An Assessment of the Financial and Economic Feasibility of a Fertilizer Manufacturing Facility in Nigeria

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ABSTRACT

This study assesses the financial and economic feasibility of the fertilizer plant in Nigeria. And it analyses alternatives for the implementation of the fertilizer plant using the integrated method of investment appraisal. The analysis also helps in the estimation of the allocation of benefits to the government of Nigeria. In assessing the potential risks variables the sensitivity analysis was carried out.

Inadequate food availability and food insecurity has a core effect on any nation and its inhabitants; it's on this premise that the need for better technologies like fertilizers arose. Fertilizer is the added nutrient sources which help to nourish the plants with essential nutrients. Lack of fertilizer plant would result in low production of food to cater for the entire community needs.

Having a urea plant in Nigeria as the reduced rate of producing natural gas would enhance agricultural productivity and reduce food scarcity. Venturing into a urea business in Nigeria would enhance the standard of living of Nigerian and would also be viable source of revenue.

Keywords: Investment appraisal, financial analysis, economic analysis, stakeholder analysis, risk analysis, fertilizer plant, Nigeria.

ÖZ

Bu çalışma Nijerya'da bulunan gübre tesisinin ekonomik ve finansal fizibilite değerlendirmesini yapmaktadır. Ayrıca, gübre tesisinin alternatif uygulamalarını bütünleşmiş yatırım değerlendirmesi kullanarak analiz etmektedir. Yapılan analizler Nijerya hükümetine ayrılacak olan faydaların da tahminini yapmaktadır. Muhtemel risk değişkenlerini incelemek için, hassaslık analizi uygulanmıştır.

Gıda yetersizliği ve güvensizliği tüm ulusları ve milletleri etkilemektedir. Bu nedenle, gübreleme alanında daha iyi teknolojilerin gereksinimi doğmaktadır. Gübreleme, ilave edilmiş besinlerin harmanlanmasıyla bitkilerin yetişmesinde önemli rol oynamaktadır. Gübreleme tesislerinin eksikliği gıda üretiminin topluma sağlanmasında yetersizliklerine sebep olacaktır.

Nijerya'da azalan doğal gaz üretimi sonrasında, bir biyokim tesisinin bulunması tarımsal üretimi artırarak gıda kıtlığını azaltacaktır. Bu tesislerin geliştirilmesi Nijerya halkının yaşam koşullarını geliştirecektir.

Anahtar Kelimeler: Yatırım değerlendirmesi, finansal analiz, ekonomik analiz, hissedar analizi, risk analizi, gübreleme tesisi, Nijerya.

I dedicate this thesis to God, and my parent, who taught me
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LISTS OF ABBREVIATIONS

ADSCR	Annual Debt Service Coverage Ratio
ADSCR	Annual Debt Service Capacity Ratio
CB	Cost Benefit
CSCF	Commodity Specific Conversion Factor
CIF	Cost, Insurance and Freight
NG	Natural gas
IFPRI	International Food Policy Research Institute
GDP	Gross Domestic Product
FGN	Federal Government of Nigeria
FIFO	First In First Out
TFI	The Fertilizer Institute
USDA	United States Department of Agriculture
NASS	National Agricultural Statistics Service
VCR	Value Cost Ratios
SSA	Sub-Sahara Africa
NPK	Nitrogen Potassium and Calcium
LLCR	Loan Life Coverage Ratio
LIFO	Last In First Out
NPV	Net Present Value
IRR	Internal Rate of Return
FNPV	Financial Net Present Value
FIRR	Financial Internal Rate of Return
ENPV	Economic Net Present Value
EIRR	Economic Internal Rate of Return
EOCK	Economic Opportunity Cost of Capital

Chapter 1

INTRODUCTION

1.1 Background to the Study

Nigeria is situated on the western coast of Africa between the Benin Republic and Cameroon with its land mass of 923,768 km^2 and a coastline of about 853km. A population census conducted in 2006 revealed that Nigeria had a population of about 140,431,790 people. From the census carried out in 2012, we see that Nigeria's population has greatly increased to 170,123,740 people, which makes Nigeria the 7^{th} most populous country in the world. (Ladan, 2014).

This increase in population has affected the various sectors of Nigeria's economy including the agricultural sector which use to be a key sector. Before the 1960s, there was a massive growth in the agricultural sector in Nigeria, besides, the government policies towards agriculture was favorable and this enhanced agricultural productivity. Food was sufficient enough to provide and cater for its increasing population, this led to an increase in public government revenue, foreign exchange, and increasing employment opportunities. (FMARD, 2003).

In the research carried out by the World Bank in 2007 it was projected that the population of the world would increase from 6 billion to 7 billion in 2020. However, this increase in population as stated by the Food and Agriculture Organization (FAO) could result in a shortage of food for over 790 million people in developing countries.

As the population increases, an issue of global food insecurity could arise. Measures have to be put in place in order to increase agricultural productivity to offset the growing population.

As population grows, there is a need for better farming technologies to be created. The number of people affected by food shortages dropped as a result of farmer's adoption of the new technologies in the past. According to F.A.O (2004), the adoption of the new farming technology like high yielding varieties of seeds increases productivity as well as creates employment opportunities. Over the years the agricultural sector has had a significant impact on the national self - sufficiency of the Nigeria economy. As a result, it is able to supply over 90% of the total food consumption requirements. This has enhanced a healthy/serene population and has provided nutrition for households. Oji-Okoro (2011).

Several methodologies have been adopted in analyzing the impact of fertilizer plants on the economy, but rarely has any research been done using the integrated investment appraisal approach. Therefore, the purpose of this research is to look into fertilizer production of Nigeria by building a model using a cost – benefit approach, that will be useful in carrying out a financial, economic and stakeholder analysis of a prototype fertilizer plant and also verify certain risk or risky variables that has influenced or might affect the fertilizer plants in Nigeria.

1.2 History of Agriculture in Nigeria

Before oil was discovered in the country, agriculture was prominent (Okoh, 2004). Agriculture was responsible for about 65-70% of the total exports in 1960, but this declined to 40% by the 1970s, and to 2% by the 1990s. The fall in agricultural sector

exports was largely due a sudden rise in the revenue of crude oil in the 1970s. However, the increase in population raised the local demand in agricultural production. Farmers were affected by problems of easy access to modern inputs and credit, poor infrastructure, land and environment devaluation, inaccessibility to research and service extension. (Lawal A.F et al (2010).

