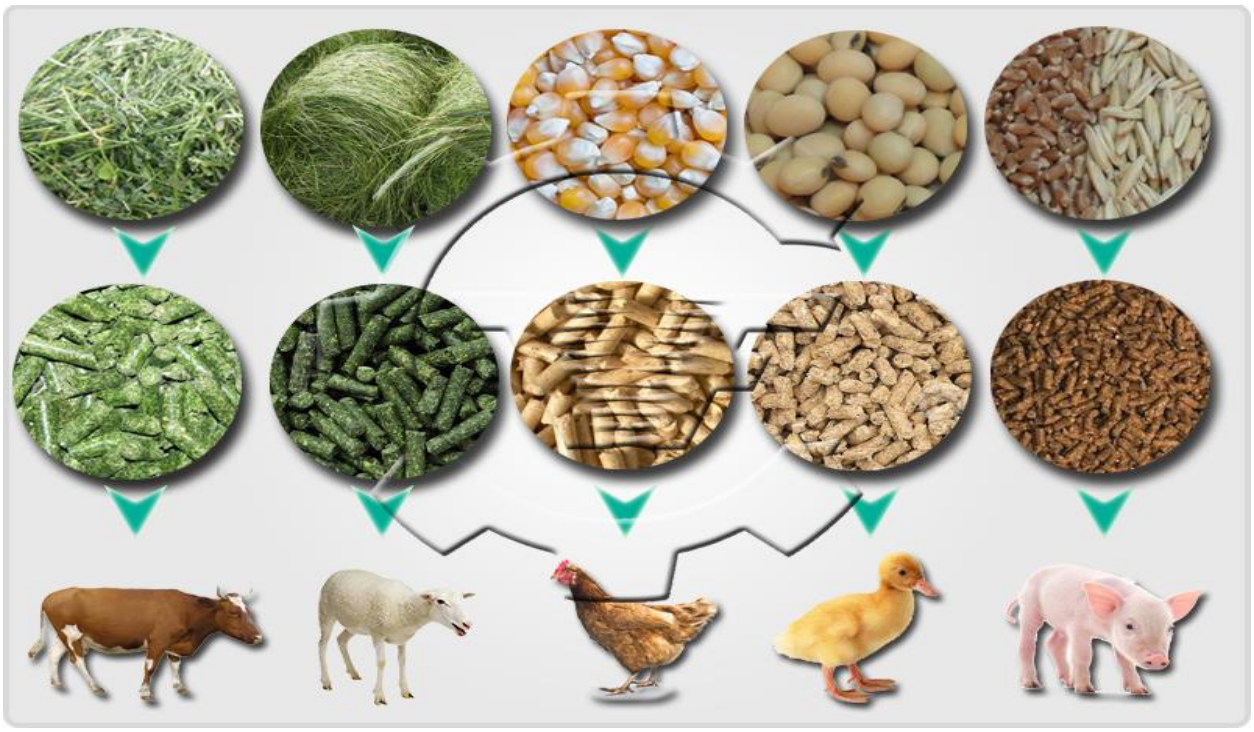
PROJECT PROFILE ON ANIMAL FEED PRODUCTION



NOVEMBER 15, 2022

ADDIS ABEBA CITY ADMINISTRATION INVESTMENT COMMISSION

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I. Executive summary

This project profile is prepared to assess the viability of running Animal feed factory, in Addis Abeba city administration. Hence Market, Technical, Organizational and Financial study was made to investigate the viability of the envisaged project.

This project profile on Animal feed factory has been developed to support the decision –making process based on a cost benefit analysis of the actual project viability. This profile includes marketing study, production and financial analysis, which are utilized to assist the decision-makers when determining if the business concept is viable. Ethiopia has a private sector driven Animal feed industry. According to the latest data sourced from Ethiopian animal feed industry association (EAFIA) here are more than 80 registered animal feed processing factories in Ethiopia.

The location of the plant will be decided on the basis of access to raw materials, infrastructure namely power, water, transport and telecom to easy access to international market. The most locally available raw materials for animal feed factory are maize, wheat bran, rice bran and etc.

The factory at full capacity operation can process 169,000 quintals to produce 84,500 quintals of cattle feed and 84,500 quintals of poultry feed, per year based on 260 working days and their shifts of 24 hours per day.

The total investment capital including establishing the factory is Birr 359.26 million. Out of the total investment capital, the owners will cover Birr 107.78 million (30 %) while the remaining balances amounting to Birr 251.48 million (70 %) will be secured from bank in the form of term loan.

As indicated in the financial study, the cash flow projection of the project shows surplus from the first year on. The net cash flows of the project range from Birr 38 Million in the first year to Birr 92 million at the end of the 10^{th} year of operation. At the end of the 10^{th} year of operation period the cumulative cash balance reaches Birr 604 million. The Benefit-cost ratio and Net present value (NPV) have been calculated at 17% discount factor (D.F) for 10 years of the project activity. Accordingly, the project has NPV of 269.64 million Birr at 17%D.F. and the benefit-cost ratio of 1.12 at 17% D.F.

Therefore, from the aforementioned overall market technical and financial analysis we can conclude that the Animal feed processing factory business is a viable and worthwhile.

1. Background information

1.1. Introduction

Ethiopia has one of the largest livestock populations in Africa and the tenth in the world. The country had 59.5 million heads of cattle, 30.70 million heads of sheep, 30.20 million heads of goats, 56.53 millions of poultry and 1.21 million heads of a camel. Cattle in Ethiopia provide draught power, income for farming communities, means of savings and investment. It is central to the Ethiopian economy contributing about 45% to the agricultural GDP, supporting the livelihoods of 70 % of the population, 18.7% to the national GDP and 16–19% to the total foreign exchange earning of the country. Animal feed is the most valuable livestock product and for many people serves as their first-choice source of animal protein which provides all the essential amino acids and various micronutrients in proper proportion to the human beings. Animal feed defined as all animal tissues suitable as food for human consumption. This includes all processed or manufactured products prepared from animal tissues. Animal feed production and consumption is an important in the Ethiopian economy. The annual contribution of ruminants to Animal feed production in Ethiopia is estimated at over 3.2 million tones, representing over 72% of the total Animal feed production. Cattle Animal feed accounts for over 70% of the total red Animal feed production and over 50% of the total Animal feed output in Sub Saharan Africa. The Ethiopian Animal feed export volume increased from 7,916 tons in 1999/2000 to 19,104.7 in 2018/2019. The Country's export performance reached its peak in 2016/17 by exporting 19,779.20 tons of Animal feed. In the same period under review, the Animal feed export (chilled shoats, beef carcass and offal) value has picked up from 1.7 million USD to 92.65 million USD . Among these shoat carcass account 80.35 million dollar (86.72%), beef carcass 6.23 (6.72%) and offal 6.07 (6.55%). There was no well-organized information on Ethiopian Animal feed production, consumption and Animal feed quality. Therefore, the objective of this

manuscript was to review Ethiopia Animal feed productions tends, consumption, Animal feed quality parameters and suggest the possible intervention

1.2. Product description

Assorted animal feed is used for feeding domestic animals like cattle, sheep and goats, poultry and hogs. The feed is prepared by modern industrial production method and the main ingredients are animal feed, Milo, wheat, barley, mash, molasses, soybean oil lees, other vegetable oil lees, crushed bones, oil and fat, and some other additives. Depending on the availability of inputs, some of the above inputs could be substituted to each other without affecting the quality of the animal feed.

1.3. Project location and justification

1.3.1. Location of Addis Ababa

Addis Ababa is the seat of the Ethiopian federal government. It is located on the central highlands of Ethiopia in the middle of Oromia Region. The absolute location is around the intersection point of 901'48''N latitude and 38°44′24″E longitudes. This is very near to the geographical center of the country. It is, therefore, equidistant to the peripheral areas or is equally accessible to almost all parts of Ethiopia. Addis Ababa is located on a well-watered plateau surrounded by hills and mountains. The city is in the highlands on the edge of the Ethiopian rift valley or the eastern slopes of the Entoto Mountain ranges bordering the Great Rift Valley. The total area of Addis Ababa is about 540 km^2 of which 18.2 km^2 are rural. Addis Ababa's built-up urban area spans 474 km^2. It is also the largest city in the world located in a landlocked country.

1.3.2. Demography of Addis Ababa

According to the CSA (2013) population projection, Ethiopia's total population reaches about 105 million people in 2022. Of the total population 22.9% (24 million people) live in urban areas. Ethiopia's urban population is expected to triple by 2037 (World Bank, 2015). Addis Ababa hosts an estimated 3,859,638 people. Currently, Addis Ababa is experiencing an annual growth rate of 3.8% and is estimated to reach 4,696,629 inhabitants by 2032 (CSA, 2015).

