250,000
59	25,000	1,525,000	1,475,000	275,000
60	25,000	1,500,000	1,500,000	300,000
61	25,000	1,475,000	1,525,000	25,000
62	25,000	1,450,000	1,550,000	50,000
63	25,000	1,425,000	1,575,000	75,000
64	25,000	1,400,000	1,600,000	100,000
65	25,000	1,375,000	1,625,000	125,000
66	25,000	1,350,000	1,650,000	150,000
67	25,000	1,325,000	1,675,000	175,000
68	25,000	1,300,000	1,700,000	200,000
69	25,000	1,275,000	1,725,000	225,000
70	25,000	1,250,000	1,750,000	250,000
71	25,000	1,225,000	1,775,000	275,000
72	25,000	1,200,000	1,800,000	300,000
73	25,000	1,175,000	1,825,000	25,000
74	25,000	1,150,000	1,850,000	50,000
75	25,000	1,125,000	1,875,000	75,000
76	25,000	1,100,000	1,900,000	100,000
77	25,000	1,075,000	1,925,000	125,000
78	25,000	1,050,000	1,950,000	150,000
79	25,000	1,025,000	1,975,000	175,000
80	25,000	1,000,000	2,000,000	200,000
81	25,000	975,000	2,025,000	225,000
82	25,000	950,000	2,050,000	250,000
83	25,000	925,000	2,075,000	275,000
84	25,000	900,000	2,100,000	300,000
85	25,000	875,000	2,125,000	25,000
86	25,000	850,000	2,150,000	50,000
87	25,000	825,000	2,175,000	75,000
88	25,000	800,000	2,200,000	100,000
89	25,000	775,000	2,225,000	125,000

Period	Expense	Value	Accumulated Depreciation	Year To Date
90	25,000	750,000	2,250,000	150,000
91	25,000	725,000	2,275,000	175,000
92	25,000	700,000	2,300,000	200,000
93	25,000	675,000	2,325,000	225,000
94	25,000	650,000	2,350,000	250,000
95	25,000	625,000	2,375,000	275,000
96	25,000	600,000	2,400,000	300,000
97	25,000	575,000	2,425,000	25,000
98	25,000	550,000	2,450,000	50,000
99	25,000	525,000	2,475,000	75,000
100	25,000	500,000	2,500,000	100,000
101	25,000	475,000	2,525,000	125,000
102	25,000	450,000	2,550,000	150,000
103	25,000	425,000	2,575,000	175,000
104	25,000	400,000	2,600,000	200,000
105	25,000	375,000	2,625,000	225,000
106	25,000	350,000	2,650,000	250,000
107	25,000	325,000	2,675,000	275,000
108	25,000	300,000	2,700,000	300,000
109	25,000	275,000	2,725,000	25,000
110	25,000	250,000	2,750,000	50,000
111	25,000	225,000	2,775,000	75,000
112	25,000	200,000	2,800,000	100,000
113	25,000	175,000	2,825,000	125,000
114	25,000	150,000	2,850,000	150,000
115	25,000	125,000	2,875,000	175,000
116	25,000	100,000	2,900,000	200,000
117	25,000	75,000	2,925,000	225,000
118	25,000	50,000	2,950,000	250,000
119	25,000	25,000	2,975,000	275,000
120	25,000	0	3,000,000	300,000

Table D-16

DEPRECIATION SCHEDULE
****

STRAIGHT LINE EQUIPMENT PHASE ONE

Cost:	313,481,213
Salvage Value:	0
Life:	10
Expense:	2,612,343

Period	Expense	Value	Accumulated Depreciation	Year To Date
1	2,612,343	310,868,870	2,612,343	2,612,343
2	2,612,343	308,256,526	5,224,687	5,224,687
3	2,612,343	305,644,183	7,837,030	7,837,030
4	2,612,343	303,031,839	10,449,374	10,449,374
5	2,612,343	300,419,496	13,061,717	13,061,717
6	2,612,343	297,807,152	15,674,061	15,674,061
7	2,612,343	295,194,809	18,286,404	18,286,404
8	2,612,343	292,582,465	20,898,748	20,898,748
9	2,612,343	289,970,122	23,511,091	23,511,091
10	2,612,343	287,357,779	26,123,434	26,123,434
11	2,612,343	284,745,435	28,735,778	28,735,778
12	2,612,343	282,133,092	31,348,121	31,348,121
13	2,612,343	279,520,748	33,960,465	2,612,343
14	2,612,343	276,908,405	36,572,808	5,224,687
15	2,612,343	274,296,061	39,185,152	7,837,030
16	2,612,343	271,683,718	41,797,495	10,449,374
17	2,612,343	269,071,374	44,409,839	13,061,717
18	2,612,343	266,459,031	47,022,182	15,674,061
19	2,612,343	263,846,688	49,634,525	18,286,404
20	2,612,343	261,234,344	52,246,869	20,898,748
21	2,612,343	258,622,001	54,859,212	23,511,091
22	2,612,343	256,009,657	57,471,556	26,123,434
23	2,612,343	253,397,314	60,083,899	28,735,778
24	2,612,343	250,784,970	62,696,243	31,348,121
25	2,612,343	248,172,627	65,308,586	2,612,343
26	2,612,343	245,560,284	67,920,929	5,224,687
27	2,612,343	242,947,940	70,533,273	7,837,030
28	2,612,343	240,335,597	73,145,616	10,449,374
29	2,612,343	237,723,253	75,757,960	13,061,717
30	2,612,343	235,110,910	78,370,303	15,674,061
31	2,612,343	232,498,566	80,982,647	18,286,404
32	2,612,343	229,886,223	83,594,990	20,898,748
33	2,612,343	227,273,879	86,207,334	23,511,091
34	2,612,343	224,661,536	88,819,677	26,123,434
35	2,612,343	222,049,193	91,432,020	28,735,778
36	2,612,343	219,436,849	94,044,364	31,348,121

Period	Expense	Value	Accumulated Depreciation	Year To Date
37	2,612,343	216,824,506	96,656,707	2,612,343
38	2,612,343	214,212,162	99,269,051	5,224,687
39	2,612,343	211,599,819	101,881,394	7,837,030
40	2,612,343	208,987,475	104,493,738	10,449,374
41	2,612,343	206,375,132	107,106,081	13,061,717
42	2,612,343	203,762,788	109,718,425	15,674,061
43	2,612,343	201,150,445	112,330,768	18,286,404
44	2,612,343	198,538,102	114,943,111	20,898,748
45	2,612,343	195,925,758	117,555,455	23,511,091
46	2,612,343	193,313,415	120,167,798	26,123,434
47	2,612,343	190,701,071	122,780,142	28,735,778
48	2,612,343	188,088,728	125,392,485	31,348,121
49	2,612,343	185,476,384	128,004,829	2,612,343
50	2,612,343	182,864,041	130,617,172	5,224,687
51	2,612,343	180,251,697	133,229,516	7,837,030
52	2,612,343	177,639,354	135,841,859	10,449,374
53	2,612,343	175,027,011	138,454,202	13,061,717
54	2,612,343	172,414,667	141,066,546	15,674,061
55	2,612,343	169,802,324	143,678,889	18,286,404
56	2,612,343	167,189,980	146,291,233	20,898,748
57	2,612,343	164,577,637	148,903,576	23,511,091
58	2,612,343	161,965,293	151,515,920	26,123,434
59	2,612,343	159,352,950	154,128,263	28,735,778
60	2,612,343	156,740,607	156,740,606	31,348,121
61	2,612,343	154,128,263	159,352,950	2,612,343
62	2,612,343	151,515,920	161,965,293	5,224,687
63	2,612,343	148,903,576	164,577,637	7,837,030
64	2,612,343	146,291,233	167,189,980	10,449,374
65	2,612,343	143,678,889	169,802,324	13,061,717
66	2,612,343	141,066,546	172,414,667	15,674,061
67	2,612,343	138,454,202	175,027,011	18,286,404
68	2,612,343	135,841,859	177,639,354	20,898,748
69	2,612,343	133,229,516	180,251,697	23,511,091
70	2,612,343	130,617,172	182,864,041	26,123,434
71	2,612,343	128,004,829	185,476,384	28,735,778
72	2,612,343	125,392,485	188,088,728	31,348,121
73	2,612,343	122,780,142	190,701,071	2,612,343
74	2,612,343	120,167,798	193,313,415	5,224,687
75	2,612,343	117,555,455	195,925,758	7,837,030
76	2,612,343	114,943,111	198,538,102	10,449,374
77	2,612,343	112,330,768	201,150,445	13,061,717
78	2,612,343	109,718,425	203,762,788	15,674,061
79	2,612,343	107,106,081	206,375,132	18,286,404
80	2,612,343	104,493,738	208,987,475	20,898,748
81	2,612,343	101,881,394	211,599,819	23,511,091
82	2,612,343	99,269,051	214,212,162	26,123,434
83	2,612,343	96,656,707	216,824,506	28,735,778
84	2,612,343	94,044,364	219,436,849	31,348,121
85	2,612,343	91,432,020	222,049,193	2,612,343
86	2,612,343	88,819,677	224,661,536	5,224,687
87	2,612,343	86,207,334	227,273,879	7,837,030
88	2,612,343	83,594,990	229,886,223	10,449,374
89	2,612,343	80,982,647	232,498,566	13,061,717

Period	Expense	Value	Accumulated Depreciation	Year To Date
90	2,612,343	78,370,303	235,110,910	15,674,061
91	2,612,343	75,757,960	237,723,253	18,286,404
92	2,612,343	73,145,616	240,335,597	20,898,748
93	2,612,343	70,533,273	242,947,940	23,511,091
94	2,612,343	67,920,929	245,560,284	26,123,434
95	2,612,343	65,308,586	248,172,627	28,735,778
96	2,612,343	62,696,243	250,784,970	31,348,121
97	2,612,343	60,083,899	253,397,314	2,612,343
98	2,612,343	57,471,556	256,009,657	5,224,687
99	2,612,343	54,859,212	258,622,001	7,837,030
100	2,612,343	52,246,869	261,234,344	10,449,374
101	2,612,343	49,634,525	263,846,688	13,061,717
102	2,612,343	47,022,182	266,459,031	15,674,061
103	2,612,343	44,409,839	269,071,374	18,286,404
104	2,612,343	41,797,495	271,683,718	20,898,748
105	2,612,343	39,185,152	274,296,061	23,511,091
106	2,612,343	36,572,808	276,908,405	26,123,434
107	2,612,343	33,960,465	279,520,748	28,735,778
108	2,612,343	31,348,121	282,133,092	31,348,121
109	2,612,343	28,735,778	284,745,435	2,612,343
110	2,612,343	26,123,434	287,357,779	5,224,687
111	2,612,343	23,511,091	289,970,122	7,837,030
112	2,612,343	20,898,748	292,582,465	10,449,374
113	2,612,343	18,286,404	295,194,809	13,061,717
114	2,612,343	15,674,061	297,807,152	15,674,061
115	2,612,343	13,061,717	300,419,496	18,286,404
116	2,612,343	10,449,374	303,031,839	20,898,748
117	2,612,343	7,837,030	305,644,183	23,511,091
118	2,612,343	5,224,687	308,256,526	26,123,434
119	2,612,343	2,612,343	310,868,870	28,735,778
120	2,612,343	0	313,481,213	31,348,121

Table D-16

DEPRECIATION SCHEDULE
****

STRAIGHT LINE EQUIPMENT PHASE TWO

Cost:	196,179,853
Salvage Value:	0
Life:	10
Expense:	1,634,832

Period	Expense	Value	Accumulated Depreciation	Year To Date
1	1,634,832	194,545,021	1,634,832	1,634,832
2	1,634,832	192,910,189	3,269,664	3,269,664
3	1,634,832	191,275,357	4,904,496	4,904,496
4	1,634,832	189,640,525	6,539,328	6,539,328
5	1,634,832	188,005,692	8,174,161	8,174,161
6	1,634,832	186,370,860	9,808,993	9,808,993
7	1,634,832	184,736,028	11,443,825	11,443,825
8	1,634,832	183,101,196	13,078,657	13,078,657
9	1,634,832	181,466,364	14,713,489	14,713,489
10	1,634,832	179,831,532	16,348,321	16,348,321
11	1,634,832	178,196,700	17,983,153	17,983,153
12	1,634,832	176,561,868	19,617,985	19,617,985
13	1,634,832	174,927,036	21,252,817	1,634,832
14	1,634,832	173,292,203	22,887,650	3,269,664
15	1,634,832	171,657,371	24,522,482	4,904,496
16	1,634,832	170,022,539	26,157,314	6,539,328
17	1,634,832	168,387,707	27,792,146	8,174,161
18	1,634,832	166,752,875	29,426,978	9,808,993
19	1,634,832	165,118,043	31,061,810	11,443,825
20	1,634,832	163,483,211	32,696,642	13,078,657
21	1,634,832	161,848,379	34,331,474	14,713,489
22	1,634,832	160,213,547	35,966,306	16,348,321
23	1,634,832	158,578,715	37,601,138	17,983,153
24	1,634,832	156,943,882	39,235,971	19,617,985
25	1,634,832	155,309,050	40,870,803	1,634,832
26	1,634,832	153,674,218	42,505,635	3,269,664
27	1,634,832	152,039,386	44,140,467	4,904,496
28	1,634,832	150,404,554	45,775,299	6,539,328
29	1,634,832	148,769,722	47,410,131	8,174,161
30	1,634,832	147,134,890	49,044,963	9,808,993
31	1,634,832	145,500,058	50,679,795	11,443,825
32	1,634,832	143,865,226	52,314,627	13,078,657
33	1,634,832	142,230,393	53,949,460	14,713,489
34	1,634,832	140,595,561	55,584,292	16,348,321
35	1,634,832	138,960,729	57,219,124	17,983,153
36	1,634,832	137,325,897	58,853,956	19,617,985

Period	Expense	Value	Accumulated Depreciation	Year To Date
37	1,634,832	135,691,065	60,488,788	1,634,832
38	1,634,832	134,056,233	62,123,620	3,269,664
39	1,634,832	132,421,401	63,758,452	4,904,496
40	1,634,832	130,786,569	65,393,284	6,539,328
41	1,634,832	129,151,737	67,028,116	8,174,161
42	1,634,832	127,516,904	68,662,949	9,808,993
43	1,634,832	125,882,072	70,297,781	11,443,825
44	1,634,832	124,247,240	71,932,613	13,078,657
45	1,634,832	122,612,408	73,567,445	14,713,489
46	1,634,832	120,977,576	75,202,277	16,348,321
47	1,634,832	119,342,744	76,837,109	17,983,153
48	1,634,832	117,707,912	78,471,941	19,617,985
49	1,634,832	116,073,080	80,106,773	1,634,832
50	1,634,832	114,438,248	81,741,605	3,269,664
51	1,634,832	112,803,415	83,376,438	4,904,496
52	1,634,832	111,168,583	85,011,270	6,539,328
53	1,634,832	109,533,751	86,646,102	8,174,161
54	1,634,832	107,898,919	88,280,934	9,808,993
55	1,634,832	106,264,087	89,915,766	11,443,825
56	1,634,832	104,629,255	91,550,598	13,078,657
57	1,634,832	102,994,423	93,185,430	14,713,489
58	1,634,832	101,359,591	94,820,262	16,348,321
59	1,634,832	99,724,759	96,455,094	17,983,153
60	1,634,832	98,089,927	98,089,927	19,617,985
61	1,634,832	96,455,094	99,724,759	1,634,832
62	1,634,832	94,820,262	101,359,591	3,269,664
63	1,634,832	93,185,430	102,994,423	4,904,496
64	1,634,832	91,550,598	104,629,255	6,539,328
65	1,634,832	89,915,766	106,264,087	8,174,161
66	1,634,832	88,280,934	107,898,919	9,808,993
67	1,634,832	86,646,102	109,533,751	11,443,825
68	1,634,832	85,011,270	111,168,583	13,078,657
69	1,634,832	83,376,438	112,803,415	14,713,489
70	1,634,832	81,741,605	114,438,248	16,348,321
71	1,634,832	80,106,773	116,073,080	17,983,153
72	1,634,832	78,471,941	117,707,912	19,617,985
73	1,634,832	76,837,109	119,342,744	1,634,832
74	1,634,832	75,202,277	120,977,576	3,269,664
75	1,634,832	73,567,445	122,612,408	4,904,496
76	1,634,832	71,932,613	124,247,240	6,539,328
77	1,634,832	70,297,781	125,882,072	8,174,161
78	1,634,832	68,662,949	127,516,904	9,808,993
79	1,634,832	67,028,116	129,151,737	11,443,825
80	1,634,832	65,393,284	130,786,569	13,078,657
81	1,634,832	63,758,452	132,421,401	14,713,489
82	1,634,832	62,123,620	134,056,233	16,348,321
83	1,634,832	60,488,788	135,691,065	17,983,153
84	1,634,832	58,853,956	137,325,897	19,617,985
85	1,634,832	57,219,124	138,960,729	1,634,832
86	1,634,832	55,584,292	140,595,561	3,269,664
87	1,634,832	53,949,460	142,230,393	4,904,496
88	1,634,832	52,314,627	143,865,226	6,539,328
89	1,634,832	50,679,795	145,500,058	8,174,161

Period	Expense	Value	Accumulated Depreciation	Year To Date
90	1,634,832	49,044,963	147,134,890	9,808,993
91	1,634,832	47,410,131	148,769,722	11,443,825
92	1,634,832	45,775,299	150,404,554	13,078,657
93	1,634,832	44,140,467	152,039,386	14,713,489
94	1,634,832	42,505,635	153,674,218	16,348,321
95	1,634,832	40,870,803	155,309,050	17,983,153
96	1,634,832	39,235,971	156,943,882	19,617,985
97	1,634,832	37,601,138	158,578,715	1,634,832
98	1,634,832	35,966,306	160,213,547	3,269,664
99	1,634,832	34,331,474	161,848,379	4,904,496
100	1,634,832	32,696,642	163,483,211	6,539,328
101	1,634,832	31,061,810	165,118,043	8,174,161
102	1,634,832	29,426,978	166,752,875	9,808,993
103	1,634,832	27,792,146	168,387,707	11,443,825
104	1,634,832	26,157,314	170,022,539	13,078,657
105	1,634,832	24,522,482	171,657,371	14,713,489
106	1,634,832	22,887,650	173,292,203	16,348,321
107	1,634,832	21,252,817	174,927,036	17,983,153
108	1,634,832	19,617,985	176,561,868	19,617,985
109	1,634,832	17,983,153	178,196,700	1,634,832
110	1,634,832	16,348,321	179,831,532	3,269,664
111	1,634,832	14,713,489	181,466,364	4,904,496
112	1,634,832	13,078,657	183,101,196	6,539,328
113	1,634,832	11,443,825	184,736,028	8,174,161
114	1,634,832	9,808,993	186,370,860	9,808,993
115	1,634,832	8,174,161	188,005,692	11,443,825
116	1,634,832	6,539,328	189,640,525	13,078,657
117	1,634,832	4,904,496	191,275,357	14,713,489
118	1,634,832	3,269,664	192,910,189	16,348,321
119	1,634,832	1,634,832	194,545,021	17,983,153
120	1,634,832	0	196,179,853	19,617,985

Table D-17

AUXILIARY INPUTS

	COST PER TON Rs	LOSSES / DAY (TONS)	DAILY TONS (CAKE)	DAYS	Rs / DAY	Rs / YEAR
A. HEXANE	25,000					
YEAR 1						
COTTONSEED		0.469	187.50	210	11,719	2,460,938
SUNFLOWER		0.450	180.00	60	11,250	675,000
TOTAL YEAR 1						3,135,938
YEAR 2	26,250					
COTTONSEED		195 0.500	200.00	220	13,125	2,887,500
SUNFLOWER		0.488	195.00	70	12,797	895,781
TOTAL YEAR 2						3,783,281
YEAR 3	27,563					
COTTONSEED		0.563	225.00	220	15,504	3,410,859
SUNFLOWER		0.525	210.00	80	14,470	1,157,625
TOTAL YEAR 3						4,568,484
YEAR 4	28,941					
COTTONSEED		0.594	237.50	220	17,183	3,780,369
SUNFLOWER		0.563	225.00	90	16,279	1,465,119
TOTAL YEAR 4						5,245,488
YEAR 5	30,388					
COTTONSEED		0.594	237.50	220	18,043	3,969,388
SUNFLOWER		0.600	240.00	100	18,233	1,823,259
TOTAL YEAR 5						5,792,647
YEAR 6	30,388					
COTTONSEED		0.594	237.50	210	18,043	3,788,961
SUNFLOWER		0.675	270.00	120	20,512	2,461,400
TOTAL YEAR 6						6,250,361

Table D-17

GM

	COST PER TON Rs	USE PER DAY (TONS)	DAILY (TONS)	DAYS	Rs / DAY	Rs / YEAR
B. CAUSTIC SODA	9,000					
YEAR 1						
COTTON OIL		0.330	75	210	2,970	623,700
SUNFLOWER OIL		0.515	117	60	4,633	277,992
TOTAL YEAR 1						901,692
YEAR 2	9,450					
COTTON OIL		0.352	80	220	3,326	731,808
SUNFLOWER OIL		0.559	127	70	5,281	369,646
TOTAL YEAR 2						1,101,454
YEAR 3	9,923					
COTTON OIL		0.396	90	220	3,929	864,448
SUNFLOWER OIL		0.603	137	80	5,981	478,503
TOTAL YEAR 3						1,342,951
YEAR 4	10,419					
COTTON OIL		0.418	95	220	4,355	958,097
SUNFLOWER OIL		0.642	146	90	6,693	602,363
TOTAL YEAR 4						1,560,460
YEAR 5	10,940					
COTTON OIL		0.418	95	220	4,573	1,006,002
SUNFLOWER OIL		0.686	156	100	7,509	750,891
TOTAL YEAR 5						1,756,893
YEAR 6	10,940					
COTTON OIL		0.418	95	210	4,573	960,274
SUNFLOWER OIL		0.774	176	120	8,472	1,016,591
TOTAL YEAR 6						1,976,865

TABLE D-17

GM

	COST PER TON Rs	INPUT / DAY (TONS)	DAILY (TONS)	DAYS	Rs / DAY	Rs / YEAR
C. BLEACHING EARTH	7,166					
YEAR 4	7,525	150.00	3.00	310	22,574	6,997,843
YEAR 5	7,901	170.00	3.40	320	26,863	8,596,060
YEAR 6	7,901	190.00	3.80	330	30,023	9,907,591

TABLE D-17

GM

	COST PER TON Rs	INPUT / DAY (TONS)	DAILY BOTTLES	TONS / DAY	DAYS	Rs / DAY	Rs / YEAR
D. PLASTIC (P.E.T)	71,663						
YEAR 4	75,246	150.00	50,000	5.25	310	395,040	122,462,255
YEAR 5	79,008	170.00	56,667	5.95	320	470,097	150,431,054
YEAR 6	79,008	190.00	63,333	6.65	330	525,403	173,382,850