1.2.1 Enhancing Agriculture in Nigeria

The International Food Policy Research Institute (IFPRI) had a briefing in 2008. In the briefing it was stated that, the usefulness of agriculture cannot be underrated. Livestock and farming cultivation is the source of improved living of over 70 percent of the country's households. There has been an immerse contribution to the country's GDP (gross domestic product), of about 42 percent growth, due to the country's improvement in agriculture which superseded the percent gotten from petroleum and natural gas production. Despite its contribution to GDP, it has not enhanced agriculture so well. Therefore low rate of agricultural productivity in Nigeria has been caused by low fertilizer usage. The federal government of Nigeria (FGN) in 2008 stated that the food security of the nation could be enhanced mainly by improving agricultural productivity. Thereby they put in place several innovations focused at adopting the various farming technologies by subsiding inorganic fertilizer. In-spite the subsidization of the fertilizer prices in Nigeria, fertilizer use in Nigeria still remains one of the lowest in the world. Afua B. et al 2009.

Table 1: Different rate of subsidy given by the government to the various states in Nigeria.

	Mt / Procured	Kg / household	Subsidy (%)
North –East			
Adamawa	26700	87	18
Gombea	29100	142	23
Bauchi	44200	162	24
Taraba	28200	117	24
Yobe	5070	56	19
Borno	9330	20	19
North-West			
Jigawa	13560	32	49
Kaduna	9870	27	18
Kano	32207	97	40
Katsina	6300	15	42
Kebbi	35036	122	12
Sokoto	16590	53	50
Zamfara	32800	115	11
North-Central			
Benue	23130	39	50
FCT	8000	208	0
Kogi	40560	118	17
Kwara	3930	26	23
Nassarawa	24000	100	15
Niger	27990	76	
Plateau	2700	87	17
South-East			
Abia	6000	13	17
Anambra	22700	6	12

Enugu	8359	30	3
Ebonyi	2589	9	2
Imo	6963	12	11
South-West			
Lagos	600	14	0
Ekiti	7600	47	19
Ogun	3600	11	10
Ondo	2550	5	12
Oyo	8200	23	0
Osun	8998	38	1
South-South			
Akwa-Ibom	9650	30	18
Bayelsa	4800	54	0
Cross-River	9330	19	6
Delta	2760	7	0
Edo	8400	20	14
River	7800	13	0

Source: Federal Fertilizer Department. a. State procures fertilizer from other sources in addition to FGN. b. Procured from FGN. c. Agricultural households. d. Exclusive of 25 percent federal subsidy.

Table 1 above shows the subsidy the government allocated to different states in Nigeria for the use of fertilizer in Nigeria. The subsidy helps the farmers to be able to buy fertilizer at a reduced price, and encourages its use.

In the last decade enhancing of fertilizer became very important, and cut - across the sub -Sahara Africa. A summit took place in Nigeria in 2006, to enhance the large scale fertilizer subsidy programs in the growing economies of Africa i.e Malawi,

Nigeria, Zambia, Tanzania etc. It also concentrated on the promotion of new agricultural inputs, and intensified government efforts and programs that develop farmers. Without a proper knowledge of where fertilizer can be profitably utilized, fertilizer development and subsidy programs that are focused on enhancing fertilizer use would fail to trigger agricultural productivity in a way that it would not conform to its expectations.

1.3 The Role and Importance of Fertilizer in Growing Economies

Inadequate food availability and food insecurity has a core effect on any nation and its inhabitants; it's on this premise that the need for better technologies like fertilizers arose. Fertilizers are the added nutrient sources which help to nourish the plants with essential nutrients and soil, which acts as a medium between the crops and the fertilizers as asserted by Bokhtiar et al., (2005).

The lack of fertilizer plant in Nigeria amounts for the low production of crops and increase shortage of food in the economy. This will create an imbalance in the economy. There abounds several explanations to the poor outcomes in the Nigeria agricultural sector in the last couple of decades due to the lack of agricultural inputs, such as fertilizer and machinery. But yields can also be increased through the development of new technologies, which made inputs more effective or allowed inputs to be combined in new and better ways. (Keith O. et al., 2007). Historically an increase in produces gotten from agriculture productivity has led to a subsequent increase in the use of fertilizer chemical in the Nigeria economy. In recent years there has been a reduction in the crop yields and nation of fertilizer usage which has caused a subsequent call for government fertilizer subsidies (Crawford et al., 2006).

Absence of fertilizer would enhance food shortage and instability, since only half of the community would be the ones that would benefit from the food production. Hence, Inorganic fertilizer plays an important role in the world's food security. Robert T.L. (2009).

The Fertilizer Institute (TFI), in 2008 stated that fertilizer catered for 40 – 60 percent of the world's food supply. The major nutrient of fertilizer is – nitrogen, phosphorus and potassium and they are frequent occurrences. Fertilizers enrich the soils in harvest and it enhances healthy and abundant crops for food production. Fertilizer nutrients are to be applied frequently every year to help grow a nutritious supply of food.

1.4 Objectives and Aims of the Study

The primary objective of the study is to build a Cost-Benefit Analysis model, using integrated investment analysis techniques to carry out financial, economic and stakeholder analysis (appraisal) for a typical fertilizer plant. A model that would be useful in analyzing the financial and economic viability of the fertilizer plant in Nigeria. To come up with a model that will be useful in appraising stakeholder impact in order to assess the distributive influence of externalities and reveal the major risky variables that would or have been affecting fertilizer plants in Nigeria.

1.5 Research Question

There are two basic questions; the researcher intends to answer through the model, which are;

(i) Are fertilizer plants in Nigeria financially and economically viable and what are their stakeholders' impacts?

(ii) What are the major risks/risky variables and their magnitude associated with the fertilizer plants in Nigeria?

1.6 Organizational Structure

Chapter one of this study consist of the background to the study, history of agriculture in Nigeria, importance of fertilizer in farming, the role of fertilizer in growing economies, objectives of the study, research questions and organizational structure.

Chapter two give a brief overview of the fertilizer company; past literature reviews and empirical analysis related to the study.

Chapter three deals with the research methodology, while chapter four, gives a brief description about the fertilizer plant. Chapter five consists of the economic analysis of the urea plant. The input parameter would be used and the study would construct a financial model also economic viability of the plant. It put in consideration the various assumption and parameters that would be used to develop the statement of economic resource flow. It shows how the economic analyses separated economic goods into traded and non-traded services and goods, importable, exportable (input and output). The economic net present value and economic internal rate of return would be interpreted to ensure that the economy benefit from the plant.

