32. COMPOSITE FLOUR

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I. SUMMARY

This profile envisages the establishment of a plant for the production of composite flour with a capacity of 5,100 tonnes per annum.

The present demand for the proposed product is estimated at 13,000 tonnes per annum. The demand is expected to reach at 19,663 tonnes by the year 2018.

The plant will create employment opportunities for 56 persons.

The total investment requirement is estimated at Birr 11.61 million, out of which Birr 3.3 million is required for plant and machinery.

The project is financially viable with an internal rate of return (IRR) of 28% and a net present value (NPV) of Birr 11.81 million discounted at 8.5 %.

II. PRODUCT DESCRIPTION AND APPLICATION

Flour is a finely ground meal of cereal crops such as wheat, rye, maize, Soybean, sorghum, rice, etc., obtained by milling and blending different streams. Based on the required ratio of endosperm and bran of the milled cereals, flour may be distinguished as whole meal flour, composite flour, special flour, etc. Flour contains various nutrients such as starch, carbohydrates, minerals, proteins and others.

To produce whole meal flour, the whole amounts of grain prepared for milling is crushed into fine meal of desired quality. Special flour is produced by grinding and sifting of grains of certain cereals and by fortifying (improving its nutritional value by adding vitamins or other ingredients). For the production of composite flour, grains of various cereals such as wheat, maize, rice, rye, etc., are ground and blended in certain proportions prior to packing. In this profile wheat, sorghum, maize and soyabean are to be blended to obtain composite flour. Composite flour has better nutritional value in respect to elements of minerals, vitamins, fibers, proteins and the like than flour milled from any specific cereal alone. It can be consumed by infants, adults, and the old.

III. MARKET STUDY AND PLANT CAPACITY

A. MARKET STUDY

1. Past Supply and Present Demand

The demand for composite flour constitutes a very small proportion of the total demand for flour. Therefore, a sound basis for estimating the demand for composite flour would be analyzing the supply and demand for flour in general.

The domestic production of flour during a ten years period is shown in Table 3.1.

Table 3.1

DOMESTIC PRODUCTION OF FLOUR

(TONNES) (1994-2003)

Year	Flour Wheat	Other Flour	Fafa, Edjet & Dube	Total
1993	62253	309	3869	66431
1994	74664	2254	6483	83401
1995	115968	1558	9711	277237
1996	271160	-	3215	274375
1997	140499	-	4704	145206
1998	105157	344	4684	110185
1999	167526	344	6183	170453
2000	185437	1147	9983	196567
2001	165345	274	11693	177310
2002	142541	891	9216	152648

***Source**: CSA, Survey of the Manufacturing and Electricity Industries, Annual Issues.*

A glance at Table 3.1 easily reveals that the commercial production of wheat flour in Ethiopia is marked by a general growth trend. The highest level of production, i.e., about 197,000 tonnes, was attained in year 2000. The average level of domestic supply during the most recent three years covered by the data set (2000-2002) was about 175,000 tonnes; and this amount is considered to approximate the present local supply of commercial flour,

Apart from local production, the country also imports considerable quantity of flour from European and Asian countries. The import data of flour is shown in Table 3.2.

Table 3.2

IMPORT OF FLOUR (1994-2003)

Year	Import Quantity (Tonnes)
1994	16717
1995	1523
1996	588
1997	197
1998	177
1999	10651
2000	24985
2001	60995
2002	13757
2003	270753

***Source**:- Customs Authority, External Trade Statistics, Annual Issues.*

Import of flour is also characterized by a general growth trend, though fluctuation is observed year to year. The import registered in year 2003, i.e. about 271,000 tonnes, could be considered as a record figure. The import of year 2001 was also high, though it is half of what was imported in year 2003 (about 61,000 tonnes). Taking the average of the past three years (2001-2003) as a point of departure, one can conclude that the present supply of flour originating from overseas is in the order of 65,000 tonnes. When added to the domestic supply, aggregate supply or apparent consumption would, thus, be about 262,000 tonnes.

Assuming the market for flour is competitive, the apparent consumption or supply pattern is used as a proxy measure of demand; and hence the above figure is considered as a fair approximation of present effective demand for commercial flour.

As mentioned earlier, composite flour, however, constitutes a small fraction of the total flour demand. According to knowledgeable opinion, the magnitude of demand for composite flour could not exceed 5% of the total flour demand. Based on this, present effective demand for composite flour is estimated at 13,000 tonnes per annum.