TABLE D-17

	COST / CUBIC METER Rs	STEAM (TONS / DAY)	GAS (CUBIC METER / DAY)	DAYS	Rs / DAY	Rs / YEAR
E. NATURAL GAS (STEAM)	0.7060					
YEAR 1						
COTTON OIL		128	10,090	210	7,124	1,495,979
SUNFLOWER OIL		222	17,500	60	12,355	741,311
TOTAL YEAR 1						2,237,290
YEAR 2	0.7413					
COTTON OIL		136	10,721	220	7,947	1,748,425
SUNFLOWER OIL		240	18,919	70	14,025	981,736
TOTAL YEAR 2						2,730,162
YEAR 3	0.7784					
COTTON OIL		154	12,140	220	9,449	2,078,826
SUNFLOWER OIL		260	20,496	80	15,953	1,276,257
TOTAL YEAR 3						3,355,083
YEAR 4	0.8173					
COTTON OIL		207	16,318	220	13,336	2,933,980
SUNFLOWER OIL		323	25,462	90	20,810	1,872,877
TOTAL YEAR 4						4,806,857
YEAR 5	0.8581					
COTTON OIL		213	16,791	220	14,409	3,169,974
SUNFLOWER OIL		347	27,354	100	23,474	2,347,377
TOTAL YEAR 5						5,517,351
YEAR 6	0.8581					
COTTON OIL		219	17,264	210	14,815	3,111,121
SUNFLOWER OIL		391	30,823	120	26,450	3,174,033
TOTAL YEAR 6						6,285,153

TABLE D-17

	COST Rs / KWH	KWH / HR	KWH / DAY	Rs / DAY	DAYS	RS / YEAR
F. NATURAL GAS (ELECTRICITY)	0.5700					
YEAR 1						
COTTON OIL		2,397	57,528	32,791	210	6,886,102
SUNFLOWER OIL		1,968	47,232	26,922	60	1,615,334
TOTAL YEAR 1					270	8,501,436
YEAR 2	0.5985					
COTTON OIL		2,557	61,368	36,729	220	8,080,325
SUNFLOWER OIL		2,131	51,144	30,610	70	2,142,678
TOTAL YEAR 2						10,223,002
YEAR 3	0.6284					
COTTON OIL		2,877	69,048	43,391	220	9,546,128
SUNFLOWER OIL		2,296	55,104	34,629	80	2,770,298
TOTAL YEAR 3						12,316,426
YEAR 4	0.6598					
COTTON OIL		3,307	79,368	52,371	220	11,521,549
SUNFLOWER OIL		2,902	69,648	45,957	90	4,136,127
FR COTTON		230	5,520	3,642	220	801,317
FR SUN		37	888	586	90	52,735
TOTAL YEAR 4						16,511,729
YEAR 5	0.6928					
COTTON OIL		3,307	79,368	54,989	220	12,097,626
SUNFLOWER OIL		3,117	74,808	51,830	100	5,182,987
FR COTTON		297	7,128	4,939	220	1,086,482
FR SUN		73	1,752	1,214	100	121,385
TOTAL YEAR 5						18,488,480
YEAR 6	0.6928					
COTTON OIL		3,307	79,368	54,989	210	11,547,734
SUNFLOWER OIL		3,509	84,216	58,348	120	7,001,771
FR COTTON		363	8,712	6,036	210	1,267,562
FR SUN		77	1,848	1,280	120	153,644
TOTAL YEAR 6						19,970,711

TABLE D-18

STAFFING REQUIREMENTS

Managerial and Administrative Personnel

Designation	Number	Base Salary	Year 1 Cost/Month	Year 1 Annual Cost	Number	Base Salary	Year 2 Monthly	Year 2 Annual	Number	Base Salary	Year 3 Monthly	Year 3 Annual
Chief Executive	1	100,000	100,000	1,200,000	1	105,000	105,000	1,260,000	1	110,250	110,250	1,323,000
Factory Manager	1	80,000	80,000	960,000	1	84,000	84,000	1,008,000	1	88,200	88,200	1,058,400
General Manager Finance	1	80,000	80,000	960,000	1	84,000	84,000	1,008,000	1	88,200	88,200	1,058,400
Assistant Finance Manager	1	60,000	60,000	720,000	1	63,000	63,000	756,000	1	66,150	66,150	793,800
Personnel Manager	1	60,000	60,000	720,000	1	63,000	63,000	756,000	1	66,150	66,150	793,800
Assistant Personnel Manager	1	40,000	40,000	480,000	1	42,000	42,000	504,000	1	44,100	44,100	529,200
Purchase Officer	1	16,500	16,500	198,000	1	17,325	17,325	207,900	1	18,191	18,191	218,295
Account Officer	1	25,000	25,000	300,000	1	26,250	26,250	315,000	1	27,563	27,563	330,750
Administrative Manager	1	50,000	50,000	600,000	1	52,500	52,500	630,000	1	55,125	55,125	661,500
Account Assistants	6	8,000	48,000	576,000	6	8,400	50,400	604,800	6	8,820	52,920	635,040
Store Assistants	5	5,000	25,000	300,000	5	5,250	26,250	315,000	5	5,513	27,563	330,750
Security Officer	1	15,000	15,000	180,000	1	15,750	15,750	189,000	1	16,538	16,538	198,450
Typists	4	6,000	24,000	288,000	4	6,300	25,200	302,400	4	6,615	26,460	317,520
Security Staff	25	3,000	75,000	900,000	25	3,150	78,750	945,000	25	3,308	82,688	992,250
Drivers	5	5,000	25,000	300,000	5	5,250	26,250	315,000	5	5,513	27,563	330,750
Cooks	2	3,000	6,000	72,000	2	3,150	6,300	75,600	2	3,308	6,615	79,380
Peons	10	2,000	20,000	240,000	10	2,100	21,000	252,000	10	2,205	22,050	264,600
Sweepers	2	2,000	4,000	48,000	2	2,100	4,200	50,400	2	2,205	4,410	52,920
Total Personnel	69		753,500	9,042,000			791,175	9,494,100			830,734	9,968,805
Fringe Benefit @ 50 %			376,750	4,521,000			395,588	4,747,050			415,367	4,984,403
Total			1,130,250	13,563,000			1,186,763	14,241,150			1,246,101	14,953,208

TABLE D-18

Designation	Number	Base Salary	Year 4 Monthly	Year 4 Annual	Number	Base Salary	Year 5 Monthly	Year 5 Annual	Number	Base Salary	Year 6 Monthly	Year 6 Annual
Chief Executive	1	121,275	121,275	1,455,300	1	133,403	133,403	1,600,830	1	146,743	146,743	1,760,913
Factory Manager	1	97,020	97,020	1,164,240	1	106,722	106,722	1,280,664	1	117,394	117,394	1,408,730
General Manager Finance	1	97,020	97,020	1,164,240	1	106,722	106,722	1,280,664	1	117,394	117,394	1,408,730
Assistant Finance Manager	1	72,765	72,765	873,180	1	80,042	80,042	960,498	1	88,046	88,046	1,056,548
Personnel Manager	1	72,765	72,765	873,180	1	80,042	80,042	960,498	1	88,046	88,046	1,056,548
Assistant Personnel Manager	1	48,510	48,510	582,120	1	53,361	53,361	640,332	1	58,697	58,697	704,365
Purchase Officer	1	20,010	20,010	240,125	1	22,011	22,011	264,137	1	24,213	24,213	290,551
Account Officer	1	30,319	30,319	363,825	1	33,351	33,351	400,208	1	36,686	36,686	440,228
Administrative Manager	1	60,638	60,638	727,650	1	66,701	66,701	800,415	1	73,371	73,371	880,457
Account Assistants	6	9,702	58,212	698,544	6	10,672	64,033	768,398	6	11,739	70,437	845,238
Store Assistants	5	6,064	30,319	363,825	5	6,670	33,351	400,208	5	7,337	36,686	440,228
Security Officer	1	18,191	18,191	218,295	1	20,010	20,010	240,125	1	22,011	22,011	264,137
Typists	4	7,277	29,106	349,272	4	8,004	32,017	384,199	4	8,805	35,218	422,619
Security Staff	25	3,638	90,956	1,091,475	25	4,002	100,052	1,200,623	25	4,402	110,057	1,320,685
Drivers	5	6,064	30,319	363,825	5	6,670	33,351	400,208	5	7,337	36,686	440,228
Cooks	2	3,638	7,277	87,318	2	4,002	8,004	96,050	2	4,402	8,805	105,655
Peons	10	2,426	24,255	291,060	10	2,668	26,681	320,166	10	2,935	29,349	352,183
Sweepers	2	2,426	4,851	58,212	2	2,668	5,336	64,033	2	2,935	5,870	70,437
Total Personnel			913,807	10,965,686			1,005,188	12,062,254			1,105,707	13,268,479
Fringe Benefit @ 50 %			456,904	5,482,843			502,594	6,031,127			552,853	6,634,240
Total			1,370,711	16,448,528			1,507,782	18,093,381			1,658,560	19,902,719

TABLE D-18

Production and Technical Personnel

Designation	Number	Base Salary	Year 1 Cost/Month	Year 1 Annual Cost	Number	Base Salary	Year 2 Monthly	Year 2 Annual	Number	Base Salary	Year 3 Monthly	Year 3 Annual
Production Manager	1	60,000	60,000	720,000	1	63,000	63,000	756,000	1	66,150	66,150	793,800
Chief Chemist	1	45,000	45,000	540,000	1	47,250	47,250	567,000	1	49,613	49,613	595,350
Technical Manager	1	36,000	36,000	432,000	1	37,800	37,800	453,600	1	39,690	39,690	476,280
Engineers	9	32,000	288,000	3,456,000	9	33,600	302,400	3,628,800	9	35,280	317,520	3,810,240
Mechanics	9	16,000	144,000	1,728,000	9	16,800	151,200	1,814,400	9	17,640	158,760	1,905,120
Electricians	6	16,000	96,000	1,152,000	6	16,800	100,800	1,209,600	6	17,640	105,840	1,270,080
Chemists	3	16,000	48,000	576,000	3	16,800	50,400	604,800	3	17,640	52,920	635,040
Supervisors	24	12,000	288,000	3,456,000	24	12,600	302,400	3,628,800	24	13,230	317,520	3,810,240
Foreman	9	10,000	90,000	1,080,000	9	10,500	94,500	1,134,000	9	11,025	99,225	1,190,700
Operators	36	8,000	288,000	3,456,000	36	8,400	302,400	3,628,800	36	8,820	317,520	3,810,240
Workers	9	6,000	54,000	648,000	9	6,300	56,700	680,400	9	6,615	59,535	714,420
Helpers	69	2,000	138,000	1,656,000	69	2,100	144,900	1,738,800	69	2,205	152,145	1,825,740
Total Personnel	177		1,575,000	18,900,000	177		1,653,750	19,845,000	177		1,736,438	20,837,250
Differential for 7 Day Week @ 14%			220,500	2,646,000			231,525	2,778,300			243,101	2,917,215
Fringe Benefit @ 50 %			787,500	9,450,000			826,875	9,922,500			868,219	10,418,625
Total			2,583,000	30,996,000			2,712,150	32,545,800			2,847,758	34,173,090

TABLE D-18

Designation	Number	Base Salary	Year 4 Monthly	Year 4 Annual	Number	Base Salary	Year 5 Monthly	Year 5 Annual	Number	Base Salary	Year 6 Monthly	Year 6 Annual
Production Manager	1	72,765	72,765	873,180	1	80,042	80,042	960,498	1	88,046	88,046	1,056,548
Chief Chemist	1	54,574	54,574	654,885	1	60,031	60,031	720,374	1	66,034	66,034	792,411
Technical Manager	1	43,659	43,659	523,908	1	48,025	48,025	576,299	1	52,827	52,827	633,929
Engineers	9	38,808	349,272	4,191,264	9	42,689	384,199	4,610,390	9	46,958	422,619	5,071,429
Mechanics	9	19,404	174,636	2,095,632	9	21,344	192,100	2,305,195	9	23,479	211,310	2,535,715
Electricians	6	19,404	116,424	1,397,088	6	21,344	128,066	1,536,797	6	23,479	140,873	1,690,476
Chemists	3	19,404	58,212	698,544	3	21,344	64,033	768,398	3	23,479	70,437	845,238
Supervisors	27	14,553	392,931	4,715,172	27	16,008	432,224	5,186,689	27	17,609	475,447	5,705,358
Foreman	12	12,128	145,530	1,746,360	12	13,340	160,083	1,920,996	12	14,674	176,091	2,113,096
Operators	51	9,702	494,802	5,937,624	51	10,672	544,282	6,531,386	51	11,739	598,710	7,184,525
Workers	12	7,277	87,318	1,047,816	12	8,004	96,050	1,152,598	12	8,805	105,655	1,267,857
Helpers	99	2,426	240,125	2,881,494	99	2,668	264,137	3,169,643	99	2,935	290,551	3,486,608
Total Personnel	231		2,230,247	26,762,967	231		2,453,272	29,439,264	231		2,698,599	32,383,190
Differential for 7 Day Week @			312,235	3,746,815			343,458	4,121,497			377,804	4,533,647
Fringe Benefit @ 50 %			1,115,124	13,381,484			1,226,636	14,719,632			1,349,300	16,191,595
Total			3,657,605	43,891,266			4,023,366	48,280,392			4,425,703	53,108,432

TABLE D-18

Marketing Personnel

Designation	Number	Base Salary	Year 1 Cost/Month	Year 1 Annual Cost	Number	Base Salary	Year 2 Monthly	Year 2 Annual	Number	Base Salary	Year 3 Monthly	Year 3 Annual
Marketing Manager	1	80,000	80,000	960,000	1	84,000	84,000	1,008,000	1	88,200	88,200	1,058,400
Sales Manager, Oil	1	40,000	40,000	480,000	1	42,000	42,000	504,000	1	44,100	44,100	529,200
Sales Manager, Meal	1	40,000	40,000	480,000	1	42,000	42,000	504,000	1	44,100	44,100	529,200
Advertising Manager	1	40,000	40,000	480,000	1	42,000	42,000	504,000	1	44,100	44,100	529,200
Meal Nutritionist	1	30,000	30,000	360,000	1	31,500	31,500	378,000	1	33,075	33,075	396,900
Sales Officer, Oil	2	25,000	50,000	600,000	2	26,250	52,500	630,000	4	27,563	110,250	1,323,000
Sales Officer, Meal	2	25,000	50,000	600,000	2	26,250	52,500	630,000	3	27,563	82,688	992,250
Advertising Executive	1	25,000	25,000	300,000	1	26,250	26,250	315,000	2	27,563	55,125	661,500
Analyst / Programmer	1	20,000	20,000	240,000	1	21,000	21,000	252,000	1	22,050	22,050	264,600
Executive Secretary	1	10,000	10,000	120,000	1	10,500	10,500	126,000	1	11,025	11,025	132,300
Typist	3	6,000	18,000	216,000	3	6,300	18,900	226,800	4	6,615	26,460	317,520
Total Personnel	15		403,000	4,836,000	15		423,150	5,077,800	20		561,173	6,734,070
Fringe Benefit @ 50 %			201,500	2,418,000			211,575	2,538,900			280,586	3,367,035
Total			604,500	7,254,000			634,725	7,616,700			841,759	10,101,105

TABLE D-18

Designation	Number	Base Salary	Year 4 Monthly	Year 4 Annual	Number	Base Salary	Year 5 Monthly	Year 5 Annual	Number	Base Salary	Year 6 Monthly	Year 6 Annual
Marketing Manager	1	92,610	92,610	1,111,320	1	97,241	97,241	1,166,886	1	102,103	102,103	1,225,230
Sales Manager, Oil	1	46,305	46,305	555,660	1	48,620	48,620	583,443	1	51,051	51,051	612,615
Sales Manager, Meal	1	46,305	46,305	555,660	1	48,620	48,620	583,443	1	51,051	51,051	612,615
Advertising Manager	1	46,305	46,305	555,660	1	48,620	48,620	583,443	1	51,051	51,051	612,615
Meal Nutritionist	1	34,729	34,729	416,745	1	36,465	36,465	437,582	1	38,288	38,288	459,461
Sales Officer, Oil	6	28,941	173,644	2,083,725	6	30,388	182,326	2,187,911	6	31,907	191,442	2,297,307
Sales Officer, Meal	3	28,941	86,822	1,041,863	3	30,388	91,163	1,093,956	3	31,907	95,721	1,148,653
Advertising Executive	3	28,941	86,822	1,041,863	3	30,388	91,163	1,093,956	3	31,907	95,721	1,148,653
Analyst / Programmer	1	23,153	23,153	277,830	1	24,310	24,310	291,722	1	25,526	25,526	306,308
Executive Secretary	1	11,576	11,576	138,915	1	12,155	12,155	145,861	1	12,763	12,763	153,154
Typist	4	6,946	27,783	333,396	4	7,293	29,172	350,066	4	7,658	30,631	367,569
Total Personnel	23		676,053	8,112,636	23		709,856	8,518,268	23		745,348	8,944,181
Fringe Benefit @ 50 %			338,027	4,056,318			354,928	4,259,134			372,674	4,472,091
Total			1,014,080	12,168,954			1,064,783	12,777,402			1,118,023	13,416,272

TABLE D-18

Procurement & Extension Personnel

Designation	Number	Base Salary	Year 1 Cost/Month	Year 1 Annual Cost	Number	Base Salary	Year 2 Monthly	Year 2 Annual	Number	Base Salary	Year 3 Monthly	Year 3 Annual
Development Manager	1	40,000	40,000	480,000	1	42,000	42,000	504,000	1	44,100	44,100	529,200
Purchase Manager	1	20,000	20,000	240,000	1	21,000	21,000	252,000	1	22,050	22,050	264,600
Purchase Officer	2	16,500	33,000	396,000	2	17,325	34,650	415,800	2	18,191	36,383	436,590
Purchase Assistant	8	6,000	48,000	576,000	8	6,300	50,400	604,800	8	6,615	52,920	635,040
Agronomist / Extension Manager	1	20,000	20,000	240,000	1	21,000	21,000	252,000	1	22,050	22,050	264,600
Extension Agronomist	8	13,500	108,000	1,296,000	8	14,175	113,400	1,360,800	8	14,884	119,070	1,428,840
Extension Assistant	8	9,000	72,000	864,000	8	9,450	75,600	907,200	8	9,923	79,380	952,560
Store Manager	1	36,000	36,000	432,000	1	37,800	37,800	453,600	1	39,690	39,690	476,280
Seedhouse Supervisors	7	12,000	84,000	1,008,000	7	12,600	88,200	1,058,400	7	13,230	92,610	1,111,320
Seedhouse Operators	6	8,000	48,000	576,000	6	8,400	50,400	604,800	6	8,820	52,920	635,040
Seedhouse Helpers	12	2,000	24,000	288,000	12	2,100	25,200	302,400	12	2,205	26,460	317,520
Seedhandling Supervisors	2	12,000	24,000	288,000	2	12,600	25,200	302,400	2	13,230	26,460	317,520
Seedhandling Assistants	2	8,000	16,000	192,000	2	8,400	16,800	201,600	2	8,820	17,640	211,680
Bookeeper	4	9,000	36,000	432,000	4	9,450	37,800	453,600	4	9,923	39,690	476,280
Operator	8	6,000	48,000	576,000	8	6,300	50,400	604,800	8	6,615	52,920	635,040
Mechanic	4	6,000	24,000	288,000	4	6,300	25,200	302,400	4	6,615	26,460	317,520
Security Staff	6	3,000	18,000	216,000	6	3,150	18,900	226,800	6	3,308	19,845	238,140
Drivers	6	5,000	30,000	360,000	6	5,250	31,500	378,000	6	5,513	33,075	396,900
Tractor Operators	4	6,000	24,000	288,000	4	6,300	25,200	302,400	4	6,615	26,460	317,520
Total	91		753,000	9,036,000	91		790,650	9,487,800	91		830,183	9,962,190
Fringe Benefits @ 50%			376,500	4,518,000			395,325	4,743,900			415,091	4,981,095
Total Personnel			1,129,500	13,554,000			1,185,975	14,231,700			1,245,274	14,943,285

TABLE D-18

Designation	Number	Base Salary	Year 4 Monthly	Year 4 Annual	Number	Base Salary	Year 5 Monthly	Year 5 Annual	Number	Base Salary	Year 6 Monthly	Year 6 Annual
Development Manager	1	48,510	48,510	582,120	1	53,361	53,361	640,332	1	58,697	58,697	704,365
Purchase Manager	1	24,255	24,255	291,060	1	26,681	26,681	320,166	1	29,349	29,349	352,183
Purchase Officer	2	20,010	40,021	480,249	2	22,011	44,023	528,274	2	24,213	48,425	581,101
Purchase Assistant	8	7,277	58,212	698,544	8	8,004	64,033	768,398	8	8,805	70,437	845,238
Agronomist / Extension Manager	1	24,255	24,255	291,060	1	26,681	26,681	320,166	1	29,349	29,349	352,183
Extension Agronomist	8	16,372	130,977	1,571,724	8	18,009	144,075	1,728,896	8	19,810	158,482	1,901,786
Extension Assistant	8	10,915	87,318	1,047,816	8	12,006	96,050	1,152,598	8	13,207	105,655	1,267,857
Store Manager	1	43,659	43,659	523,908	1	48,025	48,025	576,299	1	52,827	52,827	633,929
Seedhouse Supervisors	10	14,553	145,530	1,746,360	10	16,008	160,083	1,920,996	10	17,609	176,091	2,113,096
Seedhouse Operators	9	9,702	87,318	1,047,816	9	10,672	96,050	1,152,598	9	11,739	105,655	1,267,857
Seedhouse Helpers	18	2,426	43,659	523,908	18	2,668	48,025	576,299	18	2,935	52,827	633,929
Seedhandling Supervisors	2	14,553	29,106	349,272	2	16,008	32,017	384,199	2	17,609	35,218	422,619
Seedhandling Assistants	2	9,702	19,404	232,848	2	10,672	21,344	256,133	2	11,739	23,479	281,746
Bookeeper	4	10,915	43,659	523,908	4	12,006	48,025	576,299	4	13,207	52,827	633,929
Operator	8	7,277	58,212	698,544	8	8,004	64,033	768,398	8	8,805	70,437	845,238
Mechanic	4	7,277	29,106	349,272	4	8,004	32,017	384,199	4	8,805	35,218	422,619
Security Staff	6	3,638	21,830	261,954	6	4,002	24,012	288,149	6	4,402	26,414	316,964
Drivers	6	6,064	36,383	436,590	6	6,670	40,021	480,249	6	7,337	44,023	528,274
Tractor Operators	4	7,277	29,106	349,272	4	8,004	32,017	384,199	4	8,805	35,218	422,619
Total	103		1,000,519	12,006,225	103		1,100,571	13,206,848	103		1,210,628	14,527,532
Fringe Benefits @ 50%			500,259	6,003,113			550,285	6,603,424			605,314	7,263,766
Total Personnel			1,500,778	18,009,338			1,650,856	19,810,271			1,815,942	21,791,298

TABLE D-18

	Number	Base (DAY) Salary	Year 1 DAYS	Year 1 Annual Cost	Number	Base Salary	Year 2 DAYS	Year 2 Annual	Number	Base Salary	Year 3 DAYS	Year 3 Annual
Casual Labor	58	80	200	928,000	58	84	200	974,400	58	88	200	1,023,120
Fringe @ 15%		12		139,200		13		146,160		13		153,468
Total Casual Labor				1,067,200				1,120,560				1,176,588
TOTAL PROCUREMENT & EXTENSION PERSONNEL				14,621,200				15,352,260				16,119,873
TOTAL PERSONNEL				79,988,200				83,987,610				90,290,561

TABLE D-18

	Number	Base Salary	Year 4 DAYS	Year 4 Annual	Number	Base Salary	Year 5 DAYS	Year 5 Annual	Number	Base Salary	Year 6 DAYS	Year 6 Annual
Casual Labor	58	97	200	1,125,432	58	107	200	1,237,975	58	117	200	1,361,773
Fringe @ 15%		15		168,815		16		185,696		18		204,266
Total Casual Labor				1,294,247				1,423,671				1,566,039
TOTAL PROCUREMENT & EXTENSION				19,303,584				21,233,943				23,357,337
TOTAL PERSONNEL				109,821,670				120,195,389				131,576,058

SUMMARY

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Managerial and Administrative Personnel	13,563,000 16.96%	14,241,150 16.96%	14,953,208 16.56%	16,448,528 14.98%	18,093,381 15.05%	19,902,719 15.13%
Marketing Personnel	7,254,000 9.07%	7,616,700 9.07%	10,101,105 11.19%	12,168,954 11.08%	12,777,402 10.63%	13,416,272 10.20%
Production and Technical Personnel	30,996,000 38.75%	32,545,800 38.75%	34,173,090 37.85%	43,891,266 39.97%	48,280,392 40.17%	53,108,432 40.36%
Procurement & Extension Personnel	28,175,200 35.22%	29,583,960 35.22%	31,063,158 34.40%	37,312,922 33.98%	41,044,214 34.15%	45,148,635 34.31%
Total Personnel	79,988,200	83,987,610	90,290,561	109,821,670	120,195,389	131,576,058

ANNEXES

TO

SECTION "A"

OILSEED PRODUCTION AND PROCUREMENT UNIT

FOR

A VERTICALLY INTEGRATED
SOLVENT EXTRACTION PLANT

ANNEX A-1

UTILIZATION, CLASSIFICATION & DISTRIBUTION OF LAND IN PAKISTAN

TABLE I - UTILIZATION OF LAND

(Source: Economic survey 1989-90, Ministry of Finance)

Total cultivable land reported.....	31.25 million ha
out of this, cultivable waste.....	10.33 million ha
Current fallow.....	4.86 million ha
net area sown.....	16.06 million ha

Comment: At any given time no more than 51% of total cultivable land is cultivated. This indicates non-availability of water and or finances for development of land and other facilities.