Chapter six contains the analysis of the stakeholders based on the result gotten from the economic and financial appraisal carried out. Chapter seven shows the risk analysis of the project and how the risky it could be. Chapter eight give the summaries of the entire analysis done and its final conclusion has to whether to recommend the project or not.

Chapter 2

AN OVERVIEW OF THE STUDY

2.1 Conceptual Framework

Over several decades, farmer's production has doubled with the use of fertilizer. The United States Department of Agriculture (USDA) and the National Agricultural Statistics Service (NASS) reports show a significant increase in the consumption of fertilizer nutrients over the years. This has resulted in the increment of crops production over time. The report also reveals that over 40 percent of the world's food production is as a result of the use of fertilizer.

Fertilizer can be described as a composition of various chemical (mineral and element) used to enhance growth and nourishment of any plant. Fertilizer generally has been used to increase and boost production of commercial crops, and are therefore called agricultural fertilizers. Fertilizers help to promote the richness of the soil and enhance its nourishment, which results in high productivity of crops. According to Bokhtiar et al. (2005), the essential nutritional crops needed are gotten from fertilizing the soil. The use of fertilizer has been seen as one of the efficient adoption in agricultural production. Locally, the fertilizer is usually added to the entire farmland not taking into consideration the variations of the soil. Sindir et al., (2002) posited that, there are random mixture of cores of the soils, which are mixed into a single bit to produce a unique fertilization of the soils.

All over the world there has been a drastic change in the composition of nitrogen fertilizer. Overtime, urea has been used in replacement of nitrogen fertilizer. Farmers adopts the use of urea because it is cheaper in price compared to the cost (price) of nitrogen fertilizers. Although, urea has been seen to be used as nitrogen fertilizer, nitrogen is known to be very efficient in growing plant because of the plant easy adoption to it. (Glibert et al., 2006).

While the worldwide increment in the utilization of nitrogen-based composts has been all around perceived, another adjustment in manure use has at the same time happened: a movement toward urea-based items. Overall utilization of urea has expanded more than 100-fold in the previous 4 decades and now constitutes 50% of worldwide nitrogenous manure use. With a multiplying in only the previous decade alone to be sure, the 1990s were hailed as a 'particularly upbeat time' for urea deals (International Raw Materials 2000). Worldwide production of urea is presently around 70 million metric tons' per year. Despite the fact that urea compost is usually thought to be held in soils, there is developing confirmation of urea seepage to delicate seaside waters (Glibert et al., 2006).

A study was carried out between the month of May and June 2008 which shows the plantation of cocoa in five producing states in Nigeria. In the report, it was noticed, that there was a decline in the yield as a result of the low soil fertility. The study carried out was able to reveal to us the rate at which fertilizer is been used in the state producing cocoa. It also states the usefulness of soil fertility to the cocoa farmers and its input to agriculture. (Ogunlade et al., 2009).

The actual needs and requirement of the plant is met by the fertilizer chemicals applied to the soil. This fertilizer enhances the production of the plant. In order to hasten the growth of the plant yields the adequate mixtures of nutrients is required, thus rapid growth is enhanced, since the soil does not take much time to adapt this nutrient for use.

2.2 The Use of In-Organic Fertilizer

The inorganic fertilizer main aim is to enhance the biological base of the plant's nutrient or circle, Weight and Kelly (1999). This would enhance the inorganic fertilizer for plant production profitability and long term nutrient replenishing in the soil. Otherwise, there could be a decrease in the agricultural production as a result of the land depletion which is caused by soil infertility. Yesuf et al., (2005). Research carried out in Kenya by Marenya and Barrett (2009), showed that the profitability of fertilizer solely depends on how fertile the soil is, which shows that farmers that have poor soils might face the problem of low productivity. Low productivity in African is greatly corresponding to the low use of fertilizer by farmers Morris et al., (2007).

The degradation of soil nutrients is one main problem. With increasing population in the areas of agriculture productive sectors, farmers are not only mandated to plant in suboptimal agricultural areas, but also to cultivate the same land seasons by seasons without adding nutrient to the soil through fallowing Drechsel et al., (2001). Replenishing the soil nutrients time to time is very essential in enhancing the soil fertility. The use of fertilizer helps to reduce the increasing rate of infertility in soil. The use of fertilizer is seen to be an effective way to overcome depletion of soil fertility in terms of the level of nitrogen and phosphorus content. Weight and Kelly (1999).

2.3 Fertilizer Use and Profitability in Sub-Sahara Africa

Fertilizer usage in SSA (Sub-Sahara Africa) are far lower than any other part of the world. Minot and Benson (2009) find that the average fertilizer application rate was only 13 kg/ha in 2008, compared with an average 94 kg/ha in other developing countries. Previous research has shown that demand and supply are one of the factors that affect the use of fertilizer (Crawford et al. 2003; Morris et al. 2007).

On the demand side, both perceived profitability and inability of the farmers to pay for the fertilizers are reasons for its low use. Having the right information on fertilizer application, the nature of the soil as well the fluctuation in the price of the fertilizer influences the profit in using fertilizer. On the supply side, distribution of the required quantity of fertilizer from the producers to the farmers are hindered due to bad road network (Larson and Frisvold 1996) and this leads to the high cost of getting the fertilizer in this region compared to other parts of the world (Kherallah et al. 2002).

In their review, Morris et al. (2007) finds fertilizer use to be unprofitable in many parts of Africa due to high prices and transportation costs. Heisey and Mwangi (1997) showed that profitability of fertilizer application to maize, calculated as a ratio of fertilizer price to maize market price, had increased over time in many major maize producing countries in Africa. Meertens (2005), calculated the profitability using another metric, value cost ratios (VCR), and found a similar downward trend in profitability, reaching critically low levels particularly in SSA.

Yanggen et al. (1998) find that while overall agronomic response to fertilizer in many parts of Africa fertilizer price is similar to other places in the world, the ratio of

output price is much higher, making it one of the least profitable places to purchase the input. Clearly, the price at which fertilizer can be procured is an essential component to its profitability and likely use. In a review of four countries in SSA from 1971 to 2001, Heisey and Norton (2007) find that the price of nitrogen was below the world average price at the beginning part of the period but much higher towards the end. This finding is consistent with other claims of falling profitability over time.