1.3.3. Economic activity of Addis Ababa

The transformation of Addis Ababa has especially been rapid since 1991. According to the data from the city's Bureau of Finance and Economic Development (2006), per capital income of Addis Ababa has grown from USD 788.48 in 2010 to USD 1,359 in 2015. The city also achieved a decline in the poverty index from a high of 29.6 in 2012 to 22.0 in 2014. Moreover, the current poverty headcount index for Addis Ababa is estimated at 18.9 while the poverty severity account for 5 and 1.8 index points respectively. Even though, the poverty status of Addis Ababa has an improvement over previous years, there is still much work to be done to curb both the incidence and severity of poverty.

The major contributor to the economic growth of the city is the implementation of publicly financed mega urban projects like condominium housing, the Light Rail Transit, the international airport and industrial zone development (The state of Addis Ababa, 2017). The existence of international large and medium-size enterprises in and around Addis Ababa have also significant role in creating huge opportunity for employment and technology transfer. Furthermore, there are strong demand for goods and services following the existence of many embassies and inter-governmental organizations like the African Union, the United Nations Economic Commission for Africa.

The manufacturing sector's contribution to Addis Ababa's GDP is high. Despite the fact that 86% of the industries in the city are micro and small scale (cottage and handicrafts, and small-scale), the majority of the country's large and medium scale industries are found in the city. Noticeable increases are also registered currently in other aspects of industrial growth.

The service sector is both the largest contributor to the city's economy and the largest employer. It contributes to 76.4% of the city's GDP while industry's share makes up (almost all) the rest. This sector is dominated by three major sub-sectors: Transport and communication; Real estate, Renting and Business services; and Trade, Hotel and Restaurants. According to the state of Ethiopian Cities 2015 report, the service sector has also been responsible for more than 50% of the growth in the estimated annual growth of the city's GDP. Although 75% of employment in the city is also generated in the service sector, a large proportion of the employed work in low skill and low paying jobs as shop salespersons, petty and 'gullit' traders, sales workers in small shops, domestic helpers or doorkeepers and restaurant service workers.

Analysis of the economic structure of Addis Ababa reveals that the services sectors (63%) dominates with industry (36%) in second place indicating that these sectors account for almost all of the Addis Ababa's GDP (The State of Addis Ababa, 2017).

Addis Ababa has a great share in the economy of the country due to its attractiveness to businesses, companies, individuals and foreign direct investment. Overall primacy index of the city is 24.8 based on urban employment and unemployment survey (CSA 2015). According to the State of Addis Ababa 2017 report, the simultaneous high rates of economic growth and urbanization in Addis Ababa indicates a likely further rising dominance of the city in Ethiopia's economy as well as growing agglomeration of economic activities in and around the city.

1.4. Why is it beneficial to invest in Addis Ababa?

Addis Ababa is the largest and most economically significant city in the country. Ethiopia's urban population share is only 17 percent (as of 2012, World Bank 2015). The city is the only urban area in Ethiopia capable of delivering scale economies in terms of concentrated demand, specialization, diversity and depth of skills, innovation, and technology transfers. Thus, investors will be benefited in getting capable human power from the market.

The capital is the country's main industrial hub. The city dominates industrial capacity in almost all the braches of light manufacturing that Ethiopia prioritizes. As a result Addis Ababa completely dominates production in various subsectors. This can be taken as the political and social stability of the city.

Overall, the city has a beautiful environment, favorable location, and strong industrial base. Its advantage as an economic powerhouse of the country and human resource center are the most attractive features for local and overseas investors.

Moreover, investors will be getting a comprehensive set of incentives for priority sectors. These include:

- Customs duty free privilege on capital goods and construction materials, and on spare parts whose value is not greater than 15% of the imported capital goods' total value.
- Investors have the right to redeem a refund of customs duty paid on inputs (raw materials and components) when buying capital goods or construction materials from local manufacturing industries.

- Income tax exemption of up to 6 years for manufacturing and agro-processing, and up to 9 years for agricultural investment.
- Additional 2-4 years income tax exemption for exporting investors located within industrial parks and 10-15 years exemption for industrial park developers.
- Loss Cary forward for half of the tax holiday period. Several export incentives, including Duty Draw-Back, Voucher, Bonded Factory, and Manufacturing Warehouse, and Export Credit Guarantee schemes.

1.4.1. The city benefit from the investment

The city will be benefited from investment. These are discussed below.

- Employment opportunity

  Investment is expected to provide direct and indirect employment. These range from unskilled causal workers, semi-skilled and skilled employees.

- Improving growth of the economy

  Through the use of locally available materials and exporting products, the investment contributes towards growth of the economy by contributing to the growth of domestic product. These eventually attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of local materials will be payable directly to the producers. In addition, domestic products save foreign exchange and exports also bring money to the country.

1.5. Animal feed Production Trends in Ethiopia

Animal feed production offers opportunity to serve a vast export market as well as Ethiopia's domestic market. The total Animal feed production increase from 578,240 tons in 2004 to 749,430tons in year 2014 and decreased to 596,765 tons in year 2017. Despite the fact that Ethiopia is the tenth largest livestock population in the world, the production of Animal feed is still low and contributed to about 0.2 percent of the world total Animal feed production, of which most is sheep and goat Animal feed. The reasons behind low production of Animal feed in Ethiopia are due to low off-take rates, most animals slaughtered and exported live were not produced in commercially oriented manner and sell only in need of cash or when animals get too old after serving for draft purpose and inability to fulfill minimum standard required in the international market for processed Animal feed. The trend of Animal feed production in Ethiopia shows it was rising moderately, of course with some fluctuations from 2004 to 2017.

1.6. Status of Animal feed processing industry in Ethiopia

Ethiopia produce different types of crops that are suitable for the production of diverse varieties of animal feed products like dairy feed, beef cattle feed, poultry feed and other feed. According to Ethiopian animal feed industry association (EAFIA), Currently the commercial feed sub sectors are comprised of 80 enterprises (32 private feed processing plant, 28 farmers' unions, 15 suppliers of specialty feed ingredients, 6 suppliers of feed processing equipment). The average installed capacity of the private feed processing plants is 5.4tons per hour but operating 3 tons per hour, that means they are operating at an average of 55% of their installed capacity. Average production of farmers' union is 2 tons per hour for feed grinding and 2.10 tons per hour for feed mixing. Farmers' union facilities operating at an average of 66% of installed capacity. Private feed processing plant produce

66% poultry feed of their production, 23% dairy feed, 7% beef cattle feed and 4% other feed while farmers' union produce 55% being beef cattle feed followed by dairy (42.5%), poultry(1.5%) and other feed (1%).

2. Marketing study

2.1. Market analysis summary

The current drive and emphasis by the government on the diversification of the industrial base away from the other sector presents an opportunity for production industry to a valuable contribution towards achieving goal. Having undertaken a thorough and comprehensive research of the market we realized that there was a vast opportunity for domestic products. Aware of the fact operating in such a market is largely dependent on good networking, the promoter intends to establish networks and strategic relationships with various wholesalers and retailers to ensure a steady stream of orders. In so doing the owner intend to ensure that the products they produce are of extremely high quality and fully serve the customers purpose.

2.2. The Supply of processed Animal feed products

2.2.1. Local Animal Feed Supply

In Ethiopia there are large scales, medium and household level Animal feed processing plant. The number and processing capacity of household level animal feed processing enterprises is not known. The average design capacity of the 32 private feed processing enterprise is 5.4 tons per hour and 28 farmers' union average feed processing plant capacity is 2.1tons per hour. However, due to various problems, they are not operating at full capacity. The design and operational capacity of these enterprises is shown in table 1.

Table 1 Animal feed produced per year in Ethiopia

S/No	Factory	Installed Capacity (Tons/hr.)	Current Utilized capacity (Ton/hr.)	Annual production based on 16hrs /day and 260 working days/year operational
1.	32 private feed processing enterprises with average capacity	5.4	3.0	399,360 tons
2.	28 Farmers' union feed processing plant	2.1	1.15	133,952 tons
	Grand total			533,312 tons/year

Sources: - EAFIA, 2017

2.1.1.1. Import

The supply of Animal feed has been met both through import and domestic production. Although there is no apparent trend in the growth of imported animal feed.