2. Projected Demand

Flour demand, in general, and composite flour demand in particular, is mainly determined by the growth rate of population and the per capita consumption of flour. The apparent consumption of flour had grown, on average, by about 10% annually in the past 10 years; and this growth rate could be sustained in the future with increased application for industrially processed food products such as pasta and macaroni.

The demand for composite flour, however, could not be expected to grow at this rate since the population's food habit for this product is still rudimentary. Therefore, a modest growth rate of 3%, which is close to the population growth rate, is used to project future demand for composite flour and the result is shown in Table 3.3.

Table 3.3

PROJECTED DEMAND FOR COMPOSITE FLOUR

2004-2018

Year	Projected Demand (Tonnes)
2004	13000
2005	13390
2006	13791
2007	14205
2008	14631
2009	15070
2010	15522
2011	15988
2027	16468
2013	16962
2014	17471
2015	17995
2016	18535
2017	19091
2018	19663

3. Pricing and Distribution

The only locally produced flour having a composite preparation is *Faffa (Dube Duket*). *Faffa* is basically prepared from local cereals, and legumes like wheat, chick peas, soya flour, dry skim milk, sugur, vitamins and minerals.

A pack of *Fafa* weighs 2 kilogrammes and is sold presently at Birr 8.80. Accordingly, allowing margin for retailers and wholesalers, Birr 2,500 per tonne is proposed for the envisaged project.

B. PLANT CAPACITY AND PRODUCTION PROGRAMME

1. Plant Capacity

According to the market study, the demand for composite flour in year 2004 is 13,000 tonnes, and this figure will grow to about 17,995 tonnes by the year 2015. Accordingly based on the demand projection, the proposed plant will have a production capacity of 5,100 tonnes per annum. The plant will operate 3 shifts of 8 hours a day, and for 300 days a year. The average extraction rate of flour and bran is taken to be 80% and 20%, respectively.

2. Production Programme

The plant will start operation at 75% of its installed production capacity during the first year, and will raise its production to 85% during the second year, and then to 100% during the third year and thenafter.

Table 3.4

PRODUCTION PROGRAMME

Year		1	2	3-10
Capacity utilization (%)		75	85	100
Production (Tonne)	Flour	3060	3468	4080
	Bran	765	867	1020

IV. MATERIALS AND INPUTS

A. RAW AND AUXILIARY MATERIALS

For the purpose of this project profile, composite flour shall be produced from wheat, maize, sorghum and soya bean. The impurity rate shall be made not to exceed 5%. The proportion of the composite grains will be 50% wheat, 30% maize, 15% soya bean, and 5% sorghum. These cereals can be grown in the Benshangul-Gumuz region. Alternatively, some of the grains can be purchased from neighbouring regions.

Auxiliary materials include Polypropylene bags (pp bags) of 50 kg for flour, jute sacks of 50kg to be reusable for bran and twins.

Raw and auxiliary materials and corresponding annual costs at full production capacity of the plant is given in Table 4.1.

Table 4.1

ANNUAL REQUIREMENT OF MATERIALS & COSTS

Sr. No.	Description	Unit of Measure	Qty	Cost, ['000 Birr]
1	Wheat	Tonne	2684	4026.00
2	Maize	Tonne	1610	1771.00
3	Soybean	Tonne	805	1972.00
4	Sorghum	Tonne	268	295.00
5	PP bag - 50kg	pcs	102,000	306.00
6	Jute sacks - 50kg (bran)	pcs	25500	115.00
7	Twins	kg	140	1.40
	Total	-	-	**8486.00**

B. UTILITIES

The major utilities required by the plant are electricity, water, lubricants and oils. Electricity is used as source of motive power for production equipment, and as sources of lighting and to supply outlet sockets. Water is used for processing and personal use. Oils and lubricants are required for production equipment. The estimated annual requirement at full production capacity of the plant is shown in Table 4.2 below.

Table 4.2

ANNUAL UTILITIES REQUIREMENT AND COST

Sr. No.	Description	Unit of Measure	Qty.	Cost, ['000 Birr]
1	Electricity	kWh	270100	56.20
2	Water	m^3	380	0.6
3	Oil and Lubricants	kg	85	0.45
	Total	-	-	**57.25**

V. TECHNOLOGY AND ENGINEERING

A. TECHNOLOGY

1. Production Process

The major unit of operations involved in the production of composite flour are:-

- Grain intake and pre-cleaning,
- Grain cleaning and preparation,
- Milling,
- Blending, and
- Packing and Dispatching.