2.4 Production Processing of Urea

Ammonia is the basic chemical used in producing fertilizer. In producing Ammonia more than 80% of energy is required. In the world more than 60% of nitrogen is in the form of urea.

Ammonia is manufactured from energy, water and air. Hydrocarbon is the source of energy that produce energy for fixing nitrogen. Another form of energy needed is steam and power. This is gotten from coal or petroleum products or purchasing power of a utility company. Also natural gas amidst all other is the most effective routes for producing ammonia. Other routes used are partial oxidation in comparism to natural gas. In producing ammonia coal can also be used. The commercial combination of urea entails the combination of ammonia and carbon dioxide at high pressure which forms ammonium carbamate, which is continuously dehydrated by applying heat to form urea and water. Rajani V. et al (2013) and Wikipedia, (2016).

$2NH_3 + CO_2 \longleftrightarrow NH_2COONH_4 \longleftrightarrow CO(NH_2)_2 + H_2O$

Ammonia Carbon Dioxide Ammonium Carbamate Urea Water

2.5 Urea Fertilizer

Urea fertilizer is seen as an important nitrogenous fertilizer. It is so high in nitrogen content, possessing about 46 percent Nitrogen, hence it falls into the category of compound organic chemical. Urea is useful in animal feed additive and in agriculture. It is easy to adapt to all kinds of soil. Urea is not an expensive form of nitrogen fertilizer it comprises nitrogen phosphorous and potassium (NPK) of ratio 46-0-0. Despite urea is produced naturally from human and animals.

2.6 Theoretical Review

A research carried out shows that significant a driver of energy use and greenhouse gas in China is the efficient usage of synthetic nitrogen (N) fertilizer. Over the years there has been stability in the security of food and the synthetic nitrogen fertilizer has enhanced this food stability. Therefore, a need has been raised to improve the use of nitrogen (N) fertilizer in China. Fredrich K. et al., (2010).

Diagram 1: World fertilizer consumption

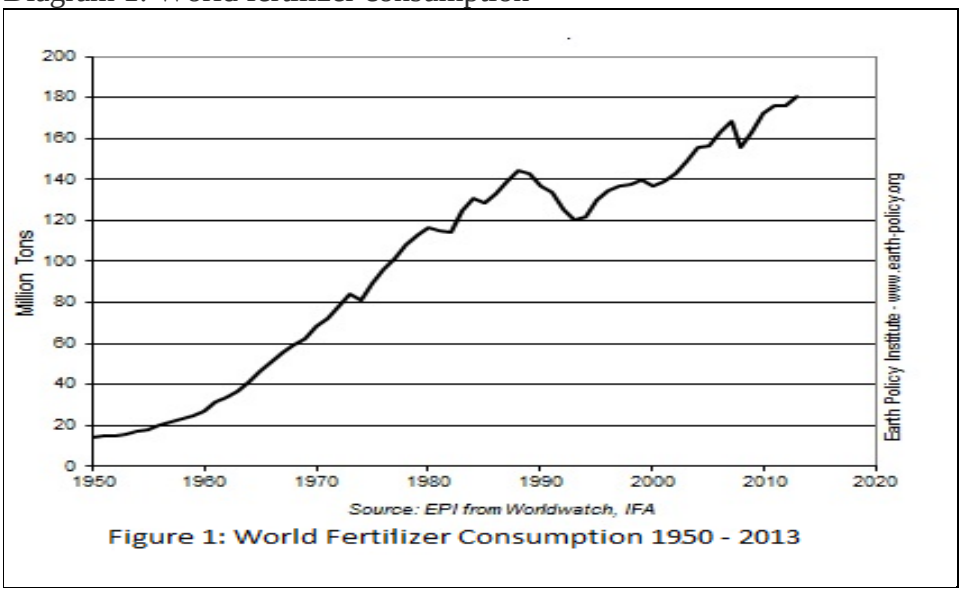

Figure 1: World Fertilizer Consumption 1950 - 2013

According to the IFA, the above diagram shows the level of fertilizer consumption over the years, there has been a sudden increase in the consumption of fertilizer from the year 1950 to the year 2013, resulting in a greater yield of crops globally overtime.

The use of synthetic nitrogen (N) fertilizers is an important driver of energy use and greenhouse gas (GHG) emissions in China. Synthetic nitrogen (N) fertilizers have played an important role in maintaining China's food security over the past three decades. In contrast to its low levels of synthetic N fertilizer production and use in the early 1970s, China is now the world's largest producer and consumer of N fertilizers.

In the 1990s, the scientific community began to raise concerns over the potential overuse and environmental impacts of N fertilizer application in China, and since then a growing body of research has identified the need to improve N fertilizer use efficiencies. Over the past ten years there has been an increase in the output of synthetic ammonia from 33.6million tons to 53.2 million tons in 2010. Synthetic ammonia as seen, has a unique product of chemical fertilizer in China. (NBSC, 2011).

Mehedi T.A., et al., (2012), analyzes the effect of urea and cow dung on the growth and yield of carrot where their study applied a randomized complete block design to achieve the aim of the study. A combination of 150kg/ha much of urea and 15 tonnes cow dung/ha maximizes the production as well as yield in the study area in Bangladesh. The study also reveals the cost benefit ratio accounting for 4.61 percent while their return shows (21142 ha^{-1}). Using a combination of two fertilizers can help strengthen the plant and enhance its efficiency.

Samira et al, (2012) conducted a research on the effect of Urea, NPK and Compost on Growth and Yield of Soybean. Three different kinds of method of research were used in two different seasons, the crops was said to improve in the two seasons, the soya-beans was planted in the two seasons, due to it fertilization the flowering days after sowing decreased to 33days, the nitrogen fertilization promotes it vegetation. The pod of the plant was increased as a result of the fertilization used.

There has been an average increase in the rate of yield over the years in the United States (Wilcox, 2004). A researched carried in the United State Corn Belt region, shows the estimate of 6-8Mg _1 of yield on soybean (Cooper, 2003; Specht et al., 1999). There was an increase in yield as a result nitrogen fertilizer added to the soya beans crops and the range of response increased from 0.11 – 1.75 Mg_1.

A research was done in the greenhouse using different cropping circle. In testing the crop field, a maize was used and also cowpea was used to test crop's performance, it was seen that there was an increase in yield from the maize and cowpeas as a result of the fertilizer nutrients used.