TABLE II - CLASSIFICATION OF LAND

(Source National Commission on Agriculture, and Pakistan Statistical Year Book 1989)

a) Classification according to sources of water is as follows:

Land irrigated by canals.....	12.18 million ha
Land irrigated by other means.....	4.35 million ha
Other Rain fed land.....	4.44 million ha

b) Classification according to responsiveness to inputs of water, fertilizer and seed is as follows:

Land classed as very good or good i.e. class 1 and 2, in canal command area.....	10.00 million ha
Land classed as water-logged or saline, in and outside canal commanded area.....	6.31 million ha
Unclassified land.....	2.18 million ha

Comment: About 50% of the cultivated land has to be upgraded through biological, chemical, and physical (leveling of land, or lowering of water table) means to make it fully productive.

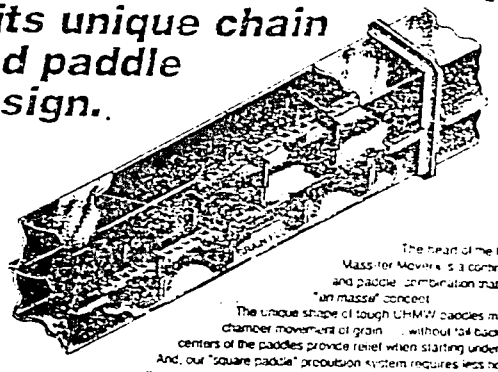
TABLE III - DISTRIBUTION OF LAND

(Source: Pakistan Census of Agriculture, 1980)

Size of the farm	Number of such farms	Total area of the farms
Less than 1 acre	1,84,067	89,409
1 acre to less than 2.5	5,17,358	8,26,493
2.5 acres to less than 5	6,85,026	24,03,833
5 acres to less than 7.5	6,84,585	40,19,569
7.5 acres to less than 12.5	9,19,353	88,35,662
12.5 acres to less than 25	7,05,173	1,16,16,800
25 acres to less than 50	2,63,699	83,86,440
50 acres to less than 150	96,141	69,12,756
150 acres and above	14,027	40,03,711

Comment: Contrary to the general impression, big farms of 150 acres or more constitute no more than 9% of the total farm area. Small farms, i.e. farms of less than 1 acre to less than 25 acres, constitute 60% of the farm area, and their owners constitute 90% of the land owning class. Thus, 60% of the area is likely to be investment starved and, hence, not amenable to scientific and modern farming. Move division of land, since 1980, due to inheritance, must have made the situation even worse.

MASS-TER MOVER'S secret is its unique chain and paddle design.

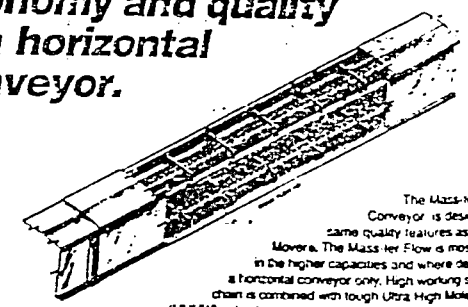


The heart of the Hutchinson Mass-ter Mover is a continuous chain and paddle combination that utilizes the "en masse" concept.

The unique shape of tough UHMW paddles maintains full chamber movement of grain ... without "pit back". The open centers of the paddles provide relief when starting under a full load. And, our "square paddle" propulsion system requires less horsepower than a screw conveyor—up to 30% energy savings can be gained!

Whether you're starting from the ground up, or updating your present facilities, you'll find the Hutchinson Mass-ter Mover ready to meet your demands.

MASS-TER FLOW DRAG CONVEYOR economy and quality in a horizontal conveyor.



The Mass-ter Flow Drag Conveyor is designed with the same quality features as the Mass-ter Mover. The Mass-ter Flow is most economical in the higher capacities and where design requires a horizontal conveyor only. High working strength roller chain is combined with tough Ultra High Molecular Weight (UHMW) polyethylene paddles for long life and smooth operation. Optional bottom plate liner is available for extra life, particularly in very dirty grain conditions.

MASS-TER MOVER

SPECIFICATIONS

MODEL	9" x 9"	7" x 13"
CAPACITY	2500, 3300, 4150 & 5000 BPH	4000, 5600, 7300 & 8500 BPH 4800, 6600, 8400 & 10,200 cu. ft.
CHAIN SPEED	150, 200, 250 & 300 FPM	150, 200, 250 & 300 FPM
DRIVE SPEED	58, 77, 97 & 116 RPM	46, 61, 77 & 92 RPM
CASING	12 Gauge Galvanized	12 Gauge Galvanized
BOTTOM	12 Gauge Galvanized	12 Gauge Galvanized
SIDE PLATES	14 Gauge Galvanized	14 Gauge Galvanized
COVER	12 Gauge Galvanized	12 Gauge Galvanized
PADDLES	1/2" UHMW	1/2" UHMW
BEARINGS	2" to 2 7/16" 4-Hole Flange Ball Bearings	1 1/2" 4-Hole Flange Ball Bearings
HEAD	14" Round	
	CASS0, CASS7 & CASS1X	
	24 Inch	

MASS-TER FLOW DRAG CONVEYOR

SPECIFICATIONS

MODEL	12 3/32" x 13-7/8"
CAPACITY	7500, 10,000, 12,500 & 15,000 BPH
	9000, 12,000, 15,000 & 18,000 cu. ft.
CHAIN SPEED	130, 173, 216 & 260 FPM
DRIVE SPEED	37, 50, 62 & 75 RPM
CASING	10 Gauge Galvanized
BOTTOM	12 Gauge Galvanized
SIDE PLATES	7 Gauge Galvanized
COVER	10 Gauge Galvanized
PADDLES	UHMW, 13" Spacing
BEARINGS	10" [illegible] 85 [illegible] 145" 20" 2-15/16"
	1 1/2" O.D.
HEAD	Boot
	18" Square
	CASS7, D81X & D88C
	CASS7 27T D81X & D88C 167

CALL TOLL-FREE 1-800-523-6993

IN KANSAS CALL (913) 632-2161

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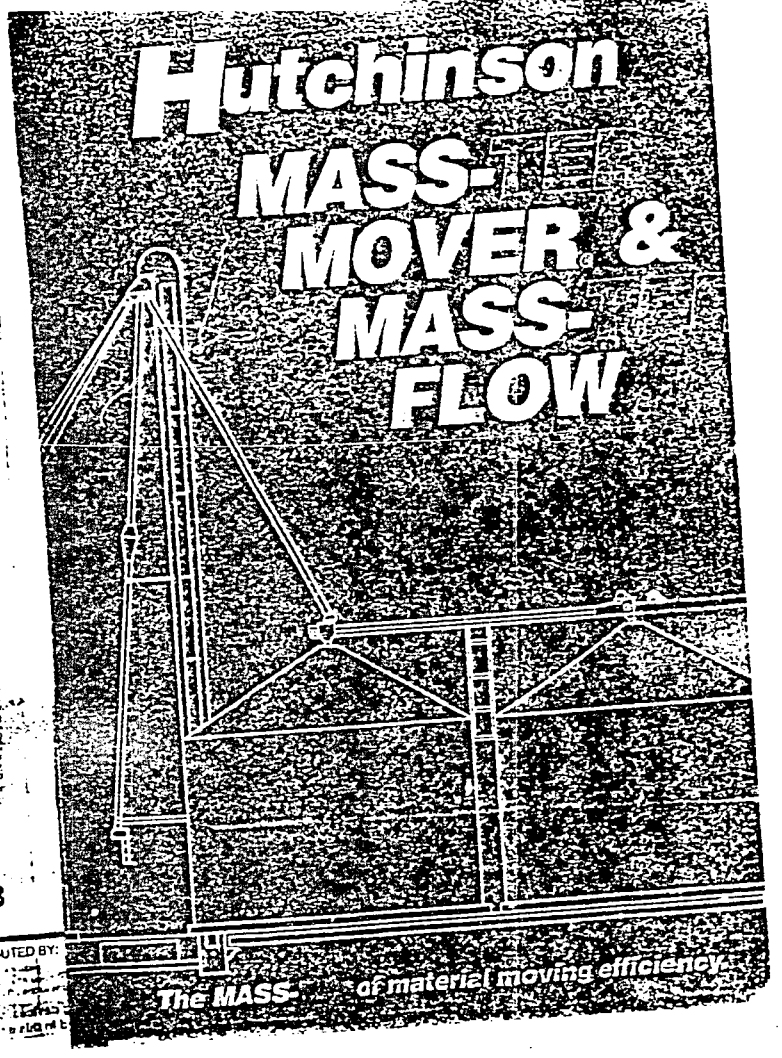


ANNEX A-6

KICE

Portable Multi-Aspirator

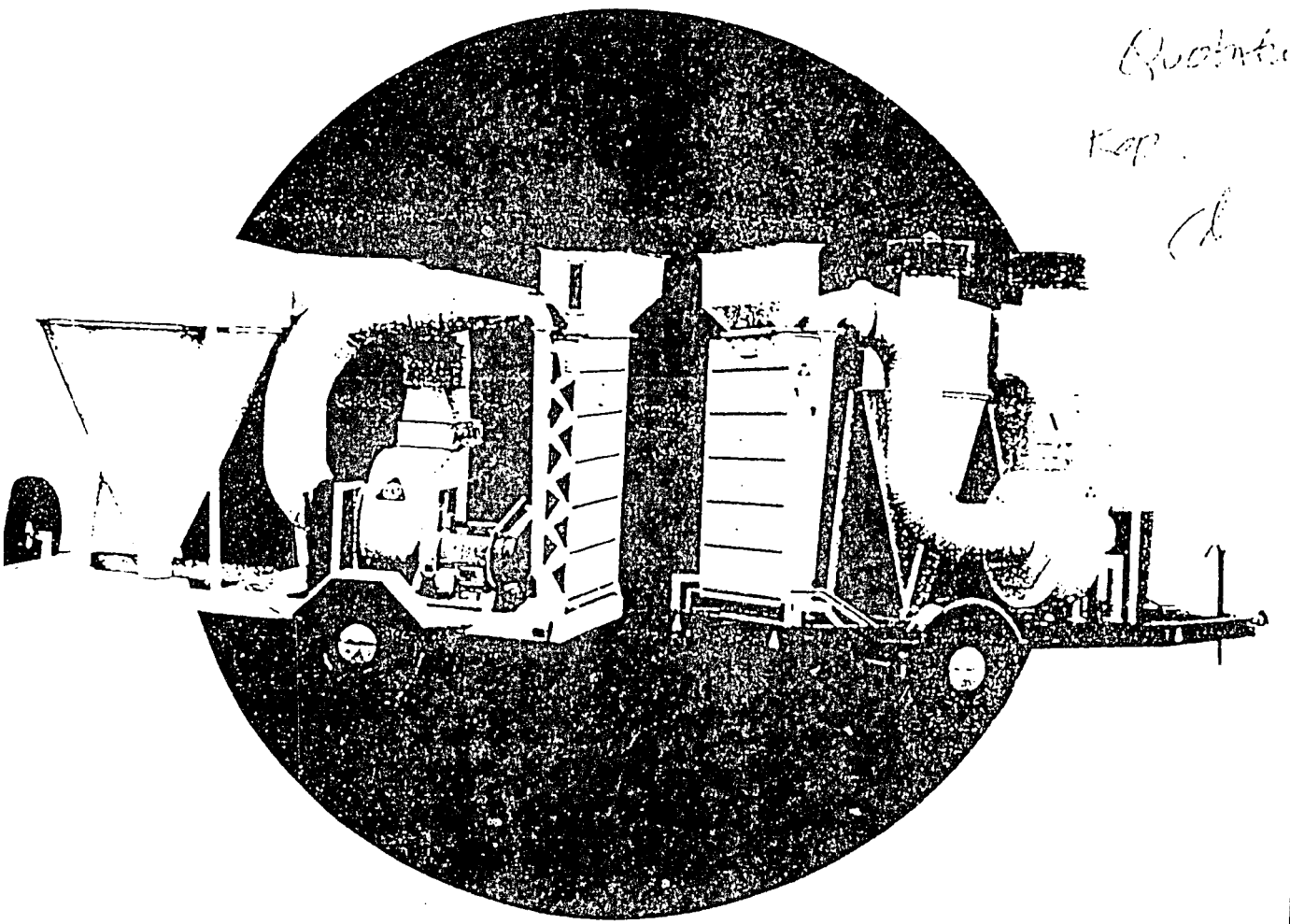
Pays Big Dividends

- Removes Dockage and F.M.
- Reduces Insect Infestation
- Reduces Dust Hazard and Improves Working Conditions
- Improves Drier and Aeration Efficiencies

Asar

Quotation

Kap

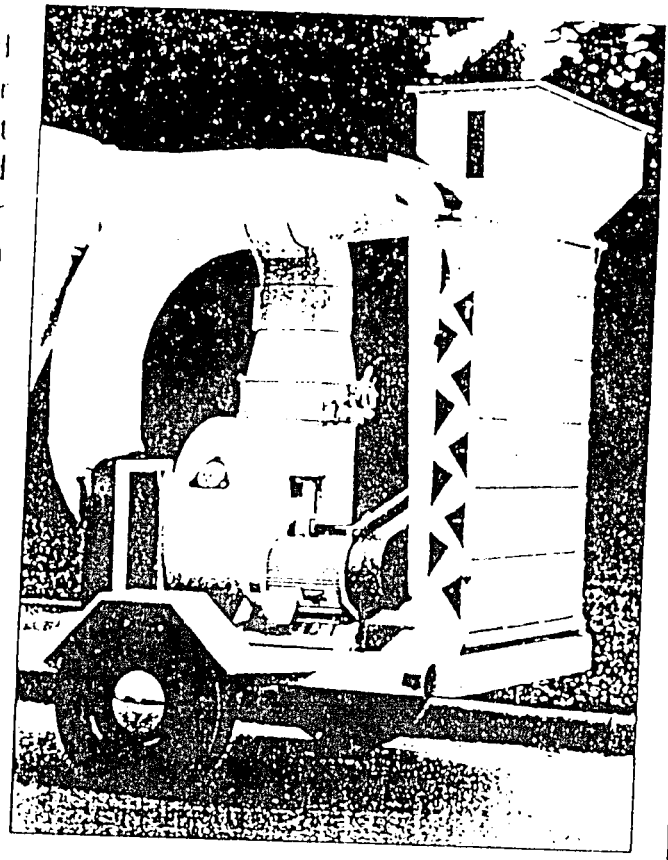


KICE DATA SHEET — PA-2

232

WHAT THE PORTABLE ASPIRATOR C

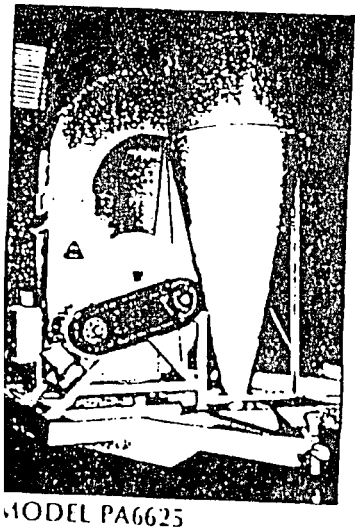
The unit is mounted on a standard road worthy trailer so it can be moved short or long distances with ease. Move it in and set it up over the grain dump pit, plug it in and you are ready to clean grain. Move it to other locations or use it for custom cleaning on location.



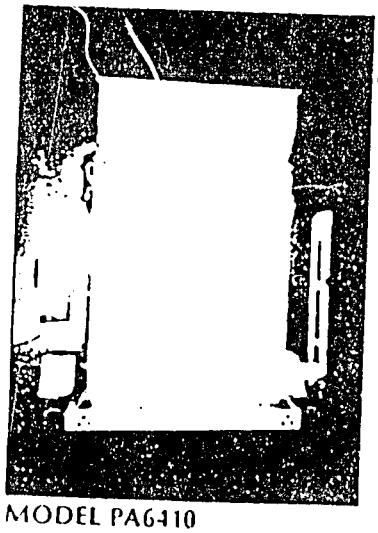
Why not improve the condition of your grain, raise the test weight and sell the dockage? No need to pay the freight on dockage and then have to take a discount on it. Because the unit is portable and quick to set up, it can be utilized when work loads permit — during winter months and off season times.

Kice has over 40 years of experience in the design and fabrication of grain handling equipment. The portable aspirator can do many jobs including:

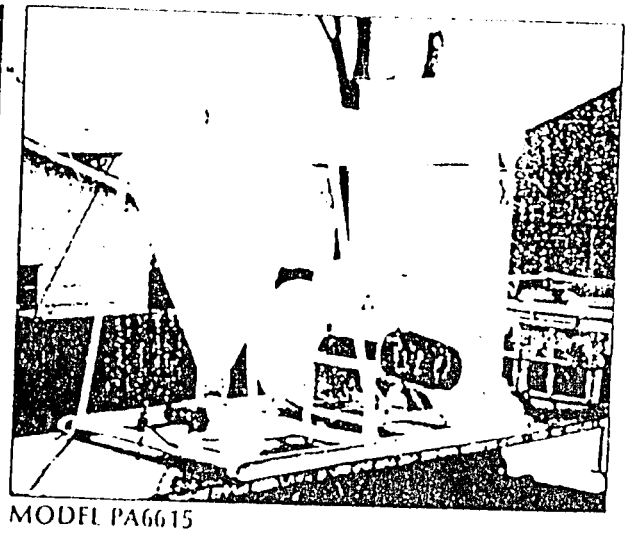
- Eliminate dockage discounts
- Recover valuable feed product
- Remove hazardous fines from grain
- Remove infestation and fragments
- Reduce shipping costs
- Improve grain quality
- Reduce drying costs significantly
- Improve customer relations
- Improve storage of grains
- Increase storage capacity
- Remove excess moisture
- Reduce insurance premiums



MODEL PA6625

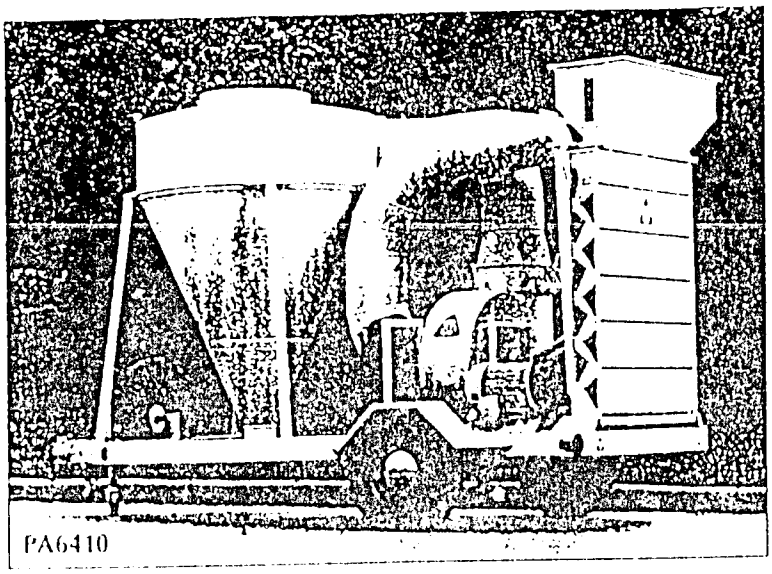


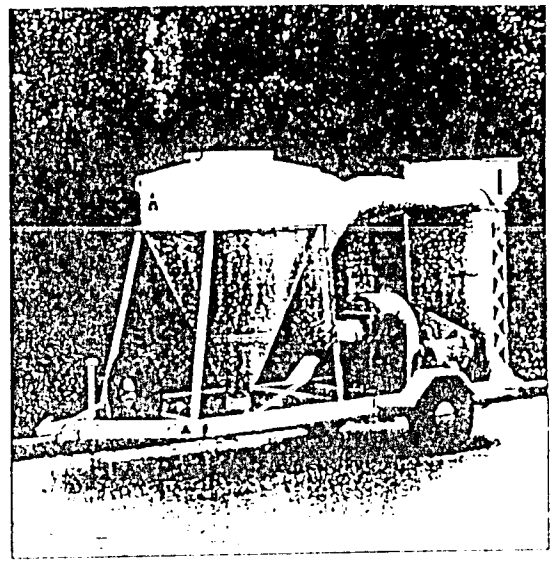
MODEL PA6410

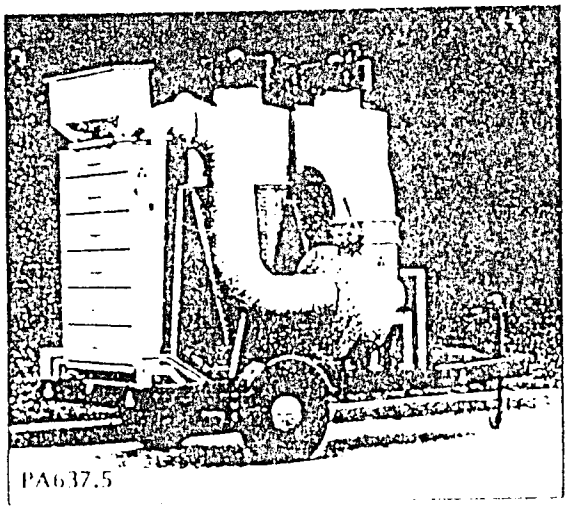


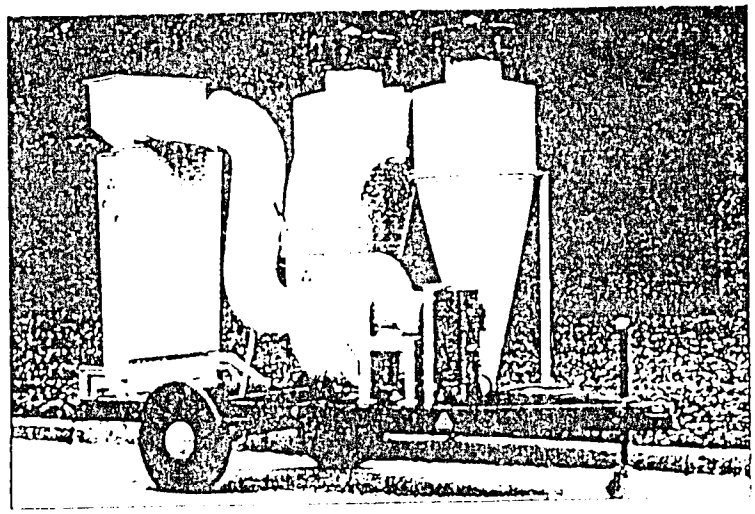
MODEL PA6615

FOR YOUR GRAIN OPERATION









TRY OUT A KICE ASPIRATOR and you'll be pleased with the results. Kice Metal Products wants you to have the opportunity to have a unit on a trial basis for on-site usage. Rent a Kice aspirator/call or write Kice Metal Products for all the details.