Grain Intake and Pre-cleaning:- The major operations involved are dumping, conveying, weighing, pre-cleaning, collecting in storage silos or transferring to the working bins of the cleaning room.

Grain Cleaning and Preparation:- The main operations involved are weighing, screening, destoning, long and round impurity separation, ferromagnetic particles separation, scouring, aspiration, dampening, tempering and entoleting. In the grain cleaning room, sieves of different aperture can be interchangeably used for screening of impurities of different grains.

Milling:- Major operations are weighing, breaking open, scalping, scratching, detaching, sifting, purifying, milling (grinding), resifting and entoleting.

Blending:- Flour of different grains and / or different streams of wheat flour are blended in the required proportion. Weighing or volumetric measuring of the product is carried out prior to blending.

Packing and Dispatching:- The major operations involved are collection of flour of different cereal grains, mixing and airation (recycling), resifting, entoleting, packing, sewing, loading and dispatching.

2. Source of Technology

The technology of grain milling can be obtained from India, China, and European countries like Italy, Germany, UK, Switzerland, etc.

Address of a manufacturer in Switzerland is given below.

Buhler Ltd. CH - 5240 Uzwil / Switzerland
Direct Call: 073 502163
Fax : 073 5184 50

B. ENGINEERING

1. Machinery and Equipment

The list of production equipment and corresponding costs are given Table 5.1.

2. Land, Building and Civil works

Total land requirement is 6,000 square meters. Land lease cost for 70 years, at the rate of Birr 2.0 per m^2, is Birr 840,000. The total built-up area for production building, offices, and other utility buildings is about 3,500 square meters. At the rate of Birr 2,700 per m^2, the expenditure on buildings will be Birr 4.2 million. Thus, the total investment on land, building and civil works, assuming that the total land lease cost will be paid in advance is estimated to be Birr 5.04 million.

3. Proposed Location

Wheat, maize, sorghum and soya bean can be grown in different parts of the region. These raw materials can be made available from the areas that grow these cereals. Considering factors like proximity to market (end-users), availability of infrastructure and utilities, it is proposed that the envisaged plant would be located in Assosa.

Table 5.1
MACHINERY AND EQUIPMENT REQUIREMENT AND COST

Sr. No.	Description	Qty.	Cost, ['000 Birr]		
1.	Screw conveyor for wheat	5	110	-	110
2.	Separator	2	275	-	275
3.	Weigher	5	110	-	110
4.	Trieur cylinder, set	1	110	-	110
5.	Scourer	2	90	-	90
6.	Bucket elevator for wheat	6	130	-	130
7.	Roller mill	27	890	-	890
8.	Plansifter	2	215	-	215
9.	Purifier	2	215	-	215
10.	Bran finisher	4	170	-	170
11.	Flour cyclone with airlock	27	260	-	260
27.	Flour filter	1	110	-	110
13.	Detacher	8	155	-	155
14.	Pneumatic conveyor	1	135	-	135
15.	Screw conveyor for flour & bran	4	90	-	90
16.	Bucket elevator for flour	2	45	-	45
17.	Pneumatic duct, set	1	25	-	25
	FOB price	-	**2985**	-	**2985**
	Bank changes, freight, insurance, material handling cost		-	300	300
	Total CIF (landed cost)		**2985**	**300**	**3285**

VI. MANPOWER AND TRAINING REQUIREMENT

A. MANPOWER REQUIREMENT

The plant requires 56 persons for both production and administrative manpower. Details of manpower requirement and corresponding annual salary expenditure is given in Table 6.1.

Table 6.1
MANPOWER REQUIREMENT & ANNUAL LABOUR COST

Sr. No.	Description	Req. No.	Salary, Birr	
			Monthly	Annual
1.	General manager	1	2000	2400
2.	Secretary (Executive)	1	800	9600
3.	Quality control head	1	2700	14400
4.	Chemist (quality controller)	2	900	21,600
5.	Production and technical head	1	1700	20,400
6.	Commercial head	1	1600	19,200
7.	Finance and administration head	1	1600	19,200
8.	Personnel	1	1000	27,000
9.	Store keeper	2	700	16,800
10.	Purchaser	1	700	8400
11.	Salesperson	1	700	8400
27.	Accountant	1	750	9000
13.	Cashier	1	700	8400
14.	Accounting clerk	1	600	7200
15.	Production shift leader	3	800	28800
16.	Operator	10	700	84000
17.	Laborer	27	300	43200
18.	Cleaning worker	3	200	7200
19.	Mechanic	3	800	28800
20.	Electrician	3	800	28800
21.	Grease & oil person	1	250	3000
22.	Driver	2	300	7200
23.	Guard	4	250	27000
	Sub-total	**56**	**-**	**441600**
	Employee benefit (25% BS)			88320
	Total	**56**		**529,920**