The above literatures have viewed the use of fertilizer using the other methods and in a different light, but this study uses the cost benefit analysis to ascertain the prototype of fertilizers plant in Nigeria. This would help us view its usefulness to the economy, stakeholders and others.

Chapter 3

METHODOLOGY

An Overview of Cost-Benefit Analysis

One important instrument the government needs for the growth, development and improvement of its nation is the effective use of public funds. A project is supposed to match with all the basic policies that would bring about positive change in the society, so as to maximize the limited economic resources. This entails that proper analysis should be done in identifying the project; to ascertain that it meets the required needs of the society.

This section of the study presents the approach used to answer the set out aims and objectives of the study. Cost benefit (CB) technique has been widely used in similar studies and found to be highly effective. This study is not an exception to adoption of the CB approach. This appraisal technique of cost benefit analysis was developed by Jenkins and Harberger in 2002 (Jenkins, Harberger, &Kuo, 2013). This integrated investment appraisal of project that is done is used to analyze the overall plant taking into consideration the stakeholder, financial, economic and risk analyses over its period of operation.

The appraisal that would be done would help effectively carryout the assessment of financial viability and sustainability of the project that is been considered. It would not leave out the economic analysis which would assess the economic as one.

Likewise the stakeholders who have beneficial interest in the project would be considered and also the risk that would be undertaken would be put into consideration to see its effect on the Plant. For the sake of the fertilizer project, the investment is seen as a separate entity from its owners.

3.1 Elements that must be considered in Analyzing a Project

Jenkins, Harberger & Kuo, (2013). States that the project objectives different element that must be put into consideration in analyzing different projects, they can be referred to as building blocks or modules; there are several modules but only few as regards the project would be mention, namely: Demand, technical, financial and economical modules. This model helps in the effective and efficient analysis of the plant during appraisal.

The demand modules seek to identify the various users of the module out of the project's value. It determines if the used domestically or sold international for others consumption. It puts into the consideration the available resources needed to offset demand. It should consider the market prices both real and nominal over the years of the project's life. The demand module should employ the use of primary data sources.

The technical modules shows the various investment and operational phases of the project, it is therefore a technical layout of the various investment and operational phase of the project. All the necessary input types, quantity, cost should be stated. The other required skills in form of manpower, labor wage should be known, in other to ascertain the construction and operation cost of the life of the project. Also the technical uncertainties have to be identified.

The financial module ascertains the sources of debt and equity that could arise, since the financial stability of the project would determine the project viability. If the project is funded by borrowing then the repayment modes should be stated and the number of years to be refunded should be considered.

A model is been constructed evaluating the following:

The parameter table is constructed stating all the necessary variable that would be needed and carrying out further analysis in during the cause of evaluating the project and it would be very helpful and building its economic, financial and sensitivity analysis.

The integrated investment analysis of the project would quantify the benefits and costs focusing on its domestic prices for both the financial and the economic appraisal. This would help in identifying the impact on the stakeholder among their parties. Although the project revenues and costs of the project are spread over a period of years, the occurrence or non-occurrence of an event might be an issue and must be first dealt when carrying out the financial analysis. Its consequential effects are then assessed in the economic analysis. In what follows, we present an overview of how an investment project is evaluated through an integrated financial, economic, risk and stakeholder analysis.

3.2 Financial Appraisal

Jenkins, Harberger & Kuo, (2013) financial analysis helps the feasibility of the project. It is the most significant part for all capital investment. In carrying out the financial evaluation, the first step is to get the relative financially related data, which

provide information about the volume of sales and production from the analysis that are foundational.

A financial model is built with specific base case assumptions carried out as regards the prices and quantities of the project inputs, outputs and other parameters which are stated in the tables of parameter. The model built considers the cash inflow and outflow of the domestic currency and nominal terms which are later converted into real terms over the life of the whole project.

Due to the unknown as regards the fluctuations in real prices affecting the demand and supply in the domestic and foreign market, the cash flow projected are made to put into consideration the future changes made in the real prices imputed items and output over a period of time.

The required information on the receipt and expenditure should be segregated into international and domestic. It enhances the impact of foreign exchange in economic analysis. The financial viability is tested with the information gotten from the project finance due to its significance. Significance is attached to capital (debt/equity) structure and its interest rate measurement as a result of its impact on income tax liability and availability of cash flow to cover its debt. From the owner's point of view, a considerable required rate of return should be ascertained in analysis the project's viability.

From the bankers' point of view the financial cash flow should generate adequate cash to offset its principals and interest loans over the projects' life. The cash flow statement starts with net cash flow before settling or financing its debt service and

finalizes with dividing the cash flow by the price index to find the real cash statement from its entire investment. This statement serves as the foundation for undertaking the economic analysis of a project. Adding the inflows generated through financing activities and deducting the outflow of these activities (principal and interest) to net cash flow from the point of view of the bankers will produce cash flow statements from owner's point of view.

The next step is to deflate the cash flows with a general price index to find the cash flow in the price level of each year. Owners of project expect to receive their own rate of return over the investment. Therefore the cash flows are to be discounted using the investor's required rate of return. The project would be rejected if the results turnout negative.

The discount rate should consider the risk associated with the project. In evaluating the project financial viability, several criteria are considered. But the most efficient one is the net present value (NPV). The owners of the project are required to earn their own required rate of return, so that rate would be used as bench mark in their evaluation. And if the net present value is greater than 0, then the project is seen to be viable to invest into but if it is negative it is not viable which entails investors earning less.

From the banker's point of view, loan life coverage ratio (LLCR) and annual debt service ratio (ADSCR) are also used as one of criteria to ensure that the project is able to generate sufficient cash to service the project's debt. The annual debt service coverage ratio (ADSCR) known to be a net cash flow after tax divided by principal and interest together. Loan life coverage ratio (LLCR) is a cumulative measure and

defined as the present value of net cash flow after tax during loan repayment period over the present value of interest and principal value of interest and principal repayment during loan repayment period. Below are the formula for calculating ADSCR and LLCR.

Annual Net Cash Flow in Year t

ADSCRt = Annual Debt Repayment in Year t

Present value of Net Cash flow from Year 0 to Year t

LLCRt = Present value of debt repayment from Year 0 to Year t.

3.3 Risk Analysis and Management

The financial analysis and results have so far been based on the deterministic values of project variables. However, certainty cannot be reached on how the values of all of a project's key variables such as the rate of inflation, the market exchange rate, and the prices and quantities of inputs and projection of the outputs throughout the life of the project.