MODEL NO.	CAPACITY	SIZE	FEATURES
PA447.5	1500 BU/HR	4'x9'x9'	Mounted on trailer with heavy-duty axle, springs, tires, lights & hitch, assembled. 48" wide aspirator (4 pass) to maximize capacity with 7.5 H.P. motor.
PA647.5	1200 BU/HR	4'x9'x9'	Mounted on trailer with heavy-duty axle, springs, tires, lights & hitch, assembled. Six pass unit (36" wide) to maximize efficiency with 7.5 H.P. motor.
PA6410	1500 BU/HR	5'x14'x9'	Mounted on trailer same as first two models joining both 48" wide capacity with six pass efficiency to make an ideal combination with 10 H.P. motor.
PA6615	2400 BU/HR	8'x13'x12'	Maximum efficiency with 72" wide aspirator for increased capacity. Pulls dockage to cyclone with heavy-duty machined airlock seal on discharge with cyclone venting to vacuum fan. Mounted on channel frame with all components assembled. Not on trailer. 15-20 H.P.

All the above units are fabricated of heavy gauge carbon steel mounted on channel iron frame with connecting duct, couplings, motors, starters, and cords. Assembled and painted.

Our results speak for themselves

STUDY & TEST REPORTS

KANSAS WHEAT COMMISSION STUDY REPORTS THE RESULTS AND VALUE OF TYPICAL ASPIRATOR INSTALLATION:

A study on the economic impact of cleaning wheat and shipping a clean product from the country elevator by the Kansas Wheat Commission compared actual shipments of wheat as received to screen cleaned wheat and aspirated wheat.

A computer program was prepared from the test results, where variables can be changed (i.e., freight rates, dockage values, etc.). Actual economic benefit can now be determined for each elevator regardless of location.

The conclusion of the tests proved:

- It is economically advantageous to remove dockage to less than 1% at the country elevator level with a multi-aspirator.
- Dockage removal increased gross proceeds by lowering price discounts and by providing a marketable product — dockage.
- The farther you ship and the higher the dockage/foreign material levels are, the more important it is to aspirate.
- Transportation costs were reduced.
- The multi-aspirator is more efficient and more economical for use in dockage elimination than a screener.

MONEY SAVING RESULTS WITH TYPICAL ASPIRATOR INSTALLATION:

500,000 bushels of wheat with half percent dockages (Bs. [illegible] one half percent dockage is .005 to .010 or up to [illegible] percent.)

Using an average figure of .0075% dockage, the 500,000 bushels [illegible] yield 3,750 bushels of dockage after aspiration. (500,000 × .0075% = 3,750 bushels or 225,000 pounds. That's 112.5 tons!)

If the dockage is sold at $60 per ton, there is a savings of $6,750.00 for a product that was previously given away!

Add to that the savings in shipping costs (25 cents per bushel $937.00) for a total savings of $7,687.00.

Summary of Savings With Aspiration —

- Received for dockage $6,750.00
- Savings in shipping costs 937.00
- THE TOTAL, without assuming any grade improvements or test weight premiums, is $7,687.00

ADDED BENEFITS —

- Improved quality of clean grain
- Explosive fines removal
- Improved aeration efficiency
- Infestation reduction
- Improved drying

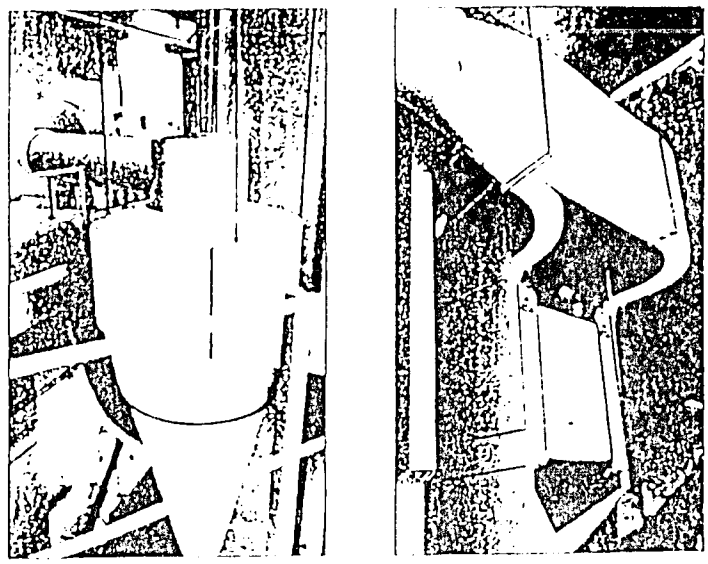
WHEAT LIFTINGS USED AS FEED:

A recent pilot test using wheat dockage liftings in cattle growing rations indicate [illegible] aspirated liftings (averaging about [illegible] pounds per bushel) were worth $75 to $80 per ton. Value was calculated by replacing milo and soybean meal with liftings. Daily gain was 8% greater. Average gain was 15.50 pounds greater and average feed intake was 10.01% higher on pens of steer cattle [illegible] 90 day test.

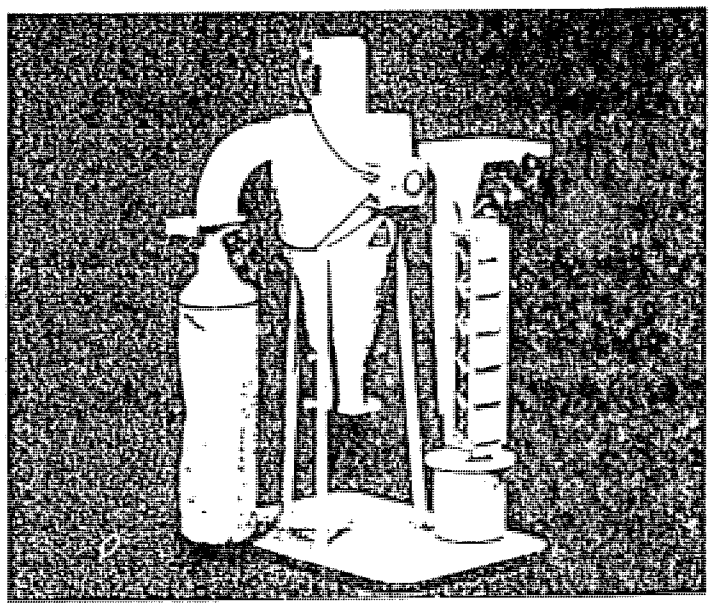
"Nutritional value of the liftings was better than expected, and calves that received the test ration grew significantly ($p^{1}0.01$) faster. The ration that contained the liftings was very palatable and feed intake was 10 percent greater."

The profitability of cleaning wheat may depend on the value of the material removed and an available market. This test indicates a very large market in the wheat growing areas.

OTHER KICE ASPIRATORS



KICE MULTI-ASPIRATOR permanently installed unit handles larger volumes and has greater capacities than the portable aspirator. The fixed multi-aspirator separates dust and dockage from grain as it is gravity-fed through the multi-aspirator. The cyclone recycles clean air back to the aspirator by way of the fan.



KICE MINI-ASPIRATOR is for fast, accurate and simple testing of dockage. Now elevators can test all incoming grain, even during harvest rush, as part of the moisture and test weight operation. The mini-aspirator provides reliable and repeatable results. This small unit uses only a 3x3 foot area.

KICE INDUSTRIES, INC.

2040 South Mead Ave., P.O. Box 11388, Wichita, Kansas 67202-0388 USA

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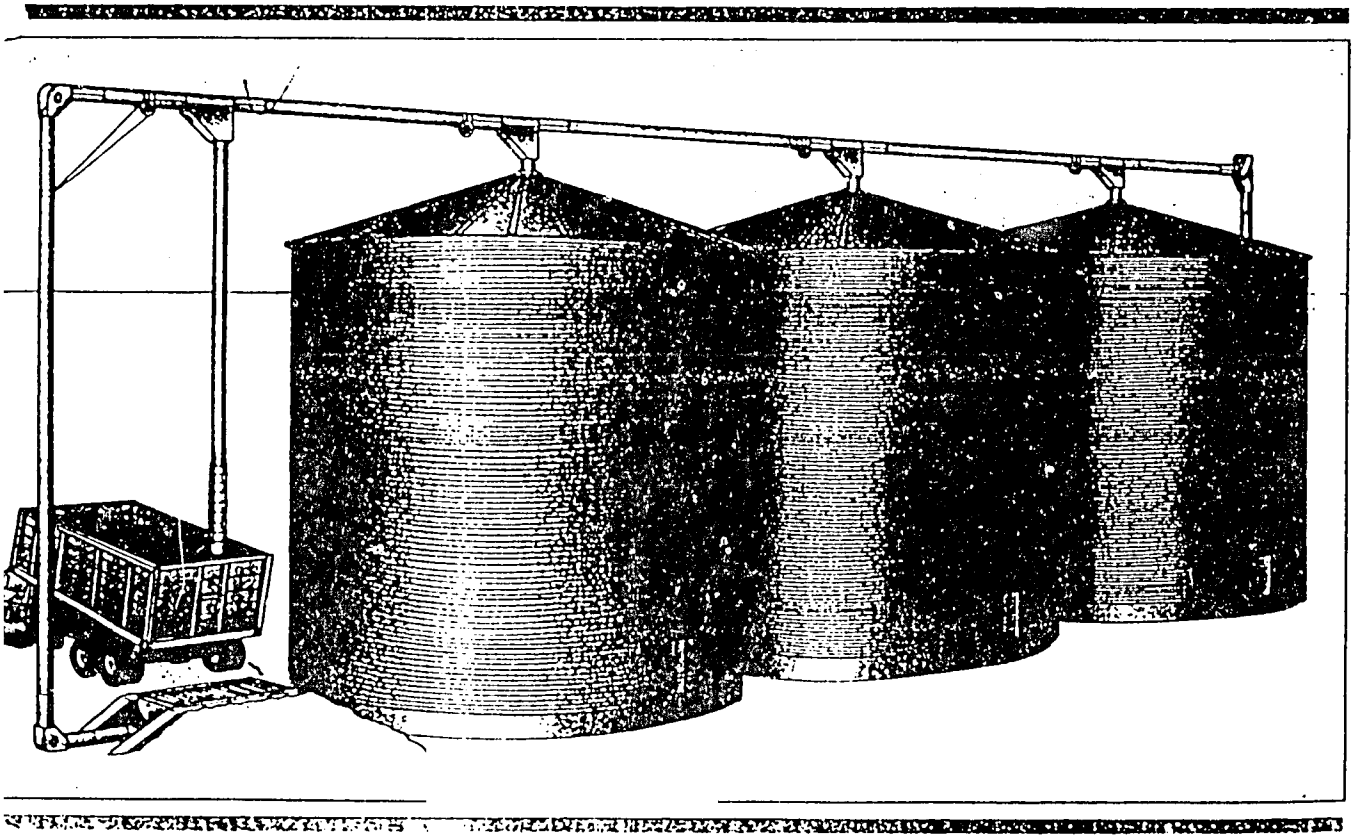
ANNEX A4

Hutchinson Grain Pump®



Hutchinson Complimented by Comparison.®

237

Specifications

31,818 1/hr

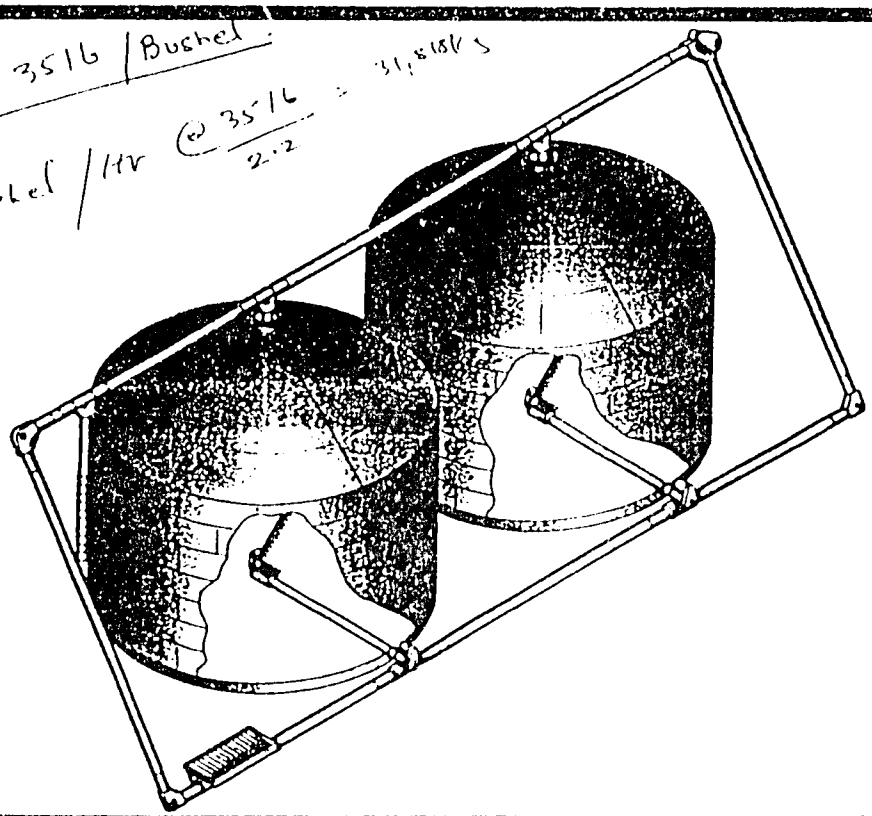
Asad
Price
Quotation
Feb 91

	6"	8"
Capacity	2,000 BPH	4,000 BPH
Housing	16 Ga. Galv.	14 Ga. Galv.
Chain Travel (ft/min)	300	300
Paddles	3/8" UHMW	3/8" UHMW
Conveyor Chain	CA 550 CA 557	CA 550 CA 557 CA 551 X
Portables - Lengths	51', 61', 65'	51', 61', 65'
Portable Drive Options	Electric PTO (Right or Left)	Electric PTO (Right or Left)

63636.

Approx. S/F = 3.5 lb / Bushel

2000 Bushel / Hr @ 3.5 lb / 2.2 = 31,818 lb/s



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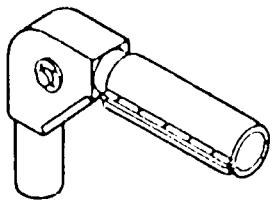
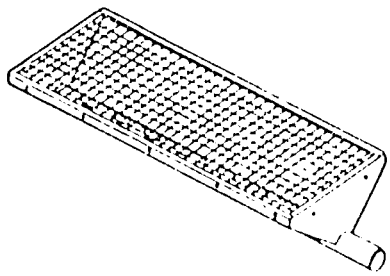
A turnkey grain handling system you can design yourself ... interchangeable components make it easy.

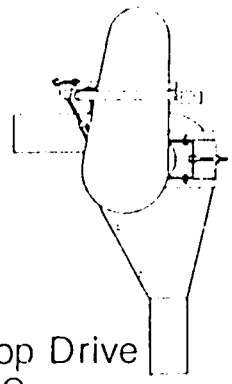
Hutchinson



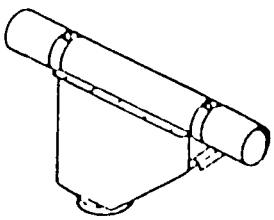
Standard Sprocket Corner



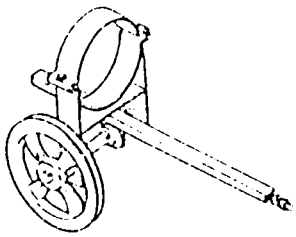
Drive Over Inlet Hopper



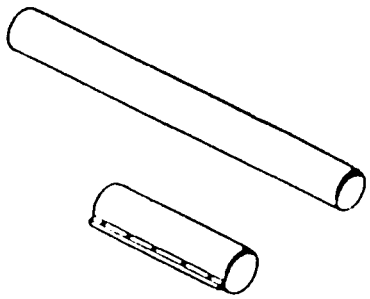
Top Drive Corner



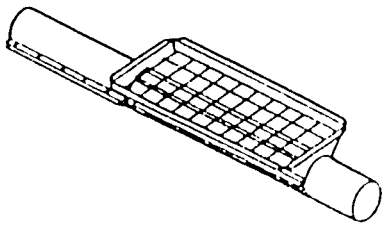
90° Discharge Spout



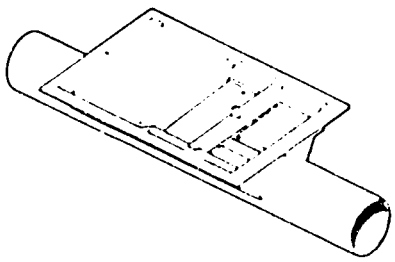
Rack & Pinion Control



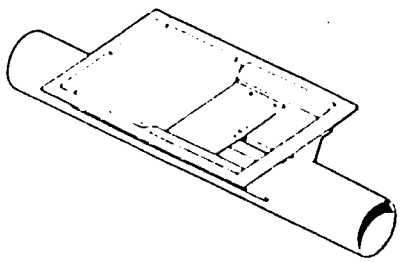
Tube Sections
(mounting accessories available)



2' Inlet Hopper



Center Bin Well

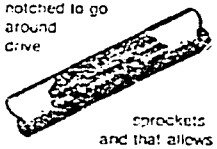


Intermediate Bin Well

Hutchinson Grain Pump. solves your grain handling needs

The revolutionary Hutchinson Grain Pump. lets you move grain gently and quickly and with less horsepower than you'd ever expect.

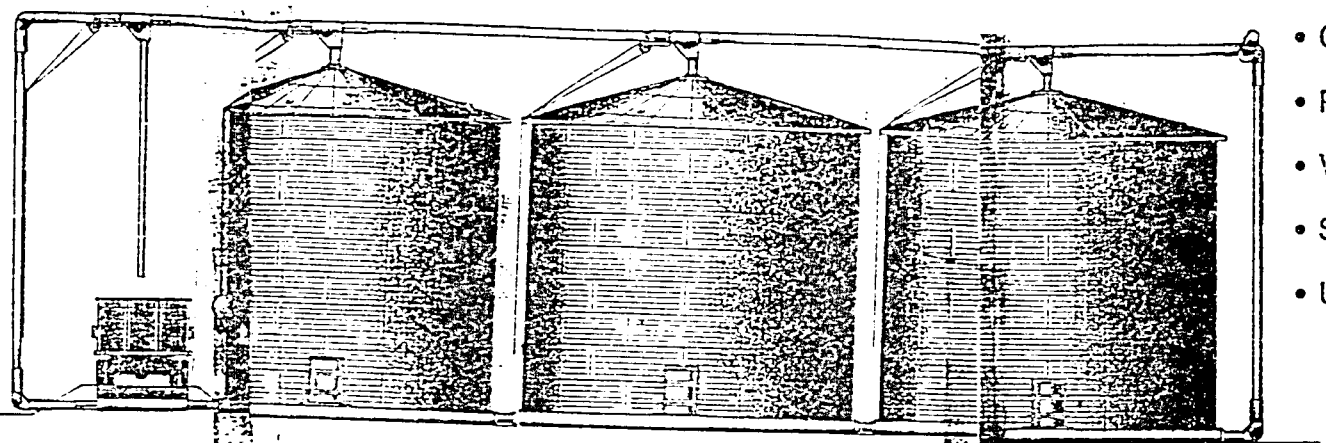
Round, plastic paddles spaced every 13" take the place of traditional auger flighting and provide a gentle, smooth grain flow within galvanized tubing. The paddles are notched to go around drive



sprockets and that allows grain to be moved around corners!

Possibilities are almost unlimited. Grain Pumps can be used in existing grain handling systems where fixed bins and pits and other facilities restrict the applications of most "standard" conventional grain moving equipment. Or they can be installed in new systems allowing total flexibility and expansion capabilities.

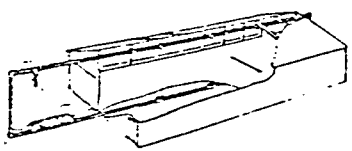
Closed loop Grain Pumps are popular because of the simplicity they offer. One unit loads and unloads a series of bins, or a flat storage facility with ease. Low installation time and expense. Minimal service requirements. It's another winner from Hutchinson.



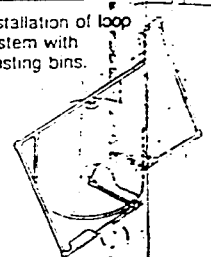
- Closed Loops
- Portables
- Verticals
- Stationary Conveyors
- Unlimited Possibilities

Patents Pending

Installation of loop system into a new flat storage structure

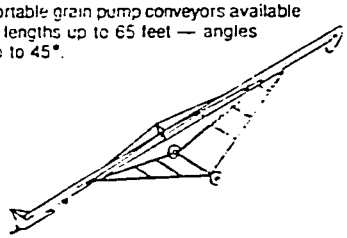


Installation of loop system with existing bins.