B. TRAINING REQUIREMENT

The production shift leaders, operators and quality controllers will have to be provided three weeks on-the-job training by the personnel of machinery supplier on technological process, machinery operation and quality aspects. The cost of training is estimated to be Birr 40,000, of which 30% will be in foreign currency.

VII. FINANCIAL ANALYSIS

The financial analysis of the Composite flour project is based on the data presented in the previous chapters and the following assumptions:-

Construction period	1 year
Source of finance	30 % equity
	70 % loan
Tax holidays	3 years
Bank interest	7.5 %
Discounted cashflow	8.5 %
Repair and maintenance	3 % of the total plant and machinery
Accounts receivable	30 days
Raw material, local	30 days
Raw materials, import	90 days
Work in progress	5 days
Finished products	30 days
Cash in hand	5 days
Accounts payable	30 days

A. TOTAL INITIAL INVESTMENT COST

The total initial investment cost of the project including working capital is estimated at 11.61 million, of which 27.7per cent will be required in foreign currency.

The major breakdown of the total initial investment cost is shown in Table 7.1

Table 7.1

INITIAL INVESTMENT COST

Sr. No.	Cost Items	Total ('000 Birr)
1	Land lease value	840
2.	Building and Civil Work	4,200
3.	Plant Machinery and Equipment	3,285
4.	Office Furniture and Equipment	75
5.	Vehicle	375
6.	Pre-production Expenditure*	697.55
7.	Working Capital	2,135.81
	Total Investment cost	**11,608.36**
	Foreign share	**27.7%**

* *N.B Pre-production expenditure includes interest during construction (Birr652.55 thousand), training (Birr 40 thousand), and (Birr 5 thousand) costs of registration, licensing and formation of the company including legal fees, commissioning expenses, etc.*

B. PRODUCTION COST

The annual production cost at full operation capacity of the plant is estimated at Birr 10.08million (see Table 7.2). The material and utility cost accounts for 84.69 per cent, while repair and maintenance take 0.79 per cent of the production cost.

Table 7.2

ANNUAL PRODUCTION COST AT FULL CAPACITY ('000 BIRR)

Items	Cost	%
Raw Material and Inputs	8,486.0	84.12
Utilities	57.3	0.57
Maintenance and repair	80.0	0.79
Labour direct	223.8	2.22
Factory overheads	15.0	0.15
Administration Cost	27.0	0.27
Total Operating Costs	**8,874.05**	**87.97**
Depreciation	672	6.66
Cost of Finance	542.0	5.37
Total Production Cost	**10,088.06**	**100.0**

C. FINANCIAL EVALUATION

1. Profitability

According to the projected income statement, the project will start generating profit in the first year of operation. Important ratios such as profit to total sales, net profit to equity (Return on equity) and net profit plus interest on total investment (return on total investment) show an increasing trend during the life time of the project.

The income statement and the other indicators of profitability show that the project is viable.

2. Break-even Analysis

The break-even point of the project including cost of finance when it starts to operates at full capacity (year 3) is estimated by using income statement projection.

$$BE = \frac{\text{Fixed Cost}}{\text{Sales} - \text{Variable cost}} = 16\%$$

3. Pay-Back Period

The investment cost and income statement projection are used to project the pay-back period. The project's initial investment will be fully recovered within 4 years.

4. Internal Rate of Return and Net Present Value

Based on the cash flow statement, the calculated IRR of the project is 28% and the net present value at 8.5% discount rate is Birr 11.81 million.

D. ECONOMIC BENEFITS

The project can create employment for 56 persons. In addition to supply of the domestic needs, the project will generate Birr 0.99 million per annum in terms of tax revenue when it starts to operate at full capacity. Moreover, the Regional Government can collect employment, income tax and sales tax revenue. The establishment of such factory will have a foreign exchange saving effect to the country by substituting the current imports.