Table 2 Volume of imported Animal feed from 2012 to 2021 in kg

HS CPODE 23099000, Other preparation of a kind in animal feeding, nes. And

HS CODE 23099010, POULTRY feed

Year	Gross weight (in Kg)	Net weight (in Kg)	CIF value in (ETB)	CIF value in USD	Total TAX in ETB	Total Tax USD
2012	731,734	725,246	17,017,248	952,515	6,956,491	389,379
2013	682,909	675,779	19,560,987	1,040,472	8,156,359	433,847
2014	859,592	850,299	28,579,037	1,418,765	11,848,225	588,188
2015	679,205	669,105	20,503,585	986,603	8,122,634	390,849
2016	669,762	664,770	20,771,708	961,720	4,764,782	220,607
2017	1,413,796	1,359,122	66,287,296	2,737,233	14,975,854	618,405
2018	872,725	856,278	46,175,214	1,668,783	10,307,380	372,511
2019	0.00	0.00	0.00	0.00	0.00	0.00
2020	3,979,395	3,892,219	225,772,259	6,459,864	7,533,761	215,558
2021	3,132,226	3,062,218	255,832,780	5,772,400	6,022,564	135,888

Source: ERCA and compiled by consultant

As it has been shown in table 6 import of animal feed and poultry feed which was 725,246 kg at the beginning of the period (2012) has increased to 3,062,218kg by the end of, 2021. A closer

observation at the data set reveals that imported Animal feed over the study period has shown varying patterns. Based on the data obtained from Ethiopia customs Authority, the annual average volume of imported animal feed is 1,275,504 kg from 2012 through 2021.

2.1.1.2. Forecasted future import of animal feed

Table 3 Future forecast of import of Animal feed by trend adjusted exponential smoothing method

Year	Imported Animal feed from 2012 to 2021 in kg.	Trend Adjusted exponential smoothing method
2012	725,246	
2013	675,779	
2014	850,299	
2015	669,105	
2016	664,770	
2017	1,359,122	
2018	856,278	
2019	0.00	
2020	3,892,219	
2021	3,062,218	
2022		3,062,218
2023		3,295,915
2024		3,529,612
2025		3,763,310
2026		3,997,007
2027		4,230,704
2028		4,464,401
2029		4,698,098
2030		4,931,796
2031		5,165,493
2032		5,399,190

Compiled: - by consultant

2.1.1.3. Animal feed animal feed Demand Projection

The demand for animal feed animal feed can be influenced by a number of factors. The demand for animal feed is a function of livestock population, price of feed, price of substitutes, and other exogenous factors. The size of livestock population and its growth rate, disposable income prices and culture are few among many variables. From production point of view, animal production is essentially a conversion of feed into animal product which dictates the level of production and product quality and safety. for the purpose of this study, attempts have been made to forecast the likely future demand for animal feed on the basis of the following assumptions:

i. Local supply of animal feed assumed to be increased by 2.5% every year
ii. Consumption of feed per bird is 120gm per day.
iii. Consumption of feed per cattle 8kg per day
iv. According to factsheet Ethiopia, the Ethiopian poultry sector grows 6 to 10 % per year.
v. According to USAID 2019, Cattle number grows by 4.5% per year
vi. According to CSA, agricultural sample survey 2020/2021, Number of cattle in 2022 is 65,354,090.
vii. According to CSA, agricultural sample survey 2020/2021, Number of poultry in 2022 is 48,955,675.

Therefore, in order to estimate the demand for animal feed, the consumption approach is considered.

Table 4 Projected Demand for animal feed animal feed in Ethiopia

Year	Number of cattle	Cattle feed in take per day in kg	Number of poultry	Poultry feed intake per day in kg	Demand projection		
					Cattle feed	Poultry feed	Total demand
2021	65,354,090	8	48,955,675	0.12	522,832,720	5,874,681	528,707,401
2022	68,295,024	8	52,627,351	0.12	546,360,192	6,315,282	552,675,474
2023	71,368,300	8	56,574,402	0.12	570,946,401	6,788,928	577,735,329
2024	74,579,874	8	60,817,482	0.12	596,638,989	7,298,098	603,937,087
2025	77,935,968	8	65,378,793	0.12	623,487,744	7,845,455	631,333,199
2026	81,443,087	8	70,282,203	0.12	651,544,692	8,433,864	659,978,556
2027	85,108,025	8	75,553,368	0.12	680,864,203	9,066,404	689,930,607
2028	88,937,887	8	81,219,871	0.12	711,503,092	9,746,384	721,249,477
2029	92,940,091	8	87,311,361	0.12	743,520,732	10,477,363	753,998,095
2030	97,122,396	8	93,859,713	0.12	776,979,164	11,263,166	788,242,330
2031	101,492,903	8	100,899,191	0.12	811,943,227	12,107,903	824,051,130
2032	106,060,084	8	108,466,631	0.12	848,480,672	13,015,996	861,496,668

As it is indicated above the effective demand for animal feed in 2022 is 552,675,474 kg. This volume will increase to 861,496,668kg in the year 2032.

2.1.1.4. Demand-Supply Gap Analysis

When we see the historical supply volume of animal feed in Ethiopia there is no apparent trend in the growth. Because both the import and production data are found to be erratic. Hence, it is found difficult to objectively forecast the future supply volume. Single exponential smoothing method was used, for forecasting purposes. A 4.5% growth rate, of cattle population, is also assumed for local

production increase, for new as well as expansion projects for domestic manufacturers though most of the existing animal feed factories.

Table 5 Demand supply gap Analysis

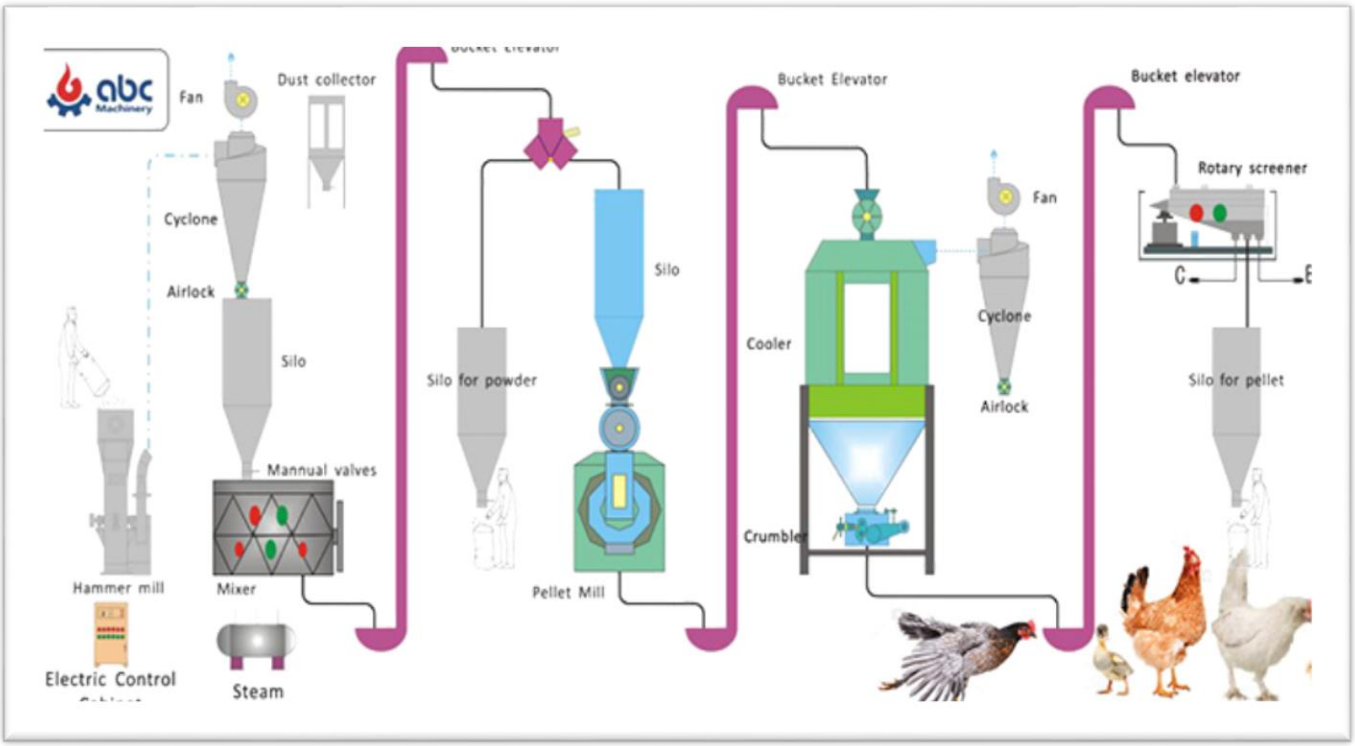
Year	Domestic production in (in kg)	Import in (kg)	Demand (in kg)	Excess demand(kg)
2022	533,312,000	3,062,218	552,675,474	19,363,474
2023	546,644,800	3,295,915	577,735,329	31,090,529
2024	560,310,920	3,529,612	603,937,087	43,626,167
2025	574,318,693	3,763,310	631,333,199	57,014,506
2026	588,676,660	3,997,007	659,978,556	71,301,896
2027	603,393,577	4,230,704	689,930,607	86,537,030
2028	618,478,416	4,464,401	721,249,477	102,771,061
2029	633,940,377	4,698,098	753,998,095	120,057,718
2030	649,788,886	4,931,796	788,242,330	138,453,444
2031	666,033,608	5,165,493	824,051,130	158,017,522
2032	682,684,448	5,399,190	861,496,668	178,812,220