Stationary and vertical grain pumps used in conjunction with existing bins

Portable grain pump conveyors available in lengths up to 65 feet — angles up to 45°.



ANNEX A 5

COPY

Thermo-Flex, Inc.
1700 East Iron / P.O. Box 1184 / Salina, Kansas 67402-1184
(913) 827-7201 / FAX 913-827-9337

PROPOSAL
AIR SUPPORTED STRUCTURE
GRAIN STORAGE

RONCO/ACSCA PROJECT
House 56
Street 88, Sector G-6/3
Islamabad, Pakistan

Attention: Mr. Asad Khan

May 9, 1991

Series No. 01090591AB

Thermo-Flex, Inc.
1700 East Iron / P.O. Box 1184 / Salina, Kansas 67402-1184
(913) 827-7201 / FAX 913 827-9337

Ronco/ACSCA Project
House 56
Street 88, Sector G-6/3
Islamabad, Pakistan

Series 01090591AB

PROPOSAL

AIR SUPPORTED STRUCTURE SYSTEM - GRAIN STORAGE.
Air supported structures inherently provide unobstructed, clear span space of circular segment cross section.

Size:	A.	B.
Width	55 dia	70 dia.
Center height	18.3 ft.	23.3 ft.
Floor area	2,375 sq. ft.	3,848 sq. ft.

Membranes System:
Thermo-Flex, Inc., "Cloud 9" air supported structures are patterned for optimum utilization of the structural fabric properties, avoidance of stress concentration, and with compensation for fabric stretch.

Structural Coated Fabric:
The coated fabric is manufactured in accordance with stringent specifications for strength, long life, weatherability and appearance. The material is certified National Fire Protection Association Code No. 701. The fabric specifications are attached.

Weight per square yard	24 ounce
Color	White

Top Coating:
Poly Vinyl TS-103
Thermo-Flex, Inc., uses the TS-103 hard vinyl top coat, which is applied to matte grain fabrics, to minimize plasticizer migration and soiling. It also provides easier cleanability than fabrics without a top coat.

Construction Technique:
All structural lap joints and seams are heat sealed and subject to 100 percent quality inspection. All joints are equal to or stronger than the coated fabric itself, as verified by testing of joint specimens. Heat sealed seams maintain their strength for the life of the fabric, eliminate exposed fiber ultra violet degradation, and cannot leak air or water.

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(913) 827-7201 / FAX 913-827-9337

Series 01090591AB

Sectionalizing:
In order to facilitate ease of handling during erection or dismantling, the structure will be sectionalized in one (1) section.

Anchorage System:
Catenary Seal Skirt/Earth Anchors.
This unique Thermo-Flex, Inc., system uses a single point attachment every five feet to eight feet around the perimeter of the building. This system is best suited for installations on parking lots, fields, or construction sites.

Mechanical Systems:
Thermo-Flex, Inc., constantly strives to provide the highest quality mechanical equipment in the industry. Whether it be our dependable, high quality, long service life, inflation blowers or our exclusive solenoid operated snow removal valve system, meticulous detail is most important to provide high quality standards.

Inflation System:
This structure will be equipped with two (2) electrically operated blowers and automatic controls. Each blower is capable of delivering sufficient CFM of air at 1 inch water static pressure. Normal operation is on one blower and the second blower is kept in standby. If a mechanical or electrical failure should occur in the primary unit, or if there is a loss of pressure for any reason, the second unit is automatically activated to supply supplementary inflation air. The second blower will continue to run until normal pressure returns and it will then automatically shut off.

The blowers are non-overloading centrifugal type with backward inclined impeller blades and are equipped with properly sized motors with the proper voltage.

Horsepower	2
Voltage	230
Phase	1

Auxiliary Power System:
The structure will be equipped with one (1) emergency gas powered, belt driven blower. The system is complete with transfer switch panel, battery, trickle charger, and manual

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(913) 827-7201 / FAX 913-827-9337

Series 01090591AB

exerciser. It provides power for one (1) blower in the event of a commercial power line failure. This system is enclosed for weather protection.
Fuel: Gasoline

Personnel Airlock:
One (1) personnel airlock is provided as shown on Bulletin #108 attached.

Vehicle Airlock with Fabric Pull Up Doors:
One (1) 10 ft. x 10 ft. x 25 ft. size vehicle airlock pull up doors is provided, located on one end of the building.

1/10th CFM per Bushel Aeration:
Aeration in excess of 1/10th CFM per bushel can be accomplished by switching the back up inflation fan to the manual position.

Twelve inch perforated P.V.C. aeration lines are required for proper aeration of the grain: (A - 4 lines, 20 ft. long). (B - 4 lines, 30 ft. long).

Grain Loading/Unloading: (A), (B).
A Hutchinson portable grain pump is required. Specifications are: 8 inch diameter capacity, 65 ft. length, 15 hp electric motor. This system is designed to load the structure from outside and fill through the top center of the structure. When it is time to unload the structure, the tail assembly fits into a fabric boot on the side of the structure and unloads into trucks outside of the building. A small front end loader will be required to move the grain to the grain pump on the edge of the structure.

Repair Kit:
One (1) repair kit included, one (1) portable fabric welder with roller, structural coated fabric and adhesive are included.

Price:
Total systems as described: A - $53,793.00; B - $59,860.00
fob Salina, Kansas

Terms: Irrevocable Letter of Credit through Bank IV, Wichita, Kansas
30 percent with order.
60 percent on completion of production.
10 percent upon presentation of valid shippi documents, U.S. portside.

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(913) 827-7201 / FAX 913-827-9337

Series 01090591AB

This proposal does not include any federal, state or local taxes and is firm for a period of thirty (30) days, after which it is subject to change.

Field Consultant:
The services of a field consultant are available at a daily rate of US $300.00 plus travel and expenses.

Warranty:
Our standard warranty is for one (1) year on the material and workmanship on a structure manufactured from vinyl coated polyester material. Refer to the enclosed warranty for terms and conditions.

ANNEX A-6

COPY

Thermo-Flex, Inc.
1700 East Iron / P.O. Box 1184 / Salina, Kansas 67402-1184
(913) 827-7201 / FAX 913-827-9337

PROPOSAL
AIR SUPPORTED STRUCTURE
GRAIN STORAGE ENCLOSURE

RONCO/ACSCA PROJECT
House 56, Street 88
Sector G-6/3
Islamabad, Pakistan

Attention: Mr. Asad Khan

April 30, 19__

Series No. 01043091

246

Thermo-Flex, Inc.
1700 East Iron / P.O. Box 1184 / Salina, Kansas 67402-1184
(913) 827-7201 / FAX 913-827-9337

Ronco/ACSCA Project
House 56, Street 88
Sector G-6/3
Islamabad, Pakistan

Series No. 01043091

PROPOSAL

AIR SUPPORTED STRUCTURE SYSTEM - GRAIN STORAGE.
Air supported structures inherently provide unobstructed, clear span space of circular segment cross section.

Size:

Width	250 ft. diameter
Center height	62 ft. 6 in.
Floor area	49,087 sq. ft.

Membranes System:
Thermo-Flex, Inc., "Cloud 9" air supported structures are patterned for optimum utilization of the structural fabric properties, avoidance of stress concentration, and with compensation for fabric stretch.

Structural Coated Fabric:
The coated fabric is manufactured in accordance with stringent specifications for strength, long life, weatherability and appearance. The material is certified National Fire Protection Association Code No. 701. The fabric specifications are attached.

Weight per square yard	24 ounce
Color	White

Top Coating:
Poly Vinyl TS-103
Thermo-Flex, Inc., uses the TS-103 hard vinyl top coat, which is applied to matte grain fabrics, to minimize plasticizer migration and soiling. It also provides easier cleanability than fabrics without a top coat.

Construction Technique:
All structural lap joints and seams are heat sealed and subject to 100 percent quality inspection. All joints are equal to or stronger than the coated fabric itself, as verified by testing of joint specimens. Heat sealed seams maintain their strength for the life of the fabric, eliminate exposed fiber ultra violet degradation, and cannot leak air or water.

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Series No. 01043091

Stress Relief:
High strength steel cables will be attached to the main structural envelope in the radial direction. This proven stress relief design is utilized for relieving tension in the fabric, which curtails propagation of tears.

Sectionalizing:
In order to facilitate ease of handling during erection or dismantling, the structure will be sectionalized in five (5) sections.

Anchorage System:
Clamp Channel Anchorage Seal.
This unique Thermo-Flex, Inc., system clamps the rope beaded seal skirt under one leg of a properly sized C channel continuously around the perimeter of the building. This system is best suited for installations enclosing existing facilities or mounted on walls. It greatly reduces air leakage, has a clean appearance and simplifies installation of the membrane.

Mechanical Systems:
Thermo-Flex, Inc., constantly strives to provide the highest quality mechanical equipment in the industry. Whether it be our dependable, high quality, long service life, inflation blowers or our exclusive solenoid operated snow removal valve system, meticulous detail is most important to provide high quality standards.

Data Logger:
A data logger is included to record wind velocity and pressure in the structure. This provides the building operator documentation so he may be assured his structure is operating properly.

Inflation System:
This structure will be equipped with two (2) electrically operated blowers and automatic controls. Each blower is capable of delivering sufficient CFM of air at 1 inch water static pressure. Normal operation is on one blower and the second blower is kept in standby. If a mechanical or electrical failure should occur in the primary unit, or if there is a loss of pressure for any reason, the second unit is automatically activated to supply supplementary inflation air. The second blower will continue to run until normal pressure returns and it will then automatically shut off.

Thermo-Flex, Inc.
1700 East Iron / P.O. Box 1184 / Salina, Kansas 67402-1184
(913) 827-7201 / FAX 913-827-9337

Series No. 01043091

The blowers are non-overloading centrifugal type with backward inclined impeller blades and are equipped with properly sized motors with the proper voltage.

Horsepower	5
Voltage	480
Phase	3

Auxiliary Power System:
The structure will be equipped with one (1) emergency-power generator set. The system is complete with transfer switch panel, battery, trickle charger, and manual exerciser. It provides power for two (2) blowers in the event of a commercial power line failure. This system is enclosed for weather protection.

Voltage	480
Fuel	Propane or Natural Gas (Customer choice)

Personnel Airlock:
One (1) personnel airlock is provided as shown on Bulletin #108 attached.

Vehicle Pull Up door:
One (1) 12 ft. x 10 ft. size vehicle pull up door is provided, located on one end of the building.

Repair Kit:
One (1) repair kit included, one (1) portable fabric welder with roller, structural coated fabric and adhesive are included.

Price:
Total systems as described: $201,000.00 fob Salina, Kansas
Irrevocable letter of credit through Bank IV Wichita.

Terms: 30 percent with order.
70 percent upon presentation of valid shipping documents port side U.S.

This proposal does not include any federal, state or local taxes and is firm for a period of thirty (30) days, after which it is subject to change.

Field Consultant:
The services of a field consultant are available at a daily rate of US $300.00 plus travel and expenses.

Thermo-Flex, Inc.
1700 East Iron / PO Box 1184 / Salina, Kansas 67402-1184
(913) 827-7201 / FAX 913-827-9337

Series No. 01043091

Warranty:
Our standard warranty is for one (1) year on the material and workmanship on a structure manufactured from vinyl coated polyester material. Refer to the enclosed warranty for terms and conditions.

OPTION #1:*
1/20th Aeration System
Two (2) 48-inch 24,000 CFM axial aeration blowers will be provided to accommodate 1/20th CFM per bushel up to a maximum of 1,200,000 bushels.
Package price: $10,272.00.
Customer Signature _____

OPTION #2:
1/10th Aeration
Five (5) additional 48-inch 24,000 CFM axial aeration blowers will be provided to accommodate 1/10th CFM per bushel up to a maximum of 1,200,000 bushels.
Package price: $25,680.00.
Customer Signature _____

OPTION #3
1/10th Aeration
Eight (8) additional 48-inch 24,000 CFM axial aeration blowers will be provided to accommodate 1/10th CFM per bushel up to a maximum of 2,000,000 bushels.
Package price: $41,088.00
Customer Signature _____

OPTION #4:
Snow Melt Furnace
One (1) 1.75 million BTU output indirect fired recirculating propane furnace with return and discharge duct work included.
System price: $16,359.00
Customer Signature _____

OPTION #5:
Snow Melt Furnace
One (1) three (3) million BTU output indirect fired recirculating propane furnace with return and discharge duct work included.
System price: $22,284.90
Customer Signature _____

250

Thermo-Flex, Inc.
1700 Ford Iron / P.O. Box 1184 / Salina, Kansas 67402-1184
(913) 827-7201 / FAX 913 827-9337

Series No. 01043091

OPTION #6:
Thirty (30) ft. fabric covered vehicle entryway
One (1) thirty (30) ft. long fabric cover designed to attach on top of an eight (8) ft. wall entrance with an inner fabric pull door. This feature allows the customer to have a vehicle airlock with easy open access to the inside of the structure for a fraction of the investment of a conventional standard airlock.
System price: $7,238.50
Customer Signature _____

OPTION #7:
Oversized door
One (1) oversized (14 ft. x 14 ft.) vehicle fabric pull up door in lieu of the 10 ft. x 12 ft. vehicle entry door.
System price: $2,300.00
Customer Signature _____

OPTION #8:
Power aeration louvers
Twenty-four (24) powered aeration louvers to attach around the perimeter on the fabric envelope and one (1) to seal the grain tunnel. (Wiring and switching not provided by Thermo-Flex, Inc.).
System price: $7,780.00
Customer Signature _____

OPTION #9:*
Powered roof vent
One (1) powered 110V roof vent pre-wired to fabric envelope (electrical hook up and power supply at ground level by others).
System price: $750.00
Customer Signature _____

OPTION #10:*
Conveyor attachment system
Nine (9) cable attachment points to attach the grain conveyor to the air structure envelope. Conveyor base stand, conveyor, and erection into place to be provided by others.
Thermo-Flex, Inc., field consultant will be available for technical assistance.
System price: $1,800.00
Customer Signature _____

Thermo-Flex, Inc.
1700 East Iron / PO Box 1184 / Salina, Kansas 67402-1184
(913) 827-7201 / FAX 913 827-9337

Series No. 01043091

*OPTION #11:
Grain Loading Equipment
One Model 50 Mass-Ter Mover incline unit 140' long, 5,000 BPH, CA551X chain. One inlet, one outlet, 30-HP bottom drive unit with 30 HP, 3 Phase TEFC motor. Bottom intake pivot, lift support bracket.
One Model 50 Mass-Ter Mover swing away inlet hopper for truck dump. 7½ HP drive with motor, throat discharge. Height is 12 ft.
System Price: $35,470.00
Customer Signature _____

*OPTION 12:
1/20 hp Aeration P.V.C. Lines
9 line system 123 ft. per line, 24 in. inside diameter this system as designed for long term storage of wheat, oats, flax, and milo.
System Price: $19,200.00
Customer Signature _____

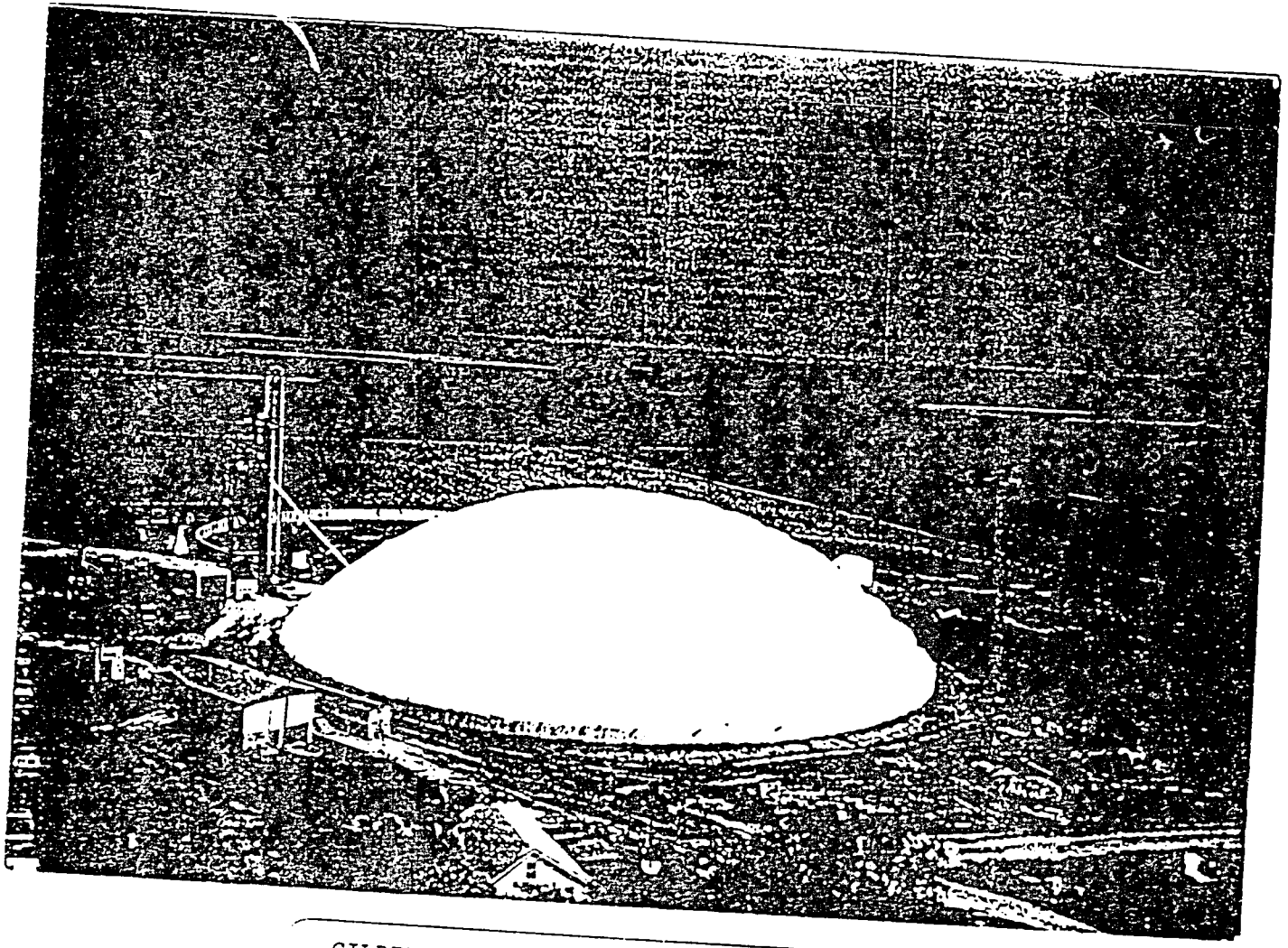
Total with recommended option fob Salina, KS: $268,492.00

Total of sale with/without options included: $_____
Customer Signature _____

NOTE: On customer approval of proposal, Thermo-Flex, Inc. will provide a sales contract agreement.

* Options 1, 9, 10,11, and 12 should be considered for long term storage. Total shipment with recommended options is four 40 ft. and one 20 ft. container.

BULK STORAGE
AIR SUPPORTED GRAIN STORAGE



GILBERT GRAINS ABILINE/KANSAS
STORAGE CAPACITY: 35,000 MT PER DOME

FOR Procure. Centre

ADDRESS:

JIM ROESNER.

THERMO FLEX MEMBRANE STRUCTURE

FAX 913-827-93

U.S.

100 TON
400 TON
1,000 TON
20,000 TON.

Fax prepared 11.30.

253

ANNEX A-7

MUSKOGEE TYPE BUILDING FOR OILSEED STORAGE

A Muskogee type building can be built as an alternative to the Thermo-Flex air supported structure described in this section. It is a concrete structure which has a capacity of 20,000 tons of cotton seed. Equipped with a proper temperature control system, a Muskogee house can also be used for storing sunflower seeds. But its storage capacity is only 10,000 tons, because of the lower density of sunflower seed compared to cottonseed.

All designs and drawings must be provided by the foreign supplier (Muskogee Iron Works, Inc.) who supervises the local construction of the seed house. Materials for the construction (steel, galvanized iron sheets, louvers, conveyance) are locally available.

Building specifications:

Floor dimension	= 150 ft x 280 ft = 42,000 sq ft
Maximum height	= 82 ft
Capacity	= 20,000 tons for cottonseed
	= 10,000 tons for sunflower seed

Estimate for construction expenditures, including purchase of materials, flooring, construction, supervision, engineering and designing for a seed house = 10 million rupees (source: equipment manufacturers and feasibility studies).

In addition, each seed house must be equipped with a temperature and humidity control and monitoring system (about US$ 45,500) and conveying and aeration system (about US$ 259,000).

Two Muskogee seed houses are needed to meet the storage requirements of the project during the first three years of operation. But the annual sunflower seed intake increases at such a pace that a third seed house will be needed from the fourth year.

ANNEX A-8

DRYING AND STORING SUNFLOWERS
(Source: synthesis note from various documents)

Introduction:

Research shows that the resistance to storage fungi by sunflowers at about 10 percent moisture is equal to wheat at 15 percent moisture content. Probably the most critical aspect of storing sunflowers is to place dry-cleaned seeds into storage.

Drying Sunflowers:

Sunflowers dry easily. Bin, batch and continuous-flow dryers have been used successfully. Drying sunflowers from 20 percent to 10 percent moisture removes only about 3.0 pounds of moisture per bushel.

Drying temperatures of 71 degree C, up to 104 degree F, do not have an adverse effect on oil yield or fatty acid composition. Continuous-flow dryers and recirculating-batch dryers should be operated at plenum temperatures of 160 degrees F. UNDER NO CONDITION SHOULD SUNFLOWER USED FOR SEED, BE DRIED AT PLENUM TEMPERATURES OF 43 DEGREES C, OVER 110 DEGREES F.

Guidelines for drying sunflower are:

1. Use good housekeeping practices. Clean up around the dryer and in the plenum chamber daily.

2. Do not over dry.

3. Ensure continuous flow for all sections of recirculating batch and continuous-flow dryers. Uneven flow will cause over-dried spots and increase fire hazards.

4. Do not leave drying equipment unattended.

ANNEX A-9

TECHNICAL SPECIFICATIONS FOR SUNFLOWER CULTIVATION
Source: derived from recommendations and specifications of various companies, including Pioneer and GCP.

Sunflower Cropping Tech.:

- Sunflower can be cultivated twice a year, once in January/February as a spring crop and again in July and August as a fall crop.

- Sunflower can be rotated easily within the summer and winter cropping seasons, for instance, it can be rotated with cotton, wheat, potato and rice (see the note attached hereafter 'Desirable Crop Rotation for Sunflower').

Crop Rotation:

The possible crop rotation easily adaptable for sunflower is as follows:

May through November	December Through May
a). Cotton (May - November)	Sunflower (Feb - May)
b). Sunflower (Aug - Nov)	Wheat (Nov - May)
c). Rice (Aug - Nov)	Sunflower (Feb - May)

- Sunflower has a deep roots system which, enables it to better withstand shortage of water.