Therefore net present value of a project and measures are subject to uncertainty and risk. Adapting the analysis to cover uncertainty is thus an important part of an integrated project evaluation. In carrying out the project's risk analysis is to identify the risky variables thereby using sensitivity and scenario analysis.

The variables that should be used should not only consider a large share of relevant benefits and costs but also analyze a significant amount of experience that would vary in terms of the final outcome. It is essential to focus only on the uncertain variables that contribute project risk in a significant way. The risky variables are to

be identified. Secondly, select a correct probabilistic distribution and the ranging of these values for each risky variable, focusing on the past analysis of values of the variable.

The relationships between these variables are also important and needs to be specific. In other to generate a probability distribution of project outcomes a Monte Carlo simulation is required. There are various types of instability and danger connects with the task. Instability can be identified with suppliers, clients, or venture financing. Individuals may see instability and hazard diversely as far as their resistance of danger. Authoritative courses of action to oversee danger are both a typical and a vital part of specific ventures. In this way, thought must be given to updating or redesigning a venture to reallocate hazard all the more effectively.

There might be contracts that venture directors can go into with its clients/end-clients or its suppliers. These distinctive game plans could make impetuses or disincentives that would urge a venture's members to change their conduct to enhance the task's general execution. The impacts of such legally binding game plans are an indispensable part of the evaluation of a venture. Monte Carlo recreations can be utilized to understand and describe the nature and extent of the variability of the undertaking.

They can likewise be utilized to gauge the effect of various contracts on the variability of the task's result. The cumulative probability of the various items that is higher or lower than the value given is used by project managers to analyze the given project under several scenarios. The ability to ascertain the various risks enables us to reduce or eliminate the risks. The various risks ascertained from different sources

threaten the life of the project. In other to mitigate these risks, contract and arrangements are used. Mitigating these risks makes the projects' attractive and enhances different groups' participation viability and profitability. (Jenkins, Harberger, and Kuo, 2013).

3.4 Economic Appraisal

The project is considered from the economic point of view to ascertain its impact on the entire economy. An analysis of the project from the economy point of view also enables us to view the likelihood of the project's incremental total net economic benefits of the society as an economic unit. To effectively carryout these analysis, its real economic benefits and costs has to be ascertained and if they accrue directly to the project's participants or other people in Nigeria, not excluding the government also. (Jenkins, Harberger, & Kuo, 2013).

Most of the time the economic cost and benefit are not so distinct from the financial benefits and cost. There may be distortion which could cause differences in the economy as a whole (corporate taxes, personal income taxes, import tariffs, value added tax and others). The goods separated into tradable and non-tradable in economic evaluation.

A tradable input required to meet the projects' outcome by importing more and exporting less by a country. A tradable output will be known, if it has more export or less export. While non-tradable goods and services have higher domestic price than their export price which is lower than CIF (cost insurance and freight) import price.

3.4.1 When Determining the Economic Value of Non -Tradable and Tradable Goods

The economic price of non –tradable goods and services will depend on the influence it has on the additional market demand and supply. The demand of particular goods or services depends on whether the market price increased or decreased. While non-tradable input, every added demand by the project adds an incremental input so that some customers can pay for the new price reduce their consumption which would enhance the new producers to be motivated to increase their productivity due to the high prices.

The cost of economic input is equivalent to the weighted average of the consumption forgone in addition to the value of the new resources to increase the productivity of goods. The economic price of tradable goods and service are ascertained based on their prices inclusive of the value of foreign exchange premium (FEP).

3.4.2 How to build up an Economic Model

After evaluating the economic values of the project inputs and outputs, furthermore replace the values of receipts and expenditure of the financial model. Also the conversion factors are utilized in assessing the economic values by multiplying the financial price into the conversion factors of each of the items. Finally, to see how economically viable the project would be, one needs to calculate the economic opportunity cost of capital (EOCK) as the discount rate to find its net present value (NPV). Any project that has a positive net present value should be undertaken. Because it shows that the benefit exceeds its cost.

3.5 Stakeholder Impacts

After the completion of the economic analysis, the stakeholder analysis is then carried out. The stakeholder analysis looks into the effect of the project on the different interested parties and also ascertaining the magnitudes of profit or losses to stakeholders. There are externalities if the economic and financial values are different. There are various externalities like taxes, subsidies, tariff, consumer or producer surplus etc.

The computation of economic opportunity cost of capital are the net present values of externalities, financial values and economic values and EOCK is used as discounted rate throughout the project life. Also there is a reconciliation between the distributional impacts in order to enhance the validity of the investment appraisal approach used. This means the net present value of both the economic and financial net cash flow should be same, in addition to the externalities. The formula is analyzed below:

Chapter 4

PROJECT DESCRIPTION

4.1 Project Parameter and Assumption

The financial model for the urea plant is built on certain assumptions and parameters. The calculation of all deterministic outcomes (internal rate of return, net present value, debt coverage ratios etc.) is based on the key assumptions which are stated in the table of parameters.

4.2 Timing of the Project

The urea plant project has a 20 year project evaluation period with a construction period of three starting from the third year. Project operations are assumed to commence in the third years.

4.3 Investment Cost

The assumed total investment cost for the urea plant is ₦30million, in which ₦20 million will be used in year 1 and the remaining ₦10million in year 2. Part of the investment on construction and infrastructure would be ₦10million in year 1 and 10million in year 2 that would be imported and $10million in year 0 that is used domestically. This is because the machineries to be used are expensive and sophisticated in nature. The machineries are seen to possess distinct characteristics that help in the production of the urea product.

Table 2: The Cost of Investment

Investment cost	Unit	Total cost
Machinery	₦	30000
Buildings, construction and infrastructure	₦	25000
Building construction and infrastructure	F$	20000
Land (year zero)	₦	5000
Investment cost over run	%	0.00%

4.4 Project Financing

The project is financed through debt and through equity. The project has a grace period of first 3years from the inception of the project life. And subsequently the debt would be paid for 10 years equal installment payment. The total investment cost if financed by loans which would be financed by the National Development Bank. The loan would be serviced by the real rate of interest of 5.50% and risk premium of 5.05%. The loan would be paid starting from the 4^{th} year in which the interest + principal inclusive. The remaining cash deficit would be financed by equity capital.