As shown in the above table, the project will have unsatisfied demand for the coming 10 years' period. The projected demand will continue to be positive until 2032. It can be clearly noted that there is a huge gap between supply and demand figures, which can really be taken as the apparent demand-supply gap for animal feed in Ethiopia. This is really the actual unsatisfied demand as imports have to be substituted that also helps in saving the foreign currency outflow from the country. The unsatisfied demand for animal feed for the year 2032 estimated at 178,812 tons.

3. Technology and engineering

3.1. Technology

3.1.1. Animal feed production process



Material flow during processing includes:

A) Particle size reduction,

B) Premixing,

C) Mixing,

D) Pelleting, and

E) Sacking.

Coarse ingredients pass over a permanent magnet which removes tramp metal and then through a hammer mill which reduces particle size to the desired screen analysis. Ground material is monitored periodically to ensure size uniformity and to help detect wear of hammer mill screen and hammers. The ground material is then routed to ingredient holding bins.

There are two mixing operations in feed milling. One is for the mixing of micro-nutrients; the operation is generally termed pre-mixing. The other mixing operation involves the actual blending of all components of the diet.

Micro-nutrients, such as vitamins and trace minerals, are accurately weighed with carrier material which has a density approximating that of the predominant micro-ingredient. The materials are then mixed in a batch mixer for a period of time specified by the equipment manufacturer to ensure homogeneity. The premix is finally routed to the premix holding bin.

Diet mixing begins when augers are set in motion to deliver; the correct amounts of each ingredient including the premix, according to the formula, into the mixer. Where manual changing of the mixer is done, ingredients are weighed out in sacks or hopper carts. The mixing period is according to the equipment manufacturer's specifications, but final mix is checked periodically with a tracer to ensure homogeneity of the mix. If the mixed diet is to undergo pelleting, it is routed to the pelleting bin.

Mixed feed mash for pelleting is first conditioned with steam in the steam conditioner section of the pellet mill, after which it enters the die where it is finally extruded. Freshly extruded pellets are hot and contain excess moisture which is removed during passage through the cooler. Fines are then screened from the cooled pelleted feed and returned for repeating. Fish oil, if added, is now applied prior to the routing of the finished pellets into the packer bins.

3.1.2. Environmental and social impact assessment of the project

Typically, any developmental projects also trigger a set of environmental and social impacts. These environmental and social due to development projects occur in different forms. An Environmental and Social Impact Assessment (ESIA) has to be carried out to study the potential environmental and social impacts due to the production processed animal feed. Potential environmental and social impacts due to the production of animal feed products on attributes like air quality, noise, water quality, soil, flora, socio-economic, etc. have to be assessed as part of the ESIA study. Appropriate mitigation measures to help minimize/avoid impacts from the development have to be recommended in the study. The measures include avoidance measures, mitigation measures and environmental enhancement measures. For the purpose of including environmental costs, the costs of wastewater treatment plant and solid waste incineration systems are included in the cost of machinery and equipment. Social responsibility cost estimated to be 1% of fixed investment costs.

3.1.3. Production Capacity and Production Program

3.1.3.1. Plant capacity

The annual production capacity of the plant in full capacity is 169,000 quintals. The production capacity is based on projected demand and realistic market share that could be captured. The production commences three shift and 260 working days a year. The production program does not include Sundays and national and public holidays. It was also considered that the plant would conduct annual maintenance on May when the supply of raw materials are low.

3.1.3.2. Production program

The plant initially produces 70 % of its annual rated capacity bound to initial operating problems such as machine set up and marketing. The production capacity will increase by 10 % and attain its full capacity by the fourth year of its commencement.

Table 6 Production program

	Period		Start-up			Full Capacity	
	Capacity utilization		70%	80%	90%	100%	100%
	Project year		1	2	3	4	5
1	Cattle feed	Quintals	59,150	67,600	76,050	84,500	84,500
2	Poultry feed	Quintals	59,150	67,600	76,050	84,500	84,500

3.2. Engineering

3.2.1. Land, buildings and civil works

The required area (m^2) and construction cost for the production facilities essential for the successful operation of the processing plant is shown in Table 7. A total area ready for the processing plant is 10,000m^2 out of which 7,300m^2 is to be covered by building while uncovered area of 2,700m^2 is left open for parking, storage of waste materials and future expansions. The land lease cost 555 Birr per/ m^2 year and for 70 years. In order to estimate the land lease cost of the project profiles it is assumed that all the project will be located in different land level from level 1/1 to level 4/3, their current market lease price is from 39,073.31 birr per M ^{2} to 2,800.71 birr per M ^{2}respectively. Therefore, for the profile a land lease rate of birr 3,885 per M ^{2} have been taken, which is between the ranges.

The cost of construction of building should be appropriate to the size and expected profitability of business, costs of building generally differs by the type of construction materials used, the type of foundation, wall height and location. The current building cost for simple storage and processing room is from 1,800.00 Birr per m^2 to 25,000 Birr per m^2. The total construction cost of buildings and civil works, at a rate of Birr 20,000 per m ^{2} is estimated at Birr 124.925 million. Therefore, the total cost of land lease and construction of buildings and civil works is estimated at Birr 163.775 million.

The proposed plant layout comprises the following buildings and structures.

Table 7 Building costs

S/No	Descriptions	Total area	Estimated cost per square meter (in Birr)	Total estimated cost (in Birr)
1	Raw materials store	1,500M^2	20,000.00	30,000,000.00
2	Damping pit	9M^2	20,000.00	180,000.00
3	Cleaning section	200M^2	20,000.00	4,000,000.00
4	animal feed production line	2,000M^2	20,000.00	40,000,000.00
6	Main product store	1,500 M^2	20,000.00	30,000,000.00
7	packing materials store	500 M^2	20,000.00	10,000,000.00
8	Office and toilet	200M^2	20,000.00	4,000,000.00
9	Canteen	160M^2	20,000.00	3,200,000.00
10	Guard house	6M^2	20,000.00	120,000.00
11	parking	600M^2	2,000	1,200,000.00
12	Green area	625M^2	1,000	625,000.00
13	Fence	1,200M		1,600,000.00
	TOTAL	7,300 M^2		124,925,000.00

Table 8 Land lease period in Addis Abeba

Sector of development activity	Period of lease	Down payment
Education, health, culture and sports	90	10%
Industry (manufacturing)	70	10%
commerce	60	10%
For urban agriculture	15	10%
For others	60	10%

Sources: - city government of Addis Abeba land development and management bureau

Table 9 Land lease floor price in Addis Abeba

S/No	Land level	Current land lease floor price per M^2	Current lease price per M^2 (Market price)
1	1/1	2,213.25	39,073.31
2	1/2	2,165.47	36,825.73
3	1/3	1,900.19	34,578.15
4	¼	1,552.93	31,119.21
5	1/5	1,531.91	29,096.45
6	2/1	1327.39	27,073.71
7	2/2	1,221.18	25,050.96
8	2/3	1,191.17	23,028.21
9	2/4	1,074.39	21,005.46
10	2/5	1,027.84	18,982.71
11	3/1	994.71	16,959.96
12	3/2	960.21	14,937.21
13	3/3	927.84	12,914.46
14	¾	904.77	10,891.71
15	3/5	873.74	8,868.96
16	4/1	814.06	6,846.21
17	4/2	786.45	4,823.46
18	4/3	748.80	2,800.71

Sources: - city government of Addis Abeba land development and management bureau

3.2.2. Machinery and equipment

The main plant and machinery consists cleaning equipment, palletize machine, mills,

Elevators, conveyer, mixer. Major part of the machinery will be imported.