- It requires an extremely short time span to mature from 90 - 110 days depending on the season.

- It can be successfully grown in all types of soil conditions, with the exception of saline or sandy soil.

Hybrid seed:

- It has a yield potential of 1.4 - 3.5 mt/ha (See PARC/CIMMYT Paper 90-8).
- Plants are of short stature with flowers coming out at the optimum angle.
- Has an excellent heat resistant quality.
- Responsive to fertilizer: higher yields with higher fertilizer use.
- Seeds have an extremely high oil content.
- Varieties have produced the best results in government trials and in farmer fields.

Land Selection and Preparation:

A loamy to a heavy loamy type of a soil/land which does not have a large number of trees in the vicinity would be ideal.

Planting and Cultivation Timing:

15th January to 15th February: Faisalabad, Sahiwal, Okara.
20th January to 10th February: Khanewal, Multan, Vehari.

Seed Quantity:

If the field capacity moisture is not up to the required level, then it is recommended that 3 kg/acre of seed be used. In the case of sowing on ridges then 2.5 kg/acre of seed should be used.
Size of the seed kernel is of critical importance to determine density of plant population. Small size kernels are numerically greater per kilogram, and give a higher plant population with the same germination % as compared to Large sized kernels.

Cultivation:

a) In case of optimum field capacity moisture of the soil, planting should be done in rows that are 2 to 2.5 feet apart with a seed drill.

b) In case of dry soil, ridges must be made which are 2 to 2.5 feet apart, and seed must be planted at a distance of 6 to 8 inches from one another at a depth of about one inch.

Fertilizer:

In order to achieve maximum yields the following nutrient weight per acre must be applied :

Nitrogen:	**Phosphorus:**	**Potash:**
45 kg	25 kg	15kg

a) **Sowing:**

At the time of sowing :

- One 50kg bag of D.A.P or three 50kg bag of SSP
- Half 50kg bag of urea or two 50kg bag of AS

  or one 50 kg bag of ammonium sulphate,
- Half 50kg bag of S.O.P should be used.

First Irrigation:

- Half 50kg bag of urea
  or one 50 kg bag of Ammonium sulphate must be used.

Before the flower stage:

- Half 50kg bag of urea

  or one 50 kg bag of ammonium sulphate must be used.

Irrigation:

Irrigation must be done in such a manner which ensures that only the moisture reaches the seed.

During the spring, water/moisture requirements are low during the start of the season, and increases when the weather warms up at the flowering/seeding stage when frequent irrigation must be done at shorter intervals.

During the flowering/seeding stage there absolutely must be no shortage of water or moisture.

Thinning and Interculture:

In irrigated areas, the optimum number of plants/acre should be between 20,000 to 25,000 or between 50,000 to 62,500.

To establish healthy vegetative growth, unwanted plants must thinned by hand or hoeing must be done twice mechanically. The required weedicides must be used for eradication of weeds.

Disease:

Sunflower can be affected with stem rot prior to flowering.

Pests:

For crop protection in case of insects, the following insecticides must be used:

a) Five kg of BHC/acre, mixed with dirt or ashes.

b) 400 to 600 ML of Methyl Parathion,
   or 500 to 750 grams of Arthane per acre should be sprayed.

c) 7 kg of Disyston/acre
   or 300 ml of sumicidon/acre should be sprayed.

At the time the crop ripens, birds/parrots flock to the fields and can cause enormous damage.

Harvesting:

Thirty five or forty days after flowering, the crop is ready for harvesting. The seed hardens and moisture is around 25%. Harvesting maybe done by the following methods:

1. Appropriate means of harvesting sunflower is done by combines. The crop must be thoroughly ripe before harvesting can be carried out by a combine.

2. Sunflower may also be hand harvested by cutting it with a sickle. In this case the flower after they are left in the sun to dry. The seed is then separated by a thresher.

Purchase Price:

The purchase price paid in 1990 was Rs. 220 - 225 per 40 kg. The recommended purchase price for sunflower should be at least Rs. 240 per 40 kg, provided it does not contain more than 4% waste material and the seed must not contain more than 10% moisture.

Quality Standard for purchase of sunflower seed.

1. Moisture - 10%
2. Waste/dirt etc - 4%
3. Damaged Seed - 2%

ESTIMATED COST OF PRODUCTION OF SUNFLOWER 1991 CROP
(Source = GCP Seed Division)

S.NO.	OPERATIONS/INPUTS	SUNFLOWER NO./QTY.	RATE/UNIT (RS.)	TOTAL EXP. RS./ACRE	TOTAL EXP. RS./HA
01	Preparatory tillage:				
	i) Ploughing	4	50	200	494.00
	ii) Planking	2	20	40	98.80
02	Seed bed preparation:				
	i) Ploughing	4	50	200	494.00
	ii) Planking	1	20	20	49.80
03	Cost of Seed (Kgs)	3	120	360	889.20
04	Sowing and Labor Charges @ Rs/ 40/day				
	i) Man days	0.25	40	10	49.40
	ii) Man days Spray Deweeding	0.25	40	10	24.70
	iii) Application of Fert.	0.25	40	10	24.70
	vi) Cleaning of water courses (M.days)	0.1	40	44	98.80
	v) Labour of Irrigation (M. days)	0.1	40	4	98.80
	Labor Charges:				
	Interculture:				
	vi) Thinning (M. days) 1	0.1	40	20	49.40
	vii) One weeding/hoeing (M. days) wedicide	1	40	40	98.80
	viii) Earthing up (M. days)	1	40	40	98.80
	ix) Watch & Ward (Caving of birds) (boys days) @Rs. 40 x 5			158	390.26
05	Fertilizer:				
	i) DAP (Bags)	1	290	290	716.30
	ii) Nitrophos "	2	500	500	
	iii) Urea "	1	100	890	
06	Plant protection (Spray)	One Spray	200	200	494.00
07	Harvesting:				
	i) Harvesting/picking heads (M.days)	5	40	200	494.00
	ii) Threshing & Winnowin		300	300	741.00
	a) M. days Winnowin				
	b) B.pair days including driver				
	c) Tractor hours				
	d) Harvesting cost @ Rs. 500/Acre	500			1,235.00
08	Canal water rates 40 x 5			200	494.00
09	Interest on investment for 6 months (@ 6% for 6 months)		500	239	
10	Management charges		60	60	148.20
	Sub-Total		2,570	4,035	7,282
11	Rent of land Rs. 1000/Acre			1,000	2,470.00
	Total cost/Acre includding land rent		2,828	3,828	9,455.16
12	Interest @ 7.5%		212	287	708.89
13	Breakeven Yield/Acre		3040	4115	(10,164.00)
14	Target Yield must exceed		.506/Ton/Ha	3989 .685/Ton/Ha	1.694 Ton/Ha

ANNEX A-11

COST OF FARM IMPLEMENTS SUITABLE FOR SUNFLOWER CULTIVATION AND HARVEST

DESCRIPTION (Country of Origin: Pakistan)	PRICE PER UNIT EX-FACTORY (RS.)
1. Chisel Plough; 3 Tine, Model MT-01	9,000
2. Ridger 3-Rows (Tool Bar Type)	8,750
3. Maschio Rotary Trillers- Model U1.55	40,500
4. Off Set Disc Harrow: 16 Discs	24,375
5. Mould Board Plough; 3-Furrow (Fixed)	11,700
6. Disc Plough; 3-Furrow (Fixed)	20,400
7. Sunflower Planter with FA; 4-Row for Seed & 4-Row for Fertilizer	13,150
8. Sunflower Kit for Combine Harvester	22,000

Source: Quotation from Millat Tractors Limited, April 1991.

ANNEXES

TO

SECTION "B"

TECHNICAL FEASIBILITY ANALYSIS FOR A
SOLVENT EXTRACTION PLANT

FOR

A VERTICALLY INTEGRATED
SOLVENT EXTRACTION PLANT

GOVERNMENT OF PAKISTAN
MINISTRY OF FINANCE

ANNEX B-1

+++

Islamabad, the 13th December, 1990.

NOTIFICATION
CUSTOMS

S.R.O/284(I)/90.- In exercise of the powers conferred by section 19 of the Customs Act, 1969 (IV of 1969), sub-section (2) of section 2 of the Finance Ordinance, 1982 (XII of 1982) and section 13 of the Sales Tax (Amendment) Act, 1990 (VII of 1990), the Federal Government is pleased to exempt such plant and machinery as is not manufactured locally and is imported during the period commencing on the 1st December, 1990, and ending on the 30th June, 1995, for setting up new units and for expansion or balancing, modernization and replacement of existing units,-

(a) in areas other than mentioned in Table-I, from whole of the custom duty, surcharge and sales tax leviable or chargeable thereon under the First Schedule to the Customs Act, 1969, or, as the case may be, the Finance Ordinance, 1982, or the Sales Tax (Amendment) Act, 1990; and

(b) in the areas specified in Table-II from so much of the customs duty leviable thereon under the First Schedule to the Customs Act, 1969, as is specified in column 3 of the said Table and whole of the sales tax chargeable thereon under the Sales Tax (Amendment) Act, 1990,

subject to the conditions set out below, namely:-

(1) For the purpose of this notification, machinery shall mean-

(i) machinery operated by power of any description, such as is used in any industrial process including mining and extraction of timber;

(ii) apparatus and appliances, including metering and testing apparatus and appliances specially adapted for use in conjunction with machinery specified in item (i) above;

(iii) power generating plant for operating item (i) above;

(iv) mechanical and electrical control and transmission gear adapted for use in item (i) above; and

(v) component parts of machinery as specified in items (i), (ii), (iii) and (iv) above, identifiable as for use in or with such machinery.

(2) The importer shall, at the time of import of machinery, make a written declaration on the bill of entry to the effect that the machinery has been imported for a project located in areas other than those specified in Table-I or for the areas specified in Table-II, as the case may be.

265

(3) The importer shall furnish an indemnity bond in the Form set out below to the extent of customs duty, surcharge and sales tax exempted under this notification. The said indemnity bond shall be discharged subsequently on the production of a certificate from the Assistant Collector, Customs and Central Excise, to the effect that the plant and machinery imported for setting up new units or expansion or balancing, modernization and replacement of existing units located in the areas enjoying benefit of concession under this notification, have been duly installed in the aforesaid areas.

(4) The certificate of installation referred to in condition (3) shall be submitted to the Collector of Customs not later than one year from the date of importation of the plant and machinery to which it relates.

266

(5) The plant and machinery released under this notification shall not, within a period of eight years from its importation, be used in any area which is not eligible for the same concession. In case this condition is violated the amount of customs duty, surcharge and sales tax exempted under this notification and penalties that may be imposed in this behalf shall be recovered under section 202 of the Customs Act, 1969 (IV of 1969).

TABLE I

S.No.	Areas
1.	The municipal or Cantonment Board limits of Karachi and 40 kilometers area around these limits.
2.	The municipal or Cantonment Board limits of Lahore and 30 kilometers around these limits.
3.	The existing limits of Municipal Corporations, Municipal Committees and their Cantonment Boards and 10 kilometers areas around Municipal Corporations and their Cantonment Boards, in provinces of Sind and Punjab excluding Bahawalpur, D.G. Khan, Sukkur and Larkana Divisions.
4.	Areas falling within the limits of Islamabad Capital Territory and Hub Tehsil in the province of Baluchistan.

267

TABLE II

S.No.	Areas	Extent of exemption
1.	All approved industrial estates in the following areas: Hub Tehsil in the province of Baluchistan; Districts of Mianwali and Bhakkar and tehsil of Khushab in the province of Punjab; and Districts of Tharparkar and Dadu (excluding Taluka of Kotri) in the province of Sind.	[illegible]
2.	All approved industrial estates in the following areas: - Islamabad Capital Territory. - Lahore District and Tehsils of Ferozwala, Gujranwala, Sialkot, Faisalabad, Multan and Rawalpindi in the province of Punjab. - Talukas of Kotri and Hyderabad in the province of Sind.	One half (1/2) of the leviable customs duties.
3.	All approved industrial estates located in the areas other than those mentioned at Table I and S.No.1 and 2 above excluding Karachi Division.	Three fourth (3/4) of the leviable customs duties.

268

FORM

[See condition (3)]

(on appropriately stamped non-judicial paper)

INDEMNITY BOND

THIS DEED OF INDEMNITY is made on the .....day of.....BETWEEN Messrs.....having registered office at.....(hereinafter called "the importer" which means and includes their successors, administrators, executors and assignees) of the one part, AND the President of Pakistan through the Collector of Customs.....(hereinafter called "the Collector of Customs)" of the other part;

WHEREAS the Federal Government has, by its decision contained in Notification No. SRO.....dated the.....and subject to the conditions given in the said Notification, been pleased to direct that such plant and machinery as is not manufactured locally, shall be exempted from .....of the customs duty chargeable and whole of the surcharge and sales tax leviable thereon, if imported for the setting up, expansion or balancing modernization or replacement of an industrial unit in accordance with the said Notification;

269

AND WHEREAS M/s.....

having registered office at.....

(hereinafter called the importers) have imported the plant and machinery mentioned in the Schedule to this Bond for the purpose of the setting up, expansion, or balancing modernization and replacement of an industrial unit in accordance with the conditions given in the said Notification;

NOW, THEREFORE, in consideration of the release of the machinery without recovery of customs duty, surcharge and sales tax, the importers bind themselves to pay on demand to the Government of Pakistan the sum of Rs..... being the customs duty, surcharge and sales tax, leviable on the machinery, if the importers fail -

(i) to produce a certificate from the Assistant Collector, Customs and Central Excise, within one year from the date of the importation of the plant and machinery, to the effect that the plant and machinery has been installed in the areas specified in the Tables given in the said Notification; or

(ii) to produce such other evidence as the Collector of Customs may require to satisfy himself that the plant or machinery has been installed in accordance with the conditions of the said Notification.

270

The importers further agree and bind themselves that the amount covered by this Bond may be recovered as arrears of customs duty under section 202 of the Customs Act, 1969.

The Bond shall become void when the aforesaid certificate has been produced and the Collector of Customs is satisfied that the importers have fulfilled all the conditions of this Bond and the said Notification.

Signed by importers on this.....
day of.....19 .

.....
(Managing Director)

(Name and permanent address)

Witness.....
(signature, name, designation and full address)

Witness.....
(signature, name, designation and full address)

Note: The bond shall be written on appropriate non-judicial stamp paper and shall be witnessed by a Government servant in Grade 16 or above, an Oath Commissioner, a Notary Public or an officer of a Scheduled Bank.

SCHEDULE OF MACHINERY"

(G. A. JAHANGIR)
ADDITIONAL SECRETARY

C.No.1(35)Mach/90.

271

212

16 PUNJAB
17
JAMMU & KASHMIR
DISPUTED TERRITORY
AFGHANISTAN
ISLAMABAD
NORTH WESTERN FRONTIER
BALUCHISTAN
SIND
Sargodha
Scale 1:2,000,000

ANNEX B-2

ANNEX B-3

FOREIGN EQUIPMENT MANUFACTURERS OF OILSEED PROCESSING PLANTS, REFINING PLANTS, PACKAGING PLANTS AND POWER GENERATING UNITS
(see also next page)

EQUIPMENT	MANUFACTURER/SUPPLIER (1)	COUNTRY OF ORIGIN
1. Oilseed Receiving & Handling		
Truck Dumper	PHELPS	USA
2. Oilseed Conveying & Aeration		
Seed House Conveying System and Cooling Fans	HUTCHISON	USA
	BUTLER	USA
	BULHER	USA
	GRAINSYSTEMS	USA
3. Temperature Monitoring & Control		
Monitoring System with Humidity and Temperature Control for Seed House	ROLFES	USA
4. Seed Preparation		
Cleaning, Delinting and Dehulling Plant	CARVER	USA
	IMPCO	USA
5. Oil Extraction		
Pre-pressing and Solvent Extraction Plant	FRENCH OIL COMPANY	USA
	DE SMET	USA
	LURGI	GERMANY
	KRUPPS	GERMANY
6. Refining		
Neutralization, Bleaching Deodorization Plant	ALFA LAVAL / SHARPLES	SWEDEN
	WESTFALIA	GERMANY

(1) This is not an exclusive list of manufacturers nor does it include local manufacturers.

EQUIPMENT	MANUFACTURER/SUPPLIER (1)	COUNTRY OF ORIGIN
7. Quality Control		
Laboratory Equipment for Analysis of Protein, Oil and Moisture of Meal and Seeds (Near-Infra-Red Analyzer)	DICKEY JOHN	USA
Laboratory Equipment for Potentiometric Titrations	BRINKMANN INSTRUMENTS	USA
8. Auxiliary		
Water Treatment Plant	CULLIGAN	USA
Power Generator	CATERPILLAR	USA
	AEG	GERMANY
	SIEMENS	GERMANY
9. Packaging		
Blow Molding	SIDEL	FRANCE

(1) This is not an exclusive list of manufacturers nor does it include local manufacturers.

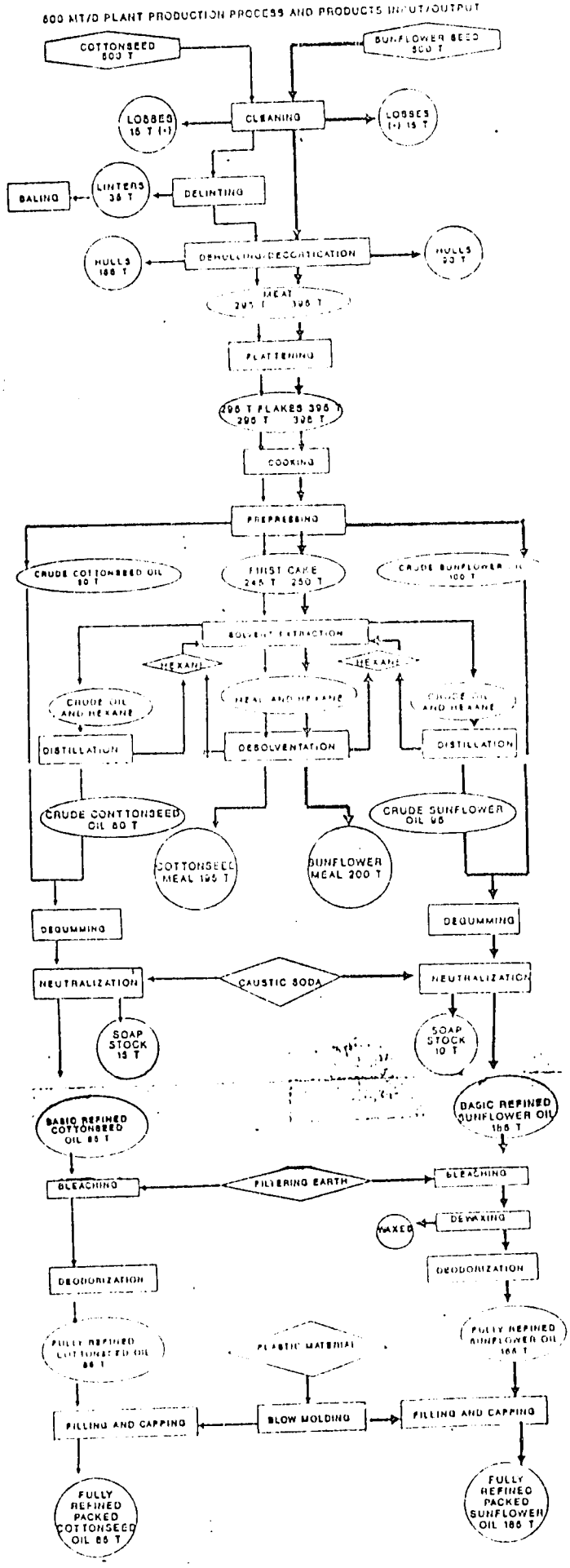
FABRICATORS OF EQUIPMENT TO BE MANUFACTURED LOCALLY

DESIGN DEVELOPMENT FABRICATION COMPANY (D.D.F.C.), Lahore

CENTRAL ENGINEERING SERVICES (C.E.S.), Lahore

JAVED ENGINEERING COMPANY (J.E.C.O.), Gujranwala

600 MT/D PLANT PRODUCTION PROCESS AND PRODUCTS INPUT/OUTPUT



(*) Total losses account for 3% of the total seed input. There are losses at each stage of the process. However, for the purpose of the chart material balance, the losses are figured out at the cleaning stage

OPERATIONS FINAL OUTPUT INTERMEDIATE INPUT/OUT

OILSEEDS RAW MATERIALS OTHER THAN OILSEEDS

ANNEXURE B 5

CALCULATION OF DAILY STEAM REQUIREMENTS FOR OILSEED PROCESSING AND OIL REFINING YEAR 1 TO 6

	PROCESS (1)	STEAM CONSUMPTION PER TON OF OIL (2) (tons)	DAILY STEAM REQUIREMENTS FOR COTTONSEED OIL: DAILY VOLUME OF OIL PROCESSED (3) (tons)	DAILY STEAM REQUIREMENTS FOR COTTONSEED OIL: DAILY STEAM REQUIREMENTS (tons)	DAILY STEAM REQUIREMENTS FOR SUNFLOWER OIL: DAILY VOLUME OF OIL PROCESSED (3) (tons)	DAILY STEAM REQUIREMENTS FOR SUNFLOWER OIL: DAILY STEAM REQUIREMENTS (tons)
YEAR 1	OE + BR	2.0	64	128	111	222
YEAR 2	OE + BR	2.0	68	136	120	240
YEAR 3	OE + BR	2.0	77	154	130	260
YEAR 4	OE + CR	2.3	81	186	139	320
	FR	0.3	69	+21	11	+3
YEAR 5	OE + CR	2.3	81	186	148	340
	FR	0.3	89	+27	22	+7
YEAR 6	OE + CR	2.3	81	186	167	384
	FR	0.3	109	+33	23	+7

(1) Process:
- OE + BR = Oil Extraction + Basic Refining (from year 1 to year 3, the plant produces basic refined oil).
- OE + CR = Oil Extraction + Complete Refining (from year 4 to year 6, the plant produces fully refined oil).
- Complete Refining = Basic Refining + Final Refining
  Final Refining only ; from year 4, the plant purchases an additional volume of basic refined cottonseed from the market that it fully refines (bleaches and deodorizes): 69 tons in year 4, 89 tons in year 5 and 109 tons in year 6 (see production program, part I, chapter 4).

(2) Average steam consumption per ton of oil processed:
- 2 tons if the process stops at the neutralization stage (production of basic refined oil),
- 2.3 tons if the processed includes a complete refining (production of fully refined oil),
- 0.3 tons for the final refining only (bleaching + deodorization).

(3) Refer to the production program, part I, chapter 4.

(2) + (3): Consumption estimates derived from Pre-Investment Considerations and Appropriate Technology in the Vegetable Oil Industry, UNIDO.