4.5 Production and Sale of Urea

The production of the urea product would commence in the third year and it would continue to the nineteenth year. Production would commence with 300,000 tons in year 3 while 500,000 and 600,000 tons would be produced in year 4 and 5 respectively. Lastly the operating capacity of year 6 would be 620,000 tons and subsequently for the remaining years. The sale of urea is assumed to be sold domestically only with a 0% export.

4.6 Inventory Valuation

The valuation of inventory of the project is carried out using the First-In-First-Out (FIFO) method. The First-In-First-Out (FIFO) method of valuation of the inventory uses the price of the previous inventory to determine the cost of goods sold. To

calculate the cost of inventory of the previous year, we multiply the quantity of inventory of the previous year by previous year's price. The cost of goods that is produced in the current year is also calculated by multiplying the quantity sold of the urea product from the current year's production by the current price. (Jenkins, Harberger, & Kuo, 2013).

4.7 Price of Urea

The C.I.F price of urea amounts to 80 USD foreign per ton, and its imported trade margin is charged to be ₦4000 per ton. The price of urea is not fixed for all country but it varies from one country to another depending on various key variables or factors.

4.8 Cost of Input Per Ton of Urea

Under the cost of input, the imported import is 5$ while the price of natural gas that is required to produce per ton of urea cost ₦3600. The domestic price of urea is ₦150 and the unit per cost of urea is 24.0mmbtu. The above are assumed assumption and it may varies from country to country depending on some variability.

4.9 Inflation and Foreign Exchange Rate

The domestic inflation rate is 8.40% and is assumed to be constant every year for the project life. While the foreign inflation rate is 1.10% and is also assumed to be constant yearly. The real exchange rate is ₦315 to 1$ due to the fluctuation in exchange rate and the state of the Nigeria economy at the moment.

4.10 Taxes

Taxes are to be charged on import duties and are said to be 5%. While no tax would be charged on sales of urea. The corporate tax is charged at 40% on their income.

4.11 Workers

The workers are divided into skilled and unskilled workers. The skilled workers are five (5) starting from the 3rd to the sixth year and it increases to ten (10) workers from the 7th year to the 20th year. While the unskilled workers are 100 from the 3rd year to the 6th year and it increases to 150 workers in the 7th year. This means 20 unskilled workers would be supervised be 1skilled worker.

Table 3: Workers

Years	0	1	2	3	4	5	6	7	8	to	19	20
Unskilled	-	-	-	100	100	100	100	150	150	to	150	150
skilled	-	-	-	5	5	5	5	10	10	to	10	10

4.12 Debt Financing

The plant is assumed to be financed through borrowing, which will be obtained domestically. The debt is to be serviced from the 4rd year through to the 14th year, since the project is granted a 3 years grace period from the starting year to the 4th year which is 10 year annual installment payment. A 3 year grace period is given to the project.

Table 4: Debt financing schedule

Real interest rate	5.00%
Risk Premium	5.00%
No. of instalment	10
Nominal interest rate	19.24%
Grace period	3 years
Loan repayment profile	Equal repayment of principal
Disbursement of loan	First year
Grace period	3year
Number of instalment	10 equal instalments
Last year for debt repayment	14th year

4.13 Discount Rate

The required rate of return needed by equity holders of the project is 14%. The discount rate depends on the opportunity cost funds on other investment in the capital market.

4.14 Total Investment (From the Banker's Perspective)

From the bankers' perspective the financial cash flow statement would assist the banker to ascertain the potential of urea plant in obtaining its debt. This means the banks that loans out money to the project would be able to determine if the plants would generate enough revenue to offset its investment cost, loan repayment, operational expenses as well as sufficient returns on the equity holders. The revenue generated from urea plant consists of 55.38% of the total sales.

The total inflows of the plant consists of gross sales, account receivables and the residuals from all the liquidated assets while the outflow consists of investment cost (land, equipment and building), Operation cost which consists of imported input,

domestic input, labor and overheads), change in account payable and changes in account balances. To arrive at the Net cash flow before the total cash outflow is subtracted from the total cash inflow.

In order to form the basis of determining the bankability of the project the net cash before financing is used. The net cash flow before financing creates the basis of obtaining the bankability of the urea plant, as the ratio net cash flow to debt service and that is used to find the debt service ratio. To order to assess the financial strength of the project via the bankers' view point is achieved through computing of the debt service ratios which serves as a criterion to make conclusion on the project's ability to service its debt (principal and interest).

4.15 Debt Service Coverage Ratios

In order to source for sufficient fund for the urea plant from any bank it needs a satisfactory annual debt service coverage ratios (ADSCR). This means the ADSCR must meet the benchmark given by the bank. The assumed ADSCR benchmark given by the bank is 1.5. The banks are therefore interested in annual debt service coverage ratios (ADSCR) and loan life coverage ratio (LLCR).

The ADSCR helps in determining the project's ability to generate adequate net cash flow to service its debt repayment. While the LLCR is used in determining the ability of the urea plant to provide adequate net cash flow in the subsequent years used in obtaining bridge financing, even if there is insufficient cash flow to offset its debt.

Table 5: Debt Service Coverage Ratios

Years	4	5	6	7	8	9	10	11	12	13	14
ADSCR	1.32	2.11	2.56	2.77	2.94	3.11	3.30	3.50	3.72	3.94	4.18
LLCR	2.54	2.86	3.07	3.22	3.36	3.50	3.64	3.78	3.91	4.05	4.18

Table 6: Minimum and average ADSCR and LLCR

	Minimum	Average
ADSCR	1.32	3.04
LLCR	2.54	3.46

With the benchmark at 1.5 it is below ADSCR 0f 1.32 would not be able to pay its debt so the LLCR is calculated and has 2.54 in the 4th year is a 3year of grace is given.

4.17 Equity Holder's Perspective

The deriving the cash flow statement from equity holder's perspective. The net cash are computed in the real terms and are thereby converted to nominal. Here the cash flow statement from the equity point of view includes, all loans recorded as cash inflow and debt repayment are treated as cash outflow. Thus the loan received by the urea plant is ₦19, 377,500 in year one. After determining the real net cash flow after financing, the next step is to derive the net worth of the project by calculating the net present value (NPV) and the internal rate of return (IRR). Using a discounted rate of 14%, the financial net present value (NPV) is ₦19, 421,110 and its internal rate of return (IRR) of 50.61%. From the result gotten it shows that the urea plant is capable

of generating sufficient net cash flows over the project life, which would cover its capital investment. All things being equal evaluating the deterministic assumptions made, the equity holder is advised to go into the investment.