Table 10 Lists of Equipment Requirements for 8-Ton-an-Hour Feed Mill

Item	Quantity	HP each motor	Size and Capacity
Receiving			
Truck Hoist	1	10	8 ton
Power Shovel	1	3	-
Conveyor, drag	1	5	9 in × 45 ft
Elevator, bucket	1	10	8 in × 5 in bucket
Magnet, plate	1	-	8 in
Scalper	1	1	25 t/h
Distributor	1	¼	10 positions
Storage tanks	2	-	5 000 gal
Diverter valve	1		8 in
Processing			
Conveyor, screw	1	3	8 in.
Hammer-mill	1	60	8-12 t/h
Elevator, bucket	1	2	8 in × 5 in bucket
Diverter valve	1	-	8 in
Mixing			
Feeder conveyor	9	3-2, 6-3	
Feeder, loading board	1	-	-
Weigh hopper and scale	1	-	120 cu ft
Vertical mixer with surge bin	2	7 ½	100 cu ft each
Conveyor, screw	1	3	12 in × 20 ft
Elevator, bucket	1	7 ½	8 in × 5 in bucket
Continuous mixer	1	5	5 t/h
Molasses pump, heating		7	
tank and other		5 ½	
equipment	1		10 gal/min
Fat system	1	3	10 gal/min
Diverter valve	1	-	8 in
Pelleting			
Pellet mill	1	75,5, ½	7-10 t/hr
Cooler, fan collector	1	20 ½	7-10 t/hr
Crumbler	1	10	6 in × 60 in
Scalper	1	1	60 in × 72 in

Elevators, buckets	2	1	8 in × 15 ft
Distributor	1	3 ¼	8 in × 30 ft 8 hole
Packing			
Scale belt feeder	1	¾	7 × 50 lb/min
Bag conveyor	1	1	7 bags/min
Sewing machine	1	1/3	7 bags/min
Warehousing			
Forklift	1	-	3 000 lb
Bulk Loadant			
Conveyor, drag	1	5	12 in × 30 ft
Travel weigh hopper	1	1	3 t
Miscellaneous			
Boiler	1	1	150 hp
Air compressor	1	1	-
Control panel	1	1	-

3.2.3. Lists of machinery suppliers

4. Animal feed organizational structure

The selection of structure of the envisaged project is made based on the existing structure of manufacturing plants operating in the country, the capacity, complexity and technology mix of the plant. Organizational structure principles such as specialization, coordination, and departmentalization are also considered for design of structure that best suits the envisaged project

4.1. Manpower Requirement and Estimated Annual manpower costs

Table 11 Annual manpower costs

s/no	Description	Number of persons	Salary in birr	
			monthly	annually
1	General manager	1	45,000.00	540,000.00
2	executive secretary	1	15,000.00	180,000.00
3	Manager- admin. and finance	1	25,000.00	300,000.00
4	assistance manager- finance	1	20,000.00	240,000.00
5	accountant	1	15,000.00	180,000.00
6	cashier	1	10,000.00	120,000.00
7	personnel and general service	1	10,000.00	120,000.00
8	guards	5	3,000.00	180,000.00
9	driver ii	4	10,000.00	160,000.00
10	manager-production and technical	1	20,000.00	240,000.00
11	production clerk	1	4,000.00	48,000.00
12	chief quality controller	3	12,000.00	432,000.00
13	chief miller	1	10,000.00	120,000.00
14	machine operator	3	5,000.00	180,000.00
15	assistant machine operator	3	3,000.00	108,000.00
16	senior mechanics	3	12,000.00	432,000.00
17	senior electrician	3	12,000.00	432,000.00
18	store keeper	1	10,000.00	120,000.00
19	manager- commercial	1	20,000.00	240,000.00
20	purchaser	1	10,000.00	120,000.00
21	sales- manager	1	15,000.00	180,000.00
	total	38		4,672,000.00

5. Financial Analysis

5.1. General

The financial analysis evaluation, under consideration has been carried out for animal feed Manufacturing cost estimates of the envisaged factory are mainly consisted of capital investment as well as operating and maintenance costs. The capital investment costs include fixed investment costs (initial fixed investment and replacement costs) and working capital, while operating and maintenance costs comprise current expenses related to material inputs, labour, utility, repair and maintenance costs, spare parts, Overheads, Sales and distribution, interest and depreciation expenses.

The financial analysis and evaluation has been conducted taking assumptions:

1. It is assumed that about 70% of the total capital investment costs including the working capital requirement could be covered through development bank loans of short and long-term credits. The remaining balance 30% will be covered by equity capital contribution of the project owner.
2. Even though the project might secure loans under different term and conditions as well as from different financial sources, for the purpose of calculation of debt service scheduling, the current development bank of Ethiopia credit terms and conditions have been used. Consequently. It is assumed that the project will secure loan facility on the basis of 11.5 % annual interest rate, and 10 years' equal installments.
3. Even though the estimated project production life is more 10 years, the financial analysis has been undertaken for a period interval covering the first 10 years only, during which time

most of the capital assets are assumed to be deprecated, debts recovered and pay-back period accomplished.

4. It is assumed that the project will be start up production activity at 70 % capacity. During years 2 & year 3 the projects is anticipated to gradually increase capacity utilization to reach 100% in year 4. Therefore, starting from year 4 the project will be operational at full capacity.
5. For the project under reference promotional, sales and distribution expenses have been estimated at 3% of the sales revenue.
6. Maintenance and spare parts costs are 1.5% of the fixed investment costs.

5.2. Initial Fixed investment costs

Table 12 Initial Fixed investment costs

S/No	Fixed investment type	Unit of measurement	Quantity	Unit price	Total Amount	Remarks
1	Land	Square meter	10,000	3,885 birr/M^2	38,850,000.00	The period of land lease will be 70 years and 10% of the total lease amount will be paid in the first year
2	Buildings and civil works	Square meter	5,100	lump sum	124,925,000.00	
	Sub total				**163,775,000.00**	
3	Machineries	set	2	Lump sum	130,000,000.00	
4	Transformer	set	1	Lump sum	2,000,000.00	
5	Weighbridge	Set	1	Lump sum	4,000,000.00	
6	Truck and vehicles	Pcs	2	Lump sum	6,000,000.00	
7	Furniture and fixture	Pcs			500,000.00	
	SUB TOTAL				142,500,000.00	
	Fixed capital investment costs				306,275,000.00	
8	pre-operational expenses				2,000,000.00	
	Working capital				50,993,000.00	
	TOTAL INVESTMENT COSTS				359,268,000.00	

5.3. Working capital

Working capital is the financial means required for smooth operation and maintenance of a project mathematically, it is a difference between current assets and current liabilities. In the particular case of the project under consideration, the current assets comprise receivables, inventories (local and imported material inputs, spare parts, work in progress, and products ready for delivery) and cash in hand, while current liabilities comprise accounts payable to creditors.

5.4. Project Financing

Fixed capital investment costs and working capital requirements are assumed to be financed by equity capital of the owner and through loans of short and long-term credits.

As stated earlier even though the company obtains loans under different terms and condition as well as from different sources, for the purpose of calculation of debt service scheduling the current development bank of Ethiopia credit terms and conditions have been used. Accordingly it is assumed that the company will be able to obtain loan 70% of the total investment costs for construction of different buildings (about 124.925 million Birr) for purchase of machineries (about 130 million Birr), for purchase of truck and vehicles (about 6 million Birr), for working capital 50.99 million and for purchase of office furniture and pre operation expense which are 0.5million and 2 million respectively will be covered through bank loans that will have to be repaid back within 10 years, during which time interest will be paid on the loan. The remaining balance that of the total investment costs will be expected to be covered by equity contribution of the project promoter.

5.5. Production costs

As it is depicted in Annex Table 20 major categories of the total production costs are assembled into the following cost elements.

5.5.1. Material inputs

In the project under study the basic material inputs are maize, wheat bran, limestone and packing materials etc. Therefore, the current prevailing local and international market prices have been used for estimation of material inputs costs. At full capacity operation the material inputs costs are estimated at Birr 427 million per annum.