ANNEXURE 5-6

CALCULATION OF ELECTRICITY REQUIREMENTS FOR OILSEED PROCESSING AND OIL REFINING YEAR 1 TO 6

	PROCESS (1)	ELECTRICITY CONSUMPTION PER TON OF OIL/SEED PROCESSED (2) (KWH)	ELECTRICITY REQUIREMENTS FOR COTTONSEED OIL PRODUCTION: VOLUME OF SEED/OIL PROCESSED (tons) (3) DAILY	HOURLY	ELECTRICITY REQUIREMENTS (KWH)	TOTAL	ELECTRICITY REQUIREMENTS FOR SUNFLOWER OIL PRODUCTION: VOLUME OF SEED/OIL PROCESSED (tons) (3) DAILY	HOURLY	ELECTRICITY REQUIREMENTS (KWH)	TOTAL
YEAR 1	OE	150	375	15.6	2,344 +		300	12.5	1,875 +	
	BR	20	64	2.7	53 =	2,397	111	4.6	93 =	1,968
YEAR 2	OE	150	400	16.7	2,500 +		325	13.5	2,031 +	
	BR	20	68	2.8	57 =	2,557	120	5.0	100 =	2,131
YEAR 3	OE	150	450	18.8	2,813 +		350	14.6	2,188 +	
	BR	20	77	3.2	64 =	2,877	130	5.4	108 =	2,296
YEAR 4	OE	150	475	19.8	2,969 +		375	15.6	2,344 +	
	CR	100	81	3.4	338 +		134	5.6	558 +	
	FR	80	69	2.9	230 =	3,536	11	0.5	37 =	2,939
YEAR 5	OE	150	475	19.8	2,969 +		400	16.7	2,500 +	
	CR	100	81	3.4	338 +		148	6.2	617 +	
	FR	80	89	3.7	297 =	3,603	22	0.9	73 =	3,190
YEAR 6	OE	150	475	19.8	2,969 +		450	18.8	2,813 +	
	CR	100	81	3.4	338 +		167	7.0	696 +	
	FR	80	109	4.5	363 =	3,670	23	1.0	77 =	3,585

(1) Process:
- OE = Oil Extraction
- BR = Basic Refining
- CR = Complete Refining = Basic Refining + Final Refining
- FR = Final Refining only

- year 1 to year 3, the plant produces basic refined oil.
- year 4 to year 6, the plant produces fully refined oil. In addition, the plant purchases [illegible] equivalent volume of basic refined cottonseed oil from the market that it fully refines (bleaches and deodorizes).

(2) Electricity requirements:
- OE: 150 KWH per ton of seed, including seed houses operation, cleaning, delinting, dehulling, [illegible] and solvent extraction.
- CR: 100 KWH per ton of oil, including packaging.
- FR: It is assumed that about 30% of electricity requirements for the complete refining [illegible] consumed during the neutralization stage.

(3) Refer to the production program, part I, chapter 4.

Source: requirement estimates derived from Pre-Investment Considerations and Appropriate Planning in the Vegetable Oil Industry, UNIDO.

ANNEXES

TO

SECTION "C"

MARKET, SALES AND DISTRIBUTION

FOR

A VERTICALLY INTEGRATED
SOLVENT EXTRACTION PLANT

ANNEX C-1

ESTIMATED MARKET DEMAND FOR SUNFLOWER MEAL IN THE LIVESTOCK AND POULTRY FEED INDUSTRY IN PAKISTAN

Source : Livestock Feed Case Study, RONCO ACSCA, 1990.

1. Sunflower Meal Quality and Recommendations for the Use of Sunflower Meal in Poultry Diets

The sunflower meal quality depends upon:

- The oil content of the seed.
- The extent of dehulling (hull removal) as it is a major determinant of the protein and fiber contents. Hull removal from sunflower seeds is not as easy as hull removal from other oilseeds, resulting in lesser opportunities for full replacement of oilseed meals by sunflower meal.
- Oil extraction efficiency: different oil milling processes result in different meal qualities. A prepress operation followed by solvent extraction is the most common method of oil extraction and the final oil content in the meal varies from 0.5 to 1.5 percent:

TABLE 1

OIL CONCENTRATION IN THE SUNFLOWER MEAL

OIL MILLING PROCESS	FINAL OIL CONCENTRATION
Mechanical extraction	8.0 %
Prepress + solvent extraction	0.5 to 1.5 %
Direct solvent extraction	3.5 %

Ruminant rations offer great opportunities for sunflower meal use because undehulled or partially dehulled sunflower meal can fully replace soybean meal on an equivalent protein basis. Only dehulled or partially dehulled sunflower meal can be used in poultry feed, because dehulling reduces the fiber content as shown in Table 2.

TABLE 2

REPRESENTATIVE COMPOSITIONS OF SUNFLOWER MEALS

	SOLVENT EXTRACTED			MECHANICALLY EXTRACTED	
	With hulls	Partially dehulled	Dehulled	with hulls	dehulled
	% as fed				
Dry matter	90.0	90.0	90.0	95.0	96.0
Crude protein (min)	**28.0**	**34.0**	**41.0**	**28.0**	**37.0**
Fat	1.5	0.8	0.5	9.0	9.1
Crude fiber	**24.0**	**21.0**	**14.0**	**26.2**	**15.8**
Calcium	0.36	0.35	0.34	0.35	0.35
Phosphorus	0.89	0.95	1.04	1.05	1.17

Source : National Sunflower Association (NSA), USA, 1986.

The lysine content is the second major constraint to the extensive use of sunflower meal in poultry ration. Comparative composition of different meals, including sunflower meal, is being reviewed for five critical amino acids in Table 3. Compared to other oilseed meal and in particular soybean meal, sunflower meal shows a low lysine content. But the methionine content is higher. Of the 22 required amino acids, excluding lysine, normal supply is obtained from the combination of raw materials found in poultry rations.

TABLE 3

AMINO ACID COMPARATIVE COMPOSITION OF SUNFLOWER MEAL, SOYBEAN MEAL, COTTONSEED MEAL AND RAPESEED MEAL

	MEAL (% of protein)			
AMINO ACID	SUNFLOWER	SOYBEAN	COTTONSEED	RAPESEED
Arginine	8.40	7.23	10.31	6.11
Cystine	1.24	1.98	1.99	1.23
Lysine	**3.36**	**5.60**	**4.09**	**5.98**
Methionine	1.67	1.14	1.45	1.78
Tryptophan	0.95	1.63	1.33	1.16

Source : NSA, 1986.

Another quality problem is related to the stickiness of the meal which causes a necrosis of the beak when sunflower is included in rations at a high level (see table 5).

2. SCOPE FOR THE USE OF SUNFLOWER MEAL IN THE POULTRY FEED INDUSTRY

An estimation of the scope of use of sunflower meal in poultry rations in Pakistan is based on the following recommendations and assumptions:

1. Due to its high fiber content, the use sunflower meal is restricted to 8% in broiler growing diets, and 16% in broiler finishing diets due to the high fiber content.

2. In layer diets, full replacement of soybean meal (extensively used in typical poultry rations) on an equivalent protein basis is possible, with a lysine supplementation if the ration contains more than 5% of sunflower meal.

3. The protein percentage in typical formulations for breeders and layers is derived from typical formulations with yellow corn and dehulled soybean meal as major ingredients: rations with the highest protein level were selected in Table 4 to estimate the greatest possible scope for the use of sunflower meal. Therefore, the protein levels of rations are: 20% for starter, 14% for grower, 19% for layer.

TABLE 4

TYPICAL POULTRY RATIONS BASED ON SOYBEAN MEAL

RATION	SOYBEAN MEAL	CORN	OTHER MEALS
starter	21.1 %	63.4 %	6.3 %
grower	10.9 %	71.9 %	1.4 %
layer	25.2 %	58.9 %	3.8 %
breeder	15.5 %	65.7 %	8.0 %

Source : Commercial Chicken Production Manual, Third edition (1984)

In these typical rations, soybean meal is the major source of protein. Other meals -such as fish meal, meat and bone meal and alfalfa meal- are maintained in the formulation to make up the

deficiency of certain amino acids. Moreover, it would not be realistic to work out a formulation only based on one source of protein.

4. It is assumed for purposes of calculation, that the quality of sunflower meal available in Pakistan is such that its protein content is equal to the average protein content of a recommended quality soybean meal. In other words, Table 5 was built on the hypothesis that the protein content of sunflower meal is around 41%, assuming the sunflower is totally dehulled passed through solvent extraction (see Table 2).

TABLE 5

SCOPE FOR USE OF SUNFLOWER MEAL IN POULTRY RATIONS IN PAKISTAN (1)

MANUFACTURED FEED		SUNFLOWER MEAL	
RATION	OUTPUT 1989 (2)	MAXIMUM RATE OF INCORPORATION	CORRESPONDING VOLUME (2)
Broiler starter	123,336	8 %	9,867
Broiler finisher	312,908	16 %	50,065
Chick starter	11,420	21 %	2,398
Grower mash	87,934	11 %	9,673
Layer mash	519,610	25 %	129,903
Breeder starter	2,284	21 %	480
Breeder grower	14,846	11 %	1,633
Breeder layer	70,804	15.5 %	10,975
TOTAL	1,142,000 (3)	18.8 % (4)	214,994

(1) The meal is usually sticky and use of sunflower meal in large quantities may cause a necrosis of the beak. The stickiness can be avoided by pelleting feed containing sunflower meal. Thus, a maximum amount of 15% sunflower meal could be included in all mash diets for broiler chicks, and 30% in pelleted diets. But the above calculation does not take this possibility into account.

(2) Volume in metric tons

(3) Total may not add due to rounding errors with discrepancies of 1% in value.

(4) Possible average utilization of sunflower meal in the poultry feed industry.

In 1989, the poultry feed industry could have absorbed a theoretical 215,000 tons of sunflower meal, for a marketed value of Rs. 752.5 million (Rs. 3,500/ton), providing that:

- the seed quality was good,
- the seed was properly dehulled,
- the oil was solvent extracted,
- the feed was supplemented with lysine when necessary.

A ton of sunflower meal can be considered equivalent to a ton of soybean meal on the same protein basis (41% to 42%) only if the above technical conditions are fulfilled.

As far as economic conditions are concerned:
- the meal should be available the year round,
- the meal should be less expensive than any other sources of vegetable proteins.

3. Protein Supplementation in Dairy Diets and Opportunities for Replacement of Traditional Protein Cake by Sunflower Meal in the Dairy Industry

Presently, most of the small amount of sunflower meal produced in Pakistan (16,000 tons in 1989/90) is used in the production of poultry feed despite quality complaints, mainly due to the high fiber content. But ruminant rations offer very interesting opportunities for sunflower meal consumption because partially dehulled sunflower meal can be the sole source of supplemental protein in dairy rations. Undehulled or partially dehulled sunflower meals can also fully replace soybean meal on an equivalent protein basis.

In Pakistan, cottonseed cake is the traditional and major protein source in dairy cows or buffalos diets. We estimated the scope for sunflower meal in poultry feed by estimating the scope for soybean meal and then replacing it with sunflower meal, an estimate of the present supplemental protein consumption in the form of cottonseed cake is needed to estimate the scope of sunflower meal in the dairy industry.

Livestock breeding in Pakistan is not developed on scientific lines. However some spots of intensive dairy production can be found here and there:

- The main concentration of dairy buffalos (and cows to a lesser extent) is found in the cattle colonies near Karachi where about 250,000 females are maintained on intensive breeding lines.

- A dozen of military dairy farms breed altogether some 50,000 females for the strict purpose of providing the army with milk products.

- For the last five years, several big farms (more than 200 cattle heads) are developing in the neighborhood of the largest cities (Lahore, Peshawar, Hyderabad...).

Everywhere else, small flocks of dairy cows or buffalos are maintained in the rural areas. Small farmers may also use cottonseed cake to feed their animals but the cattle feed industry is still not developed and farmers buy cottonseed cake from the local market.

An estimate of the present supplemental protein consumption in the biggest breeding units (cattle colonies and military farms) will be calculated, assuming 300,000 dairy females are raised in the said farms.

Assumptions:

- The typical ration includes wheat straw, a few kilos of fodder -for example alfalfa hay, 2 kgs of cottonseed cake as supplemental protein source, and different feedstuffs, cereal by-products, etc., to make up the deficiency in energy, proteins or minerals of the basic ration.

- The estimate is based on 300,000 buffalos assuming cattle feeding is similar for the simplification of calculation. Cattle colonies around Karachi mainly shelter buffalos. Moreover, the potential for milch buffalo production in Pakistan is enormous as this country has among the best animals in the world.

- The calculation is based on the daily nutrient requirements of a lactating female buffalo producing 4 kgs of milk a day containing 7% fat (KEARL, 1982, Nutrient requirements of ruminants in developing countries).

- 450 kgs is considered to be the average weight of a female buffalo raised in intensive conditions.

TABLE 6

DAILY NUTRIENT REQUIREMENTS OF A LACTATING BUFFALO

	DMI kg	ME Mcal/kg	DP g	Ca g	P g
Maintenance	7.7	12.21	248	12	12
Production	9.6	19.10	580	31	24
TOTAL	**17.3**	**31.31**	**828**	**43**	**36**

Source : KEARL, 1982.

DMI = Dry Matter Intake
ME = Metabolizable Energy
DP = Digestible Protein
Ca = Calcium
P = Phosphorus

TABLE 7 - APPROXIMATE COMPOSITION OF FOUR FEEDSTUFFS COMMONLY USED (1) IN MILCH BUFFALO DIETS IN PAKISTAN

FEEDSTUFFS (2)	DM	ME	DP	Ca	P
Wheat straw	90 %	1.72	0.9 %	0.18 %	0.05 %
Alfalfa hay (3)	91 %	2.35	20.0 %	1.64 %	0.22 %
Cottonseed cake (4)	92 %	2.56	23.0 %	0.25 %	1.15 %
Sunflower meal (5)	91 %	2.32	22.6 %	0.46 %	1.18 %

Source: KEARL, 1982.
(1) Except for sunflower meal
(2) DM = Dry Matter, ME in Mcal/kg, DP, Ca & P in percentage of DM
(3) Sun-cured, early bloom
(4) Seeds without lint, mechanical extracted caked
(5) Solvent extracted

Wheat straw being available at will, a maximum of 10 kgs of Dry Matter Intake is consumed by the lactating female in the form of straw. For the simplification of calculations, we will assume that about 2.2 kgs of alfalfa hay is distributed, resulting in an average DMI of 2 kgs.

TABLE 8

ESTIMATE OF DAILY NUTRIENT SUPPLY BASED ON WHEAT STRAW, ALFALFA HAY AND A COMPARISON BETWEEN COTTONSEED CAKE AND SUNFLOWER MEAL AS SUPPLEMENTAL PROTEIN SOURCES

	DMI kg	ME Mcal/kg	DP g	Ca g	P g
Straw at will	10.0	17.20	90	18.0	5.0
Alfalfa hay	2.0	4.70	400	32.8	4.4
TOTAL 1 (1)	**12.0**	**21.90**	**490**	**50.8**	**9.4**
REQUIREMENTS	17.3	31.31	828	43.0	36.0
DEFICIT 1 (2)	**- 5.3**	**- 9.41**	**- 338**	**0.0**	**- 26.6**
Cottonseed cake	1.8 *	4.71	423	4.6	21.7
DEFICIT 2A (3)	**- 3.5**	**- 4.70**	**0**	**0.0**	**- 4.9**
Sunflower meal	1.8 *	4.22	411	8.4	21.5
DEFICIT 2B (4)	**- 3.5**	**- 5.19**	**0**	**0.0**	**- 5.1**

(1) TOTAL 1 = STRAW + HAY
(2) DEFICIT 1 = REQUIREMENTS - TOTAL 1
(3) DEFICIT 2A = DEFICIT 1 + COTTONSEED CAKE
(4) DEFICIT 2B = DEFICIT 1 + SUNFLOWER MEAL
(*) Rounded figures : DMI cottonseed cake = 1.84
DMI sunflower meal = 1.82

Wheat straw and alfalfa hay would be more than sufficient to meet the maintenance nutritional requirements. However, when considering milk production, more energy and proteins are needed. A comparison is made by supplementing the fodder with 2 kgs of cottonseed cake or 2 kgs of sunflower meal. As the approximate compositions of cottonseed cake and sunflower meal are very close, the deficits after supplementation with cake or meal (deficits 2A and 2B, see table 8) are rather similar. The demand in digestible protein and calcium is met, but there is still a deficiency in metabolizable energy and phosphorus. Cottonseed cake and sunflower meal are quite interchangeable in ruminant rations.

In reality, the above deficiencies are easily made up by a very important quantity of concentrated feed, 10 kgs per female, per day including 2 kgs of cottonseed cake as it is available round the year and different by products such as bran, rice polishing, molasses, etc.. Due to this important volume of concentrated feed distributed to each female, the protein and energy levels are such that they allow a much higher yield than 4 kgs of milk a day. The average milk production in the "cattle colonies" is around 2,200 to 2,400 kgs per lactation, resulting in an average of 7 to 8 kgs of milk per day (the reference lactation lasts 305 days).

4. Current Consumption of Cottonseed Cake in the Dairy Industry and Scope for the Use of Sunflower Meal

As cottonseed cake is of excellent value in ruminant rations and readily available, an average of Rs.2,800/ton versus Rs.3,500/ton for sunflower meal on an equivalent digestible protein basis is extensively used in the large dairy farms.

The annual cottonseed cake and meal production in Pakistan is estimated to be about 85% of the total oilseed and marine meal production at a level of 1,143 million of metric tons. 5 to 6% of which (60,000 to 70,000 tons of meal) is used in poultry feed. Therefore, the large animals' consumption of cottonseed cake is about 1 million tons with demand limited to available supplies since no cottonseed cake or meal is imported. (Figures should be rounded as there is some wastage of meal and as cake and meal are not equivalent). Cottonseed cake stocks were around 25,000 tons each year but rising demand from the dairy industry has ended the stock accumulation.

The cottonseed cake consumption in big dairy farms is around 219,000 tons a year as the following calculation shows:

300,000 females (*) x 2 kgs of cottonseed cake a day x 365 days = 219,000 tons of cotton seed cake a year

(*) A dry or ill female is immediately replaced by a productive one. Therefore 300,000 females are actually in production the year round.

The ruminant feed industry is not yet very developed. Two feed mills are currently operating (one in Lahore, one in Hyderabad) and altogether their production does not exceed 15,000 tons of concentrated feed. These farms use a maximum of 20% cottonseed cake (3,000 tons) in their formulation and satisfy demand for the large intensive units near Peshawar, Lahore and Hyderabad that are not included in the "cattle colonies" and the military farms.

Therefore, the annual consumption of cottonseed cake on an intensive basis is about 220,000 tons a year and 780,000 tons are left for the animals on traditional farms.

Today, the sunflower meal absorption capacity of intensive dairy units is still very low as the meal is not available year-round and is more expensive than cottonseed cake on an equivalent digestible protein basis. However, a cattle feed miller was visited and he showed no objection in using sunflower meal in the rations as he actually uses it whenever it is available and if it is expensive than cottonseed and rapeseed cakes.

In 1988, lactating female buffalos and cattle were estimated to be respectively 4.7 and 2.8 million, or 7.5 million altogether. Of this number, 7.2 million females are raised in small traditional farms. As 780,000 tons of cottonseed cake are available for

traditional livestock husbandry, the average consumption of cottonseed cake is estimated to be about 108 kgs a year per female, or 355 grams per day of lactation (the reference lactation lasts 305 days). In June 1990, the cost of a 50 kgs bag of good quality cottonseed cake was about Rs. 150. The average annual expense for protein supplementation with cottonseed cake comes to Rs.324. But this is an average and many females are not fed any cake.

In 1988, Dr. Qureshi from the Poultry Research Institute (PRI) of Rawalpindi already pointed to the tremendous livestock feed pool deficiency. According to him, by year 2000, the total deficit in crude protein will be about 5.2 million tons(!)

Therefore, the present protein supplementation level leaves ample room for nutritional improvement, which is the first constraint to the development of animal production. Any genetic improvement would also result in growth in the demand of energetic and protein sources. An increase of 50 grams in the average individual protein consumption would lead to a 110,000 ton increase in the demand of cottonseed cake or sunflower meal (Rs.385 million is the marketed value for sunflower meal), as they are interchangeable in the rations, assuming that they equally priced.

ANNEX C-2

INTERNATIONAL SUNFLOWER MEAL TRADE OVERVIEW AND MARKET OPPORTUNITIES AND CONSTRAINTS FOR PAKISTANI SUNFLOWER MEAL

Source : Livestock Feed Case Study, RONCO, ACSCA, 1990.

The data used in this annexure are estimates for the 1989/90 marketing year. Figures following the name of a country account for volumes of sunflower meal in thousands of metric tons.

The appendix attached, outlines sunflower meal production, imports, exports, consumption and ending stocks for all concerned countries.

1. World Sunflower Meal Production and Trade Overview

Of the oilseed meals used in animal feed worldwide, sunflower meal is the fourth largest source of protein after soybean meal, cottonseed meal and rapeseed meal (see Table 1).

8.8 million tons of sunflower meal were produced worldwide in 1989/90. The major part of the world sunflower meal output is used in the country of origin: 22% of it is traded across borders (2 million tons for a marketed value of $232 million - Minneapolis FOB), as shown in Table 1, against 36.6% for soybean meal (25 million tons, $ 4 billion).

TABLE 1

MAJOR PROTEIN MEALS :
COMPARATIVE WORLD EXPORT AND ENDING STOCKS LEVELS

PROTEIN MEALS (1)	PRODUCTION 1989/90 (2)	EXPORT (3) /production	ENDING STOCKS /production (3)
SOYBEAN MEAL	69.4 - 58.9 %	36.6 %	4.7 %
COTTONSEED MEAL	11.4 - 9.6 %	9.4 %	2.2 %
RAPESEED MEAL	12.4 - 10.5 %	17.5 %	3.2 %
SUNFLOWER MEAL	**8.8 - 7.5 %**	**22.0 %**	**2.3 %**
TOTAL	102.0 - 86.6 %		

Source : World oilseed situation and market highlights, March 1990.

(1) Four major protein meals account for 86.6% of the worlds protein meal production.
(2) Million tons and percentage of world production
(3) Average export and ending stock levels for the last five

marketing years (85/86 to 89/90)

PRODUCTION AREAS

- The Soviet Union (2,362): the total output is locally consumed.

- The two main commercial growers: Argentina (1,485) and European Community (1,947). Production in Western Europe (mainly the southern countries of the EC: France, Italy, Spain) is expected to continue its upward path, though without an impressive percentage increase.

- Other countries such as China (391), Eastern Europe (Hungary + Romania + Bulgaria = 695), Turkey (493), the USA (282), India (250) and South Africa (167). Major output produced for these countries (except China and India) is consumed directly and has no impact on the international sunflower meal market.

Sunflower production tends to be restricted to areas where:

- either the demand for oil and protein meal is more balanced: in the USA and in the European Community, demand for oilseed products arise principally from the livestock feed sector's demand for protein meal,

- or climatic reasons restrict the growing of soybeans (sunflower is more resilient in low rainfall conditions): hence the interest in production in Argentina, despite the livestock industry orientation towards low protein beef rations.