Table 13 Raw materials input plan in Birr for cattle feed (for 325quintals/day)

	Period					Start-up			Full Capacity
	Capacity utilization					70%	80%	90%	100%
	Project year					1	2	3	4
	Materials input for animal feed	%	Unit of measure	Quantity at full Capacity	Unit price				
1	Maize	33	Quintals	27,885.00	2,500	48,798,750	55,770,000	62,741,250	69,712,500
2	Cassava	14	Quintals	11,830.00	1,800	14,905,800	17,035,200	19,164,600	21,294,000
3	Wheat bran	10	Quintals	8,450.00	2,000	11,830,000	13,520,000	15,210,000	16,900,000
4	Salt	2.50	Quintals	2,112.50	1,250	1,848,438	2,112,500	2,376,563	2,640,625
5	Limestone	2.50	Quintals	2,112.50	500	739,375	845,000	950,625	1,056,250
6	Groundnut cake	15	Quintals	12,675.00	3,200	28,392,000	32,448,000	36,504,000	40,560,000
7	Cotton seed cake	12	Quintals	10,140.00	2,200	15,615,600	17,846,400	20,077,200	22,308,000
8	Rice bran	10	Quintals	8,450.00	1,200	7,098,000	8,112,000	9,126,000	10,140,000
9	Cattle premix	1	Quintals	845.00	14,000	8,281,000	9,464,000	10,647,000	11,830,000
10	Packing materials		PCS	169,000.00	22	2,602,600	2,974,400	3,346,200	3,718,000
	Total					140,111,563	160,127,500	180,143,438	200,159,375

Table 14 material input for poultry feed (325 quintals per day)

	Period					Start-up			Full Capacity
	Capacity utilization					70%	80%	90%	100%
	Project year					1	2	3	4
	Materials input for animal feed	%	Unit of measure	Quantity at full Capacity	Unit price				
1	Maize	58.23	Quintals	49,204	2,500	86,107,000	98,408,000	110,709,000	123,010,000
2	Wheat bran	15	Quintals	12,675	2,000	17,745,000	20,280,000	22,815,000	25,350,000
3	Soya bean cake	12	Quintals	10,140	4,500	31,941,000	36,504,000	41,067,000	45,630,000
4	Peanut cake	8	Quintals	6,760	2,500	11,830,000	13,520,000	15,210,000	16,900,000
4	Meat and bone	2.4	Quintals	2,028	2,300	3,265,080	3,731,520	4,197,960	4,664,400
4	Salt	0.32	Quintals	270.40	1,250	236,600	270,400	304,200	338,000
5	Limestone	3.6	Quintals	3,042	470	1,000,818	1,143,792	1,286,766	1,429,740
6	B.concentrate	0.25	Quintals	211.25	12,500	1,848,438	2,112,500	2,376,563	2,640,625
7	DL.Lysine	0.1	Quintals	84.50	18,500	1,094,275	1,250,600	1,406,925	1,563,250
8	DL.Methionine	0.10	Quintals	84.50	28,000	1,656,200	1,892,800	2,129,400	2,366,000
10	Packing materials		PCS	169,000.00	22	2,602,600	2,974,400	3,346,200	3,718,000
	Total					159,327,011	182,088,012	204,849,014	227,610,015

Table 15 Total raw materials required for animal feed processing plant"000"

Period	START-UP			FULL CAPACITY						
Capacity utilization	70%	80%	90%	100%						
Project year	1	2	3	4	5	6	7	8	9	10
Cattle feed	140,112	160,128	180,143	200,159	200,159	200,159	200,159	200,159	200,159	200,159
Poultry feed	159,327	182,088	204,849	227,610	227,610	227,610	227,610	227,610	227,610	227,610
Total	299,439	342,216	384,992	427,769	427,769	427,769	427,769	427,769	427,769	427,769

5.5.2. Utilities

In estimating costs of utility expenses for operation and maintenance of the project, Costs of fuel, oil and lubricant, electricity and water consumptions have been taken in to consideration, the rates of which have been estimated on the basis of the proposed capacity utilization program of the project and at the current official charging rates. At full capacity operation the project will have the following utility expense per annum which amounts to Birr 4.66million.

Table 16 Utilities of the factory'000"Birr

Utility"000"Birr		Start-up			Full Capacity
Capacity utilization		70 %	80 %	90 %	100 %
Project year		1	2	3	4
Item description	Unit of measurement				
Fuel					
Gasoline for service vehicle	100km*260days*37Birr/LIT*8km/Li	84.18	96.20	108.1	120.25
Gasoline for transport truck	(200km*300days*37Birr/LIT*5km/Li)*3	932	1,066	1,199	1,332
Sub-Total		1016	1162	1307	1452
Change of oil and lubricant	10% of the fuel consumption	102	116	131	145
Sub-Total		1,118	1,278	1,438	1,597
Electricity	260days*24 hrs*600kwh* 0.69Birr/kwh	1,808	2,066	2,325	2,583
Sub- Total		1,808	2,066	2,325	2,583
Water	365days*100m^3/day*10 Birr/m^3	255.50	292.00	328.50	365.00
Sub -Total		255.50	292.00	328.50	365.00
Telecommunication					
Telephone	5 lines* 500Birr/month/line+18Birr/line/month	31.08	31.08	31.08	31.08
Mobile	5 lines*500 Birr/month/line	30.00	30.00	30.00	30.00
Fax	2line*1,000Birr/month + 17 Birr/line/month	24.40	24.40	24.40	24.40
Internet	2,500 Birr/month	30.00	30.00	30.00	30.00
Sub-Total		**115.48**	**115.48**	**115.48**	**115.48**
TOTAL		**3,297.00**	**3,752.00**	**4,207.00**	**4,661.00**

5.5.3. Repair and maintenance

In the expenses under this title have been considered cost estimates required for annual repair and maintenance works including spare parts expenses. These costs include the annual repair expenses of structures and civil works as well as repair and maintenance expenses of machinery and equipment including accessory and general service facilities. The repair and maintenance and spare parts costs have been assumed to be (1.5% of fixed costs and spare part costs).

5.5.4. Salaries and wages

The costs of salaries have been calculated in accordance with the manning list proposed under the "organization and Management" section of this study. In the estimation of salaries and wages, the official minimum wage has been taken in to account. At full capacity operation the costs of salaries and wages will amount to Birr 5.646 Million.

5.5.5. Over heads

In the expenses under this title have been included land and building taxes, buildings, vehicles as well as machinery and equipment insurance, vehicles annual inspection; postage, telephone and e. mail, stationery and office supplies; printing and copying; audit fee; cash indemnity etc. The overhead costs and divided in to direct overheads and administration overheads.

Table 17 Overhead costs

Direct Overhead"000"Birr		Year 1	Year 2	Year 3	Year 4
Annual land lease Payment		5,550.00	5,550.00	5,550.00	5,550.00
Insurance					
Building and Civil works	0.10%	124.92	124.92	124.92	124.92
Machinery and Equipment	0.20%	260	260	260	260
Motor vehicle and Truck	1%	60.00	60.00	60.00	60.00
Vehicles annual inspection and registration	25,000 Birr per annum per vehicle	50.00	50.00	50.00	50.00
Work cloth	Two times per annum per workers at 800 Birr	78.40	78.40	78.40	78.40
Cleaning and sanitation	An estimate of 300 Birr/day	78.00	78.00	78.00	78.00
Sub Total		6,201.32	6,201.32	6,201.32	6,201.32
Administration Overhead "000' Birr					
Audit fee	40,000 Birr per annum	40.00	40.00	40.00	40.00
Office cleaning and sanitation	2,000 Birr per month	24.00	24.00	24.00	24.00
Stationery and office supplies	2,000 Birr per month	20.00	20.00	20.00	20.00
Printing and Copy	2,000 Birr per month	24.00	24.00	24.00	24.00
Sub Total		**108.00**	**108.00**	**108.00**	**108.00**
GRAND TOTAL		**6,309.32**	**6,309,32**	**6,309.32**	**6,309,32**

5.5.6. Financial costs

As it has been outlined earlier under" project Financing" the current Development Bank of Ethiopia credit terms and conditions for newly establishing projects have been used to compute the financial costs, estimated to be incurred in connection with that of the total investment costs assumed to be covered through loan financing. The amount of the loan capital to be obtained and the financial costs to be incurred thereof have been determined depending on the amount of fixed investment cost and pre-production expenses.

5.5.7. Depreciation

Depreciation charges should be taken in to account as part of the total production costs in order to calculate the total production costs, the net working capital and the gross or net-profit. For the given project under reference, the fixed assets and the pre-production capital expenditures have been depreciated and amortized respectively on "a straight line" depreciation method basis using the following rates of the original acquisition costs of the assets:

The rationale uses for the estimation of the depreciation and the amortization rates is based on the expected service life of the assets and repayment capacity of the project under consideration. Based on the above charging rates and consideration of the above facts, the total annual depreciation cost at full capacity operation have been estimated at Birr 29.08 million.