The major countries involved in sunflower meal trade:

IMPORTS

- The European Community accounts for 88% of the imports. The Northern European countries -Netherlands (390), German Federal Republic (250), United Kingdom (220), Denmark (200), import more meal than the Southern European countries -Italy (150), France (130), Spain (130), as the climate does not favor sunflower cultivation in North Europe.

- Cuba accounts for 6% of world imports.

- Eastern Europe (Czechoslovakia, GDR, Poland, Romania, USSR) accounts for 4% of total imports.

EXPORTS

- With 73% of world exports, Argentina is the largest exporter

of sunflower meal (1375).

- The European Community accounts for 18% of exports, mainly within its borders.

- China (80) and India (50) account respectively for 4% and 3% of exports.

Production of sunflower has increased the last three years as health has become a major issue for consumers who are increasingly aware of the benefits of unsaturated fats (soybean, sunflower) and the market for sunflower seed, and derived products, has become very dependent on the European agricultural policy.

East Asia and Middle East are not major participants in the sunflower meal market. They may have other protein sources (soybean and copra meals in East Asia or fish meal) or may be interested in import of livestock products (Japan, Saudi Arabia).

2. Current Consumption Areas and Future Opportunities

The bulk of sunflower (70% of world production) is mainly consumed at the production site: big consumers are also big producers, except Cuba and for some countries of the northern European Community. (Denmark and United Kingdom consume respectively 200,000 and 278,000 tons, but Denmark does not grow sunflower and UK only produces 50,000 tons).

One of the major difficulties encountered when estimating the world sunflower meal market is that the demand is derived from the livestock products market, and thus inextricably linked to cereals and the dairy sector. Moreover, the degree of substitutability for oilseed meals is relatively high and the different markets have an impact on each other.

Meal consumption is expected to increase in countries where the livestock product demand is increasing and the concept of protein supplementation developing. That is the case in the Eastern Europe. Recent talks between Argentina and Eastern Europe indicated that there is a significant demand for meal. Similarly, the Soviet pig industry has shown considerable improved profitability as a result of a higher protein content in rations. For the time being, USSR is not much involved in World Trade but any shortfall is likely to send the USSR out on to the international protein meal market.

3. Competition

Argentina is the largest exporter of sunflower meal and has an estimated crushing capacity of 12 to 14 million tons.

According to newspaper reports in Argentina, East Germany, Hungary,

Czechoslovakia and Poland are interested in acquiring soybean meal. Soviet Union and China are already big markets for Argentina.

Increased consumption prospects in Argentina are limited as the country only has 30 million people and the population grows at a steady rate of 1-2 percent a year. Pork and poultry production is rather small, given the fact that beef is cheap. Any future increase in oilseed production will result in increased export of oilseed meal.

Apart from Argentina, significant sunflower meal exports (more than 10,000 tons = 1% of total exports) are coming from large producers (countries producing more than 100,000 tons).

As the degree of substitutability for oilseed meal is relatively high (protein content varies but the difference is clearly reflected in price premia), competition may come from other oil meal markets, especially from soybean meal.

For example, 80% of the Brazilian soybean meal is exported. At present, Brazil is looking keenly at the East Europe and Soviet Union situation. Increases in meal demand in these countries will ultimately lead to an expansion of those markets for imported soybean meal. Moreover, if inflation remains high in Brazil and purchasing power does not keep pace, meal consumption may slag, consequently resulting in additional supplies of soybean meal in the export market.

4. Constraints to Pakistani Sunflower Meal Exports

Four major constraints in Pakistani sunflower meal exports can be forecasted:

- Quality is probably the main problem. In the past, Pakistan has gained a rather bad reputation by exporting low quality feedstuffs. There are no specific regulations for quality control or consumer protection applicable to the production of sunflower meal in Pakistan, as opposed to trade specifications and rules and individual controls of industrialized countries. The market for protein meals concerns mainly industrialized countries with intensive breeding and high protein supplementation levels. All these countries have rigid rules and regulations regarding quality control of raw material and finished products.

  Moreover, in world trade, the rules most frequently used are those of the Grain and Feed Trade Association (GAFTA) of London. Rule 100 of GAFTA specifies a minimum of protein-plus-fat, with the specific level of protein/fat designated at the time of the sale. Individual contracts may also include a maximum limit on moisture. Other factors are handled on a contract-by-contract basis.

Most sunflower meal traded internationally is pelleted to reduce bulk and transportation cost.

The current quality of Pakistani sunflower meal is very low due to a high fiber content which adversely affects the protein-plus-fat content. Sunflower seed milling is more complex than bean milling as sunflower seed is "soft" and dehulling is not as easy for other oilseeds. Therefore, it requires some pre-processing. Unless investments are made and local plants are appropriately equipped, it will be difficult for the Pakistani sunflower meal to compete in the world market.

The distance between production and consumption sites is normally limited. Feed compounders like to keep their stock in the form of unprocessed seed rather than meal, the quality of which may be difficult to maintain. Meal users are often closer to the site of the processing mill than oil users are, in order to limit large inventories.

No subsidies or incentives are provided for the export of Pakistani sunflower meal. In Argentina, there is a system of differential taxes to encourage crushing of the bulk of the primary product, be it soybean, sunflower seed or cottonseed. For example the tax rates are reported to be 25% for soybean and 18% for soybean meal and oil. India also provides export subsidizes for meal while soybean exports are banned. In the European Community, farmers are financially encouraged to sell the seed to local crushing plants.

AGRO-INDUSTRY INVESTORS' SEMINAR

AGRIBUSINESS INVESTMENT OPPORTUNITIES IN THE OILSEED SECTOR OF PAKISTAN

Date: October 26, 1991
Place: Lahore Chamber of Commerce and Industry
Lahore, Pakistan

Co-sponsored By
The AgriBusiness Cell,
Federal Ministry of Food, Agriculture & Cooperatives
And The
Lahore Chamber of Commerce & Industry
Lahore University of Management Sciences
United States Agency for International Development
Technical Consultants
RONCO Consulting Corporation
Agri-Bi-Con International (Pvt.) Ltd.
Analysis of Corporate Sector Constraints in Agriculture Project (ACSCA)

Time Allotted	*Speakers and Topics*
PART I:	OILSEED SECTOR POLICY AND THE AGRIBUSINESS INVESTMENT ENVIRONMENT
10:00 - 10:15 a.m.	**Welcoming Remarks:** Gordon Kunde, Session Chairman and Corporate Agribusiness Specialist, RONCO/ACSCA Project
	Recitation from the Holy Quran: Mr. M. D. Tahir
	Introduction of the Chief Guest: Gordon Kunde
10:15 - 10:30 a.m.	**Chief Guest:** Lt. Gen. (Ret'd) Abdul Majid Malik, Federal Minister of Food, Agriculture, and Cooperatives
	"The Importance of Private Sector Agro-Industry Investment in the Oilseed Sector and MINFAC Investment Promotion Efforts through the AgriBusiness Cell"
10:30 - 10.45 a.m.	Mr. Mian Mohammad Ashraf, President, Lahore Chamber of Commerce and Industry
	"The Role of the LCC&I in Promoting Agro-Industry Investment"
10:45 - 11:00 a.m.	Dr. Imran Ali, Professor, Lahore University of Management Sciences
	"The Role of Agribusiness Research and Training at LUMS: An Opportunity to Collaborate with the ABC and Agro-Industry in Pakistan"
11:00 - 11:15 a.m.	Dr. John Swanson, Deputy Chief, Office of Agricultural and Rural Development, United States Agency for International Development
	"USAID Support for the AgriBusiness Cell and Private Sector Agro-Industry in Pakistan"
11:15 - 11:35 a.m.	**Tea Break**

294

Part II:	TECHNICAL PRESENTATIONS ON THE ACSCA OILSEED SECTOR INVESTMENT CONCEPT
11:35 - 11:45 a.m.	**Introductory Remarks:** Vice Admiral (Ret'd) M. Fazil Janjua, Session Chairman and President, Agri-Bi-Con International (Pvt) Ltd.
11:45 - 12:15 p.m.	George Metcalfe, Chief of Party, RONCO/ACSCA Project **"Agribusiness Investment Opportunities within the Oilseed Commodity System of Pakistan: Conclusions from ACSCA Research and Analysis"**

******Time allotted for the following presentations to include 10 minutes for questions and comments from the audience******

12:15 - 1:00 p.m.	Dr. Faiz Mohammad, Professor of Economics, International Islamic University and George Metcalfe, RONCO/ACSCA Project **"The Edible Oil and Feed Meal Markets in Pakistan"**
1:00 - 1:30 p.m.	Pascale Debord, Team Leader, Oilseed Investment Concept Paper, RONCO/ACSCA Project **"Oilseed Processing Plant Requirements and Specifications"**
1:30 - 2:10 p.m.	Adnan Ahmad, Oilseed Supply and Farm Services Analyst, RONCO/ACSCA Project **"Sunflower Grower Contracts, Farm Inputs and Extension Services and Oilseed Procurement Requirements"**
2:10 - 3:10 p.m.	**Luncheon:** Hosted by the ABC/ACSCA Project
3:10 - 3:40 p.m.	Gary Maher, Financial Analyst, RONCO/ACSCA Project **"Financial Projections for the Model Oilseed Processing Company"**
3:40 - 4:00 p.m.	Gordon Kunde, RONCO/ACSCA Project **"The ACSCA Oilseed Sector Foreign Investors' Survey"**
4:00 - 4:30 p.m.	**Final Comments from Participants and Concluding Remarks:** Dr. Imtizaj Husain, Agricultural Development Commissioner and Chairman, AgriBusiness Cell, Federal Ministry of Food, Agriculture and Cooperatives

***** COPIES OF THE AGRIBUSINESS CELL/ACSCA STUDY, *INVESTMENT OPPORTUNITIES IN THE OILSEED SECTOR OF PAKISTAN*, WILL BE DISTRIBUTED TO PARTICIPANTS AT THE SEMINAR *****

AGRIBUSINESS CELL

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AGRIBUSINESS PROFILE: INVESTMENT OPPORTUNITIES IN THE OILSEED SECTOR OF PAKISTAN

Given the demand for edible oil and feed meal in Pakistan, the preparation of a comprehensive **Oilseed Commodity System Investment Concept Paper** was commissioned by the **AgriBusiness Cell (ABC)** in March 1991 for the consideration of interested local and foreign private sector investors. Policy and agribusiness specialists from the RONCO Consulting Corporation and Agri-Bi-Con International (Pvt) Ltd. were retained by the Ministry of Food, Agriculture and Cooperatives and the United States Agency for International Development under the **Analysis of Corporate Sector Constraints in Agriculture Project (ACSCA)** to analyze the Pakistan oilseed sector. Detailed agro-industry evaluations of the seed, farm chemicals, farm machinery, edible oil and livestock feed sectors of Pakistan preceded the integrated analysis of the oilseed commodity system[1]. The purpose of this research was to identify potentially viable investment opportunities attractive to private sector agro-industry investors.

The major participants in the oilseed commodity system in Pakistan include seven agro-industries which produce and supply farm and processing plant inputs, six commodity processing and marketing agro-industries and four farm production sectors. Table 1 shows the agro-industries and farm production sectors that comprise the oilseed commodity system.

ACSCA technical consultants analyzed the agribusiness functions and linkages within and between these agro-industries and farm production sectors to determine the technical and economic strengths and limitations affecting agribusiness operations in the oilseed commodity system of Pakistan. Figures 1 and 2 illustrate the agribusiness linkages that comprise commodity systems in general and the Pakistan oilseed sector in particular.

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1. *An agricultural commodity system is an organized business process involving agro-industry input suppliers, farmers, agro-industry processors, and financing, distribution and marketing functionaries engaged in an integrated series of agribusiness activities. An analysis of an agricultural commodity system includes an evaluation of the agro-industry structures, business functions and marketing linkages which impact on the production, pricing and use of a given commodity within the agricultural economy.*

296

Market demand for edible oil and feed meal products, and the supply of oilseed raw material for processing, were the primary factors analyzed to determine the potential viability of investment opportunities in the oilseed sector. ACSCA consultants concluded that edible oil and feed meal market demand and price trends; government policies and investment incentives; and oilseed production capability in place or available in Pakistan justify substantial investments in large scale oilseed processing plants. The establishment of such enterprises will also create new investment opportunities in the hybrid seed, farm chemicals and implements, farm equipment custom hire services, equipment manufacturing, livestock feed and commodity marketing agro-industry sectors.

The model company proposed assumes the installation of a 500 ton per day oilseed solvent extraction plant to produce basic refined cottonseed and sunflower seed edible oil for manufacturers of fully refined edible oil products. In year three of operation, additional processing capability would be added to produce 200 tons of fully refined and packaged edible oil for the consumer market. Processing plant technology would include the delinting and decorticating equipment required to produce high quality cottonseed and sunflower seed meals for the livestock feed market.

The total fixed and working capital investment required to establish the model company is estimated at Rs.430 million ($18 million). At full production, the model plant would process 154,000 tons of cottonseed and sunflower seed and produce and market 37,000 tons of high value edible oil and 60,500 tons of feed meal. The plant would operate 330 days a year, processing cottonseed for 210 days and sunflower seed for 120 days. Annual gross revenue is projected to increase from Rs.800 million (US $33 million) in year three to Rs.2 billion (US $83 million) in year five.

Direct support to sunflower seed contract growers, provided by an Oilseed Production and Procurement Unit, is a major operational feature of the model company. Given the supply of high quality inputs and provision for technical extension services from the model company to contract farmers, sunflower seed raw material for the processing plant, operating at full capacity, is projected to be grown annually on 24,500 hectares.

Given current and projected domestic demand and price trends for high quality refined edible oil and feed meal, as well as the potential to export these products, ACSCA analysts also concluded that some 10 oilseed processing companies, on the scale of the proposed model company, could be viably established in Pakistan in the medium term. Demand trends and related product differentiation in the market segments identified also indicate that, for the medium to long term, the proposed companies would not be in direct competition with ghee manufacturers, palm oil and soybean meal producers in the market place.

297

The establishment of 10 such companies would create a major commodity system within the agricultural economy of Pakistan. The cultivation of 250,000 hectares of sunflower and other non-traditional oilseeds on irrigated land in the cotton belt is attainable. At this scale of sunflower production, oilseed processors would produce some 200,000 tons high value sunflower oil and 220,000 tons of high quality sunflower meal. Pakistan currently imports over 300,000 tons of high value edible oils (excluding palm oil), and an estimated 400,000 tons of wheat is now used annually as an ineffective, and thus costly, substitute for high protein meal in poultry feed. Thus the development of viable domestic markets for large volumes of locally produced sunflower oil and meal appears to be an attainable marketing objective.

In addition to generating new investment of Rs.4.3 billion (US $180 million) in modern oilseed processing plants, achieving these oilseed production, processing and marketing targets would create significant new agribusiness investment and domestic and export marketing opportunities in the farm input supply and farm output processing agro-industry sectors. Such major new investments in agribusiness would also substantially increase production, employment and income in farming and agro-industry sectors in rural Pakistan. Increased income for the rural population would, in itself, significantly increase domestic market demand for the expanding supply of agro-based products and services resulting from the dynamic growth of the oilseed commodity system.

The **ACSCA Oilseed Commodity System Investment Concept Paper,** presenting detailed data and information on the proposed agribusiness investment opportunity, is available to prospective investors from the **AgriBusiness Cell.**

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298

Table 1 PARTICIPANTS IN THE OILSEED COMMODITY SYSTEM

A. Agro-Industries

FARM AND PROCESSING PLANT INPUT SUPPLIERS	OUTPUT PROCESSORS & DISTRIBUTORS
Hybrid Seed Producers	Oilseed Processors
Fertilizer Manufacturers	Livestock Feed Producers
Pesticide Manufacturers	Poultry Processors
Farm Machinery Manufacturers	Cattle Processors
Land Preparation and Harvesting Services	Distribution and Marketing Services
Processing and Handling Equipment Manufacturers	
Cotton Ginners (supply cottonseed to oilseed processors)	

B. Farm Production Sectors

OILSEED RAW MATERIAL SUPPLIERS	LIVESTOCK FEED BUYERS
Cotton Farmers	Poultry Farmers
Sunflower and Other Oilseed Farmers	Cattle Farmers

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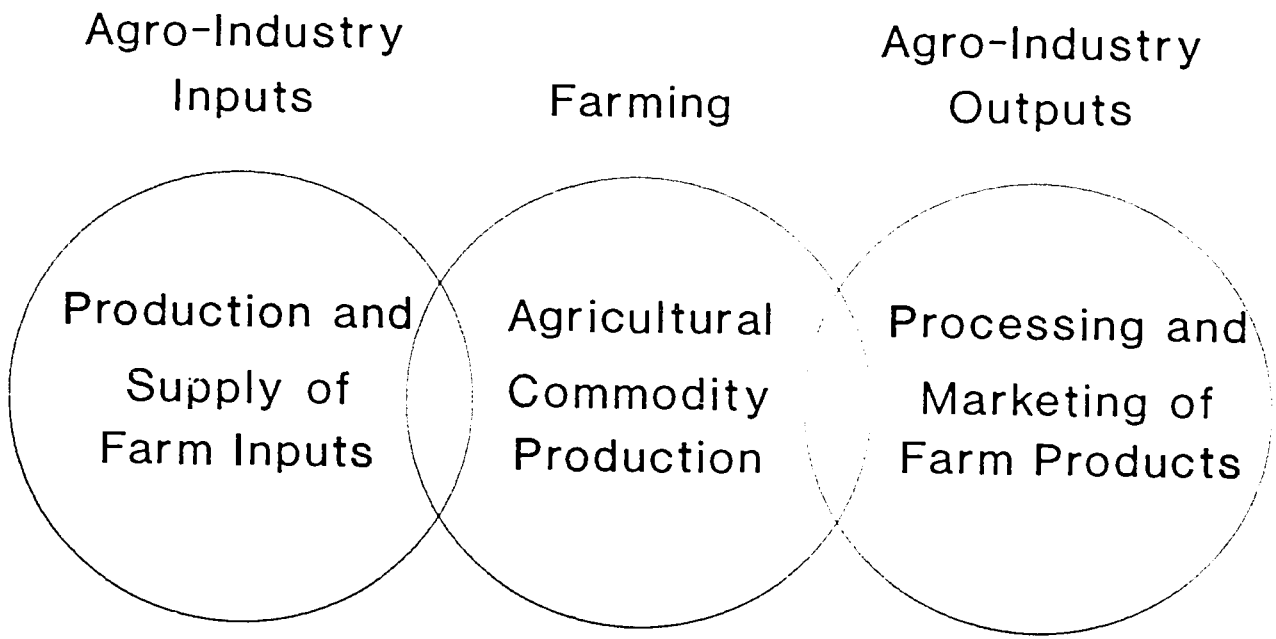
Analysis of Corporate Sector Constraints in Agriculture Project

10/91

Figure 1

Schematic of a Commodity System



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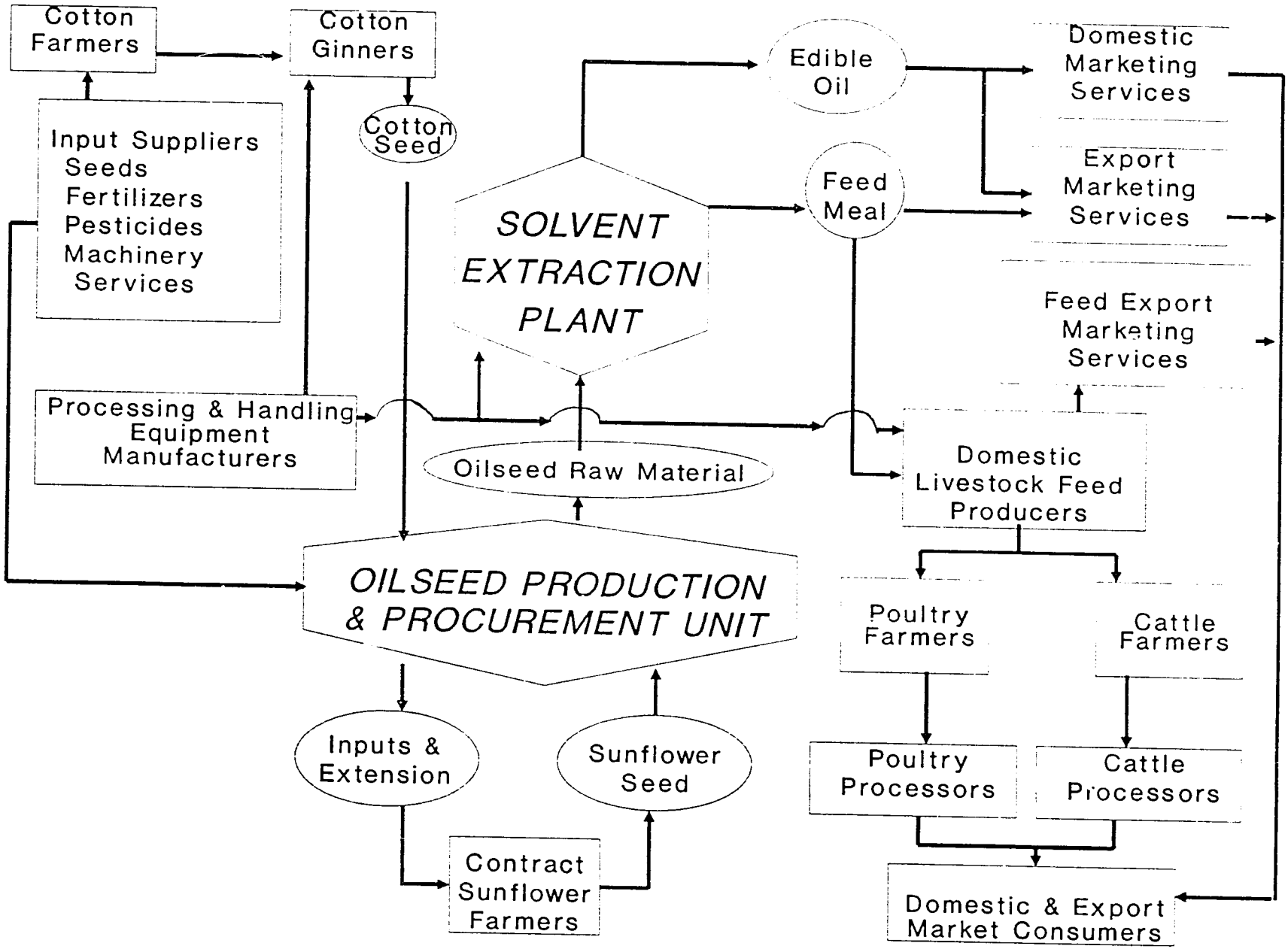
10/91

Figure 2

The Pakistan Oilseed Commodity System



THE AGRIBUSINESS CELL
MINISTRY OF FOOD, AGRICULTURE AND COOPERATIVES
Analysis of Corporate Sector Constraints in Agriculture Project

SEMINAR ON THE OILSEED COMMODITY SYSTEM:
A MAJOR AGRIBUSINESS INVESTMENT OPPORTUNITY

October 26, 1991

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