Table 18 Depreciation in Birr"000"

Period			Start-up			
Capacity utilization			70 %	80 %	90 %	100 %
Project year			1	2	3	4
Item description	Original Value					
Structure and civil works	124,925,000.00	5% of original value	6,246.25	6,246.25	6,246.25	6,246.25
Machinery and equipment	130,000,000.00	15 % of original value	20,437.00	20,437.00	20,437.00	20,437.00
Transformer	2,000,000.00	15 % of original value	300.00	300.00	300.00	300.00
Motor vehicles and trucks	6,000,000.00	15 % of original value	900.00	900.00	900.00	900.00
Weighbridge	4,000,000.00	15 % of original value	600.00	600.00	600.00	600.00
Office equipment and furniture	500,000.00	20% of original value	100.00	100.00	100.00	100.00
Pre-operation expense	2,000,000.00	25% of original value	500.00	500.00	500.00	500.00
Total			29,083.23	29,083.23	29,083.23	29,083.23

5.6. Break Even point and ROI

5.6.1. Break Even point (BEP)

Three kinds of break-even point

A. BEP Sales Revenue(BR)

B. BEP production (Volume)

C. BEP Percentage (%)

A. Break-even point(BEP) Sales

To determine BEP Annual Sales, multiply annual sales found in income statement by the annual fixed cost, and divided by Annual sales less Annual variable cost.

$$\text{BEP (sales)} = = \frac{\text{Annual sales x Annual fixed costs}}{\text{Annual sales} - \text{Annual variables costs}}$$

Annual sales = 608,400,000 Birr

Unit selling price = 35 Birr/kg

$$\text{BEP (sales)} = = \frac{\text{Annual sales x Annual fixed costs}}{\text{Annual sales} - \text{Annual variables costs}} = = \frac{608{,}400{,}000 \text{ x } 73{,}579{,}000}{608{,}400{,}000 - 315{,}512{,}000}$$

BEP (Sales) = 152,841,576 Birr

B. BEP production

To determine BEP production volume, divided BEP sales by the unit selling price (USP)

BEP production = 152,841,576/35 = 4,366,902

C. $$\text{BEP percentage} = \frac{\text{Annual fixed costs x 100\%}}{\text{Annual sales} - \text{Annual variables costs}}$$

$$= \frac{73{,}579{,}000 \text{ x } 100\%}{608{,}400{,}000 - 315{,}512{,}000}$$

= 25%

5.6.2. Return on investment

Return on investment = Net profit /Total capital requirement

= 23,913,000/359,268,000

= 6.65%

The return on owners' investment (ROOI)

= Annual net profit /owners' investment

= 23,913,000/107,780,400

= 22%

5.7. Project costs

Project capital investment costs are the sum of fixed capital investment (fixed investment plus pre-production capital expenses) and net working capital at full capacity, with fixed capital constituting the resources required for constructions and civil works, importation and installation of production machinery (animal feed machinery) and equipment and general service facilities, whereas, the working capital corresponding to the resources needed for operation of the project totally and partially.

As it has been revealed in Annex Table 20 the total annual operating costs excluding depreciation and interest are estimated to range from 331 million Birr in year 1 to 466 million Birr in year 4 and then after remain constant for the rest of the project life.

The total annual production costs including depreciation and interest increase from 389 million Birr in year 1 to 518 million Birr in year 4 then starts declining until it reaches 477 million Birr in year 10.

5.8. Project benefits

For financial analysis and evaluation of the given project, the current material input price, and packing materials buying price and final packed animal feed price at the project gate has been taken as a basis. As it has been stated earlier the project is envisaged to reach full capacity operation four years after commencement of production activities which are assumed to begin with 70% of the estimated total capacity.

At full capacity operation the project is envisaged to have the following revenue components.

Table 19 Source of revenue in Birr"000"

	Period			Start-up			Full Capacity	
	Capacity utilization			70%	80%	90%	100%	100%
	Project year			1	2	3	4	5
	Product type		Unit price					
1	Animal feed for cattle	Quintals	3,500	207,025	236,600	265,658	295,750	295,750
2	Poultry feed	Quintals	3,700	218,855	250,120	281,385	312,650	312,650
	Total			425,880	486,720	547,043	608,400	608,400

Thus, according to the computation in Annex Table 22 and Annex Table 24, the net income and cash flow statements analysis revealed that at full capacity operation the project will generate a total income (gross revenue) amounting to 608 million Birr per annum. The corresponding Annex Table 22 of "Net Income Statement" shows a steady growth of gross profit starting from 37 million Birr in year 1 reaching the peak of 131 million Birr in year 10. In its 10 years of manufacturing activities,

the project is expected to generate a total net profit of 603 million Birr and contribute 325 million Birr to the government treasury in form of 35% income tax.

According to the current investment Law, machinery and equipment are anticipated to be imported duty- free. The liquidity position of the project is very strong. The corresponding Annex Table 24 of "Cash Flow Statement" shows the positive cumulative cash balance of Birr 604 million and the project will not face any cash shortage throughout its production life.

The computation of the pay-back period as depicted in Annex table 29 indicates that the project will be able to reimburse itself from its net cash-income within six years after commencement of production activities, the period which is considered to be very good for the project of this nature.

In Annex Table 30 of the Benefit-cost ratio and Net present value (NPV) have been calculated at 17% discount factor (D.F) for 10 years of the project activity. Accordingly, the project has NPV of 269 million Birr at 17%D.F. and the benefit-cost ratio of 1.12 at 17% D.F. These results are most appreciable, especially, when related to the external capital borrowing interest rate which ranges from 8.50% to 18.5 % for newly establishing projects.

The project under study when implemented will have BEP at about 25% operation of the estimated full capacity. In addition to this, finally, summary of financial efficiency tests have been conducted in Annex table 28, Accordingly, all efficiency ratios indicated positive trends and consequently, it can be inferred that the project can operate in the frame work of free market mechanism on commercially and financially viable basis and is remunerative.

ANNEXES

ANNEX II

CALCULATION OF ANNUAL PRODUCTION COSTS

Table 20 Annual total production costs"000"

Period	Start-up			Full capacity						
Capacity utilization	70 %	80 %	90 %	100 %	100 %					
Project Year	1	2	3	4	5	6	7	8	9	10
Cost category										
I. Material inputs	299,439	342,216	384,992	427,769	427,769	427,769	427,769	427,769	427,769	427,769
II. Labor	4,672	4,672	4,672	4,672	4,672	4,672	4,672	4,672	4,672	4,672
III. Utility	3,297	3,752	4,207	4,661	4,661	4,661	4,661	4,661	4,661	4,661
IV. Repair and Maintenance and spare parts (1.5 % of fixed costs)	4,594	4,594	4,594	4,594	4,594	4,594	4,594	4,594	4,594	4,594
VI Direct overheads	6,201	6,201	6,201	6,201	6,201	6,201	6,201	6,201	6,201	6,201
A. Direct Production costs	318,203	361,435	404,666	447,897	447,897	447,897	447,897	447,897	447,897	447,897
VII. Administration over head	108	108	108	108	108	108	108	108	108	108
VIII. Marketing and Promotional expense 3 % of sales revenue	12,776	14,602	16,411	18,252	18,252	18,252	18,252	18,252	18,252	18,252
B. Operating costs	331,087	376,145	421,185	466,257	466,257	466,257	466,257	466,257	466,257	466,257
Interest	28,921	27,232	25,350	23,251	20,911	18,301	15,392	12,148	8,530	4,497
Depreciation	29,083	29,083	29,083	29,083	28,583	28,483	21,078	6,246	6,246	6,246
C. Total production costs	389,091	432,460	475,618	518,591	515,751	513,041	502,727	484,651	481,033	477,000

ANNEX IV
CALCULATION OF WORKING CAPITAL REQUIREMENTS

I. Minimum requirement of current assets and liabilities
   A. Accounts receivable: 30 days at total production costs minus depreciation and interest
   B. Inventory
      1. Material inputs: 30days
      2. Spare parts : 90 days
      3. Work under process: two days at direct costs
      4. Product ready for delivery: 8 days at direct costs plus administration overheads
   C. Cash on hand : 90 days
   D. Accounts payable 52 days for material inputs and utilities

ii. Working capital requirement

Table 21 Calculation of working capital

Cost category	Minimum Days of coverage	Coeff-icient of turnover	Project year									
			Start up			Full capacity						
			1	2	3	4	5	6	7	8	9	10
I. Current asset												
A. A/R	26	10	33,109	37,615	42,119	46,626	46,626	46,626	46,626	46,626	46,626	46,626
B. Inventory												
1. Material inputs	26	10	29,944	34,222	38,499	42,777	42,777	42,777	42,777	42,777	42,777	42,777
2. Spare parts	90	4	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149
3. Work under process	2	130	2,448	2,780	3,113	3,445	3,445	3,445	3,445	3,445	3,445	3,445
4. Product ready for delivery	8	32.5	9,899	11,229	12,559	13,889	13,889	13,889	13,889	13,889	13,889	13,889
C. Cash on hand			4,718	4,832	4,946	5,059	5,059	5,059	5,059	5,059	5,059	5,059
D. Current assets			81,267	91,827	102,385	112,945	112,945	112,945	112,945	112,945	112,945	112,945
II. Current liabilities			30,274	34,597	38,920	43,243	43,243	43,243	43,243	43,243	43,243	43,243
A. A/p	26	10										
III. Working capital												
A. Net working capital			50,993	57,230	63,465	69,702	69,702	69,702	69,702	69,702	69,702	69,702
B. Increasing in working capital			50,993	6,237	6,235	6,237						

ANNEX VI

PROJECTED NET INCOME STATMENT

Table 22 Projected Net income statement "000"

Period	Start up			Full capacity						
Capacity utilization	70 %	80 %	90 %	100 %						
Project year	1	2	3	4	5	6	7	8	9	10
Item description										
Product sales revenue	425,880	486,720	547,043	608,400	608,400	608,400	608,400	608,400	608,400	608,400
Less total production costs	389,091	432,460	475,618	518,591	515,751	513,041	502,727	484,651	481,033	477,000
Gross profit	36,789	54,260	71,425	89,809	92,649	95,359	105,673	123,749	127,367	131,400
Tax	12,876	18,991	24,999	31,433	32,427	33,376	36,986	43,312	44,578	45,990
Net profit	23,913	35,269	46,426	58,376	60,222	61,983	68,687	80,437	82,789	85,410
Accumulated undistributed profit	23,913	59,182	105,608.10	163,984	224,206	286,189	354,877	435,313	518,102	603,512

ANNEX VII
DEBT SERVICE SCHEDULE AND COMPUTATION
PAYMENT OF EQUAL ANNUAL INSTALLMENTS

Table 23 Debt services schedule and computation

Item description	Project year										
	1	2	3	4	5	6	7	8	9	10	
A. Investment and working capital											
1. Investment											
2. Increment working capital											
Total											
B. Loan receipts and balances											
1. Loan receipts	251,488	236,807	220,437	202,185	181,834	159,143	133,841	105,632	74,177	39,105	
2. Outstanding balance at end of year											
a. First year loan	251,488	236,807	220,437	202,185	181,834	159,143	133,841	105,632	74,177	39,105	
Total											
A. Debt service											
1. First year Loan											
a. Interest	28,921	27,232	25,350	23,251	20,911	18,301	15,392	12,148	8,530	4,497	
b. Repayment of principal	14,681	16,370	18,252	20,351	22,691	25,301	28,210	31,455	35,072	39,10	

ANNEX VIII
CASH-FLOW STATEMENT
FOR
FINANCIAL PLANING

Table 24 Projected Cash flow statement

Period	Start up			Full capacity								
Capacity utilization	70%	80%	90%	100%								
Project year	1	2	3	4	5	6	7	8	9	10	11	12
Item description												
A. Cash - inflow	815,422	497,280	557,601	618,960	608,400	608,400	608,400	608,400	608,400	608,400		
1. Financial resource (total)	389,542	10,560	10,558	10,560								
2. Sales revenue	425,880	486,720	547,043	608,400	608,400	608,400	608,400	608,400	608,400	608,400		
B. Cash – outflow	777,107	449,298	500,344	551,852	542,286	543,235	546,845	553,172	554,437	516,744		
1. Total assets schedule including replacement	389,542	10,560	10,558	10,560								
2. Operating costs	331,087	376,145	421,185	466,257	466,257	466,257	466,257	466,257	466,257	466,257		
3. Debt service (total)												
a. Interest	28,921	27,232	25,350	23,251	20,911	18,301	15,392	12,148	8,530	4,497		
b. Repayment	14,681	16,370	18,252	20,351	22,691	25,301	28,210	31,455	35,072	39,10		
4. Tax	12,876	18,991	24,999	31,433	32,427	33,376	36,986	43,312	44,578	45,990		
C. Surplus (Deficit)	38,315	47,982	57,257	67,108	66,114	65,165	61,555	55,228	53,963	91,656		
D. Cumulative cash balance	38,315	86,297	143,554	210,662	276,776	341,941	403,496	458,724	512,687	604,343		

ANNEX XII
TOTAL INVESTMENT COSTS

Table 25 Total investment costs"000"

Period	Start up			Full capacity								
Project year	1	2	3	4	5	6	7	8	9	10	11	
Investment Category												
1. Fixed investment costs												
a. Initial fixed investment costs	306,275											
b. Replacement												
2. Pre-operational capital expenditure	2,000											
3. Working capital increase	50,993	6,237	6,235	6,237								
Total investment costs	359,268	6,237	6,235	6,237								

ANNEX XIII
TOTAL ASSETS

Table 26 Total Assets

Period	Start up			Full capacity								
Project year	1	2	3	4	5	6	7	8	9	10	11	12
Investment Category												
1. Fixed investment costs												
c. Initial fixed investment costs	306,275											
❖ Cost of land												
d. Replacement												
2. Pre-operational capital expenditure	2,000											
3. Current assets increase	81,267	10,560	10,558	10,560								
Total assets	389,542	10,560	10,558	10,560								

ANNEX XIV
SOURCES OF FINANCE

Table 27 Sources of finance

Period	Start up			Full capacity							
Project year	1	2	3	4	5	6	7	8	9	10	Total
Sources of finance											
1. Equity capital	107,780	6,237	6,235	6,237							
2. Loan capital	251,488										
3. Current liabilities	30,274	4,323	4,323	4,323							
Total finance	389,542	10,560	10,558	10,560							

ANNEX XI
SUMMARY OF FINANCIAL EFFECIENCY TESTS

Table 28 Summary of financial efficiency tests

	Project year									
Project year	1	2	3	4	5	6	7	8	9	10
Capacity utilization	70%	80%	90%	100%						
Financial ratio in %										
1. Gross profit : Revenue	9%	11%	13%	15%	15%	16%	17%	20%	21%	22%
2. Net profit : Revenue	6%	7%	8%	10%	10%	10%	11%	13%	14%	14%
3. Net profit : initial investment	7%	10%	12%	15%	16%	16%	18%	21%	22%	23%
4. Net profit : Equity	22%	31%	39%	46%	48%	49%	54%	64%	65%	68%
5. Gross profit : Initial investment	10%	15%	19%	24%	25%	25%	28%	33%	34%	35%
6. Operating costs : Revenue	78%	77%	77%	77%	77%	77%	77%	77%	77%	77%

ANNEX XV

CALCULATIONS OF PAYBACK PERIOD

Table 29 Calculation of payback period"000"

Year	Amount Paid Back			Total investment	End of year
	Net Profit	Depreciation	Total		
1	23,913	29,083	52,996	359,268	-306,272
2	35,269	29,083	64,352	6,237	-248,157
3	46,426	29,083	75,509	6,235	-178,883
4	58,376	29,083	87,459	6,237	-97,661
5	60,222	28,583	88,805		-8,856
6	61,983	28,483	90,466		+81,610

ANNEX XVI

CALCULATIONS OF NET PRESENT VALUE AT 17% D.F.

Table 30 Calculation of NPV at 17% D.F.

Project year	Gross Revenue	$1/(1+i)^n$ At 17%	Present value at 17%	Project costs			
				Total investment	Operating costs	Total	Present value at 17%
1	425,880	0.854701	364,000	359,268	331,087	690,355	590,047
2	486,720	0.730514	355,556	6,237	376,145	382,382	279,335
3	547,043	0.624371	341,558	6,235	421,185	427,420	266,869
4	608,400	0.53365	324,673	6,237	466,257	472,494	252,146
5	608,400	0.456111	277,498		466,257	466,257	212,665
6	608,400	0.389839	237,178		466,257	466,257	181,765
7	608,400	0.333195	202,716		466,257	466,257	155,355
8	608,400	0.284782	173,261		466,257	466,257	132,782
9	608,400	0.243404	148,087		466,257	466,257	113,489
10	608,400	0.208037	126,570		466,257	466,257	96,999
Total			2,551,096				2,281,451

A. Benefit- cost ratio At 17% D.F. = 1.12

B. NPV At 17% D.F. = 269,645,000 Birr