Chapter 5

ECONOMIC ANALYSIS

5.1 National Parameters

The financial analysis considers the benefits of equity holders and bankers; the economic analysis's main aim is to foresee entire country's and societies' welfare. In evaluating the economic benefits, the financial analysts looks for the good and services in the market, and the necessary information that are available to measure economic values are gotten from the analyses done as regards the producers' and consumers choice of market.

Therefore the project has to be analyzed from the economic point of view as seen ın the appendix table, this would assist the groups to know if they are losing or gaining from the project. The income tax employed by the project is a cost to the owners of the project but a benefit to the government and should be estimated by the economic analysis done.

For analyzing the urea plant from the country's point of view, additional assumptions are being made in furthering the economic parameters that is taken into account.

- The foreign exchange premium is 2.5 percent
- The economic opportunity cost of capital is 12 percent

Table 7: National Parameters

EOCK	12.0%
FEP	2.5%
Import duty	5.00%
VAT	0%
Real exchange rate	315 USD/₦

5.2 Calculating of Commodity Specific Conversion Factors (CSCF)

|In estimating the economic values for the various input and output of the urea plant, conversion factors are calculated for the various financial cash flow items. Below is shown the various conversion factor calculations:

Table 8: Conversion factor for urea

Coversion Factor		Financial Value	CFi	Value of FEP	Economic value
Domestic Price of Urea		29200			25830.00
Domestic	**CF =**		**0.8846**		
C.I.F Price of Urea		25200	1.00	**630.00**	**25830.00**
Trad.	100%				
Total		25200			25830.00
Import Trade	**CF =**		**1.025**		

An assumption of C.I.F price of urea is $80. The C.I.F price is when converted to naira is ₦25200 by multiplying 80$ by 315 exchange rate which is 1$ to ₦315. This is then adjusted with the FEP (2.5%) to estimate the economic value of ₦25830. The financial values are adjusted to with the conversion factors to get the corresponding economic values. The result shows that the true economic value worth more than the financial value. (Jenkins, Harberger, & Kuo, 2013).

Below are the lists of various commodities and their various conversion factors.

Table 9: Commodities and their conversion factors

Items	CFSF
Gross sales	1.0250
Sales tax	0.0000
Net sales revenue	1.0250
Change in account recievable	1.0250
Liquidation value:	
Land	1.000
Equipment	0.9631
Building	1.0058
COSTS	
Investment cost:	
Land	1.0000
Equipment	0.9631
Building	1.0058
Operation Cost:	
Domestic Input	1.0000
Imported Input	0.9631
Labour	1.0000
Overheads	1.0000
Change in account payable	0.9884
Change in cash balance	1.0000
Income Tax	0.0000

The conversion factors for the items under the benefit and costs are expressed as a weighted rate of the entire items put under the various categories.

5.3 Working Capital

Account receivables of the plant are considered as been linked with the sales revenue which is estimated to be 30% of gross sales. Therefore the conversion factor for the gross sales is assigned to account receivable in the economic resource flow. While the account payable is linked with category of financial cash outflow items which is under cost which means the conversion factor is designated to it. Also the cash balance has no distortion since the project holds cash. (Jenkins, Harberger, & Kuo, 2014).

5.4 Valuation of the Economic Output of the Project

The analysis shows the impact of the project on the Nigeria economy, the economic value of the plant should be ascertained. The output produced by the urea plant. It is assumed that the entire urea is produced domestically.

5.5 Economic Feasibility

The economic resource flow statement of the urea plant is gotten from the financial cash flow statement from the banker's point of view, this shown in the appendix. This was derived from the financial model built. The entire cash flow from the banker's point of view is converted to the corresponding economic values using their conversion factors. When the outflow of the economic analysis is subtracted from the inflow of the urea plant, the economic net benefit is gotten.

The next step is the economic net benefit gotten is thereby discounted using the economic discount rate which is the economic cost of capital (EOCK). This is used to estimate the economic net present value (ENPV) as seen in the appendix and economic internal rate of return (EIRR). This estimation gotten is used to ascertain the value the urea plant has added to the economy, if not the resources can be allocated to other areas with better benefit. A urea plant estimate a positive economic NPV of ₦47, 001,160.35 and an economic IRR of 37.7%. This shows that the project would be beneficial to the Nigeria economy.

Chapter 6

STAKEHOLDER ANALYSIS

6.1 The Stakeholder Analysis Scope

The stakeholder analysis determines the project's impact the various groups' interest which aids its implementation. The analysis also determines the net of those benefitting and those losing. Therefore, the distributive analysis is done to facilitate the statement of the externalities. The externalities of the project is the different between input and output of economic to the input and output of the financial values of the projects. Thereafter, the identified externalities are shared amidst the stakeholders based on the distributive analysis. To calculate the present value of externalities, discounting has to be done on economic, financial and externalities by using a discount rate which equate the economic opportunity cost of capital. After the externalities has been shared among all the stakeholders, the financial cash flow statement, likewise the economic resources statement and the statement of reconciliation of financial are to be reconciled

$$\mathbf{NPV}_{\mathbf{ECON\ @\ EOCK}} = \mathbf{NPV}_{\mathbf{FIN@EOCK}} + \Sigma\ \mathbf{PV}_{\mathbf{EXT@EOCK}}$$

47,001,160 = 24,128,904.56 +22,872,256.

Table 10: Reconciliation of Financial, Economic and Externalities Statement

Stakeholder Analysis	Financial	Externalities	Economic
Benefits			
Gross sales	84114846.33	2,102,871	86,217,717
Sales tax	0	0	0
Net sales revenue	84114846.33	2,102,871	86,217,717
Change in account recievable	-4449617.728	-111,240	-4,560,858
Liquidation value:			
Land	518.3338254	0	518
Equipment	-203135.0262	7,492	-195,643
Building	390063.4814	2,249	392,312
Total Benefits	79852675.39	2,001,371	81,854,046
COSTS	0	0	0
Investment cost:	0	0	0
Land	5000	0	5,000
Equipment	8136160.714	-300,066	7,836,095
Building	8542968.75	49,247	8,592,215
Operation Cost:	0	0	0
Domestic Input	11532850.68	0	11,532,851
Imported Input	5297903.283	-535,498	4,762,406
Labour	32227.28374	0	32,227
Overheads	5679.86987	0	5,680
			0
Change in account payable	-890335.3508	10,336	-879,999
Change in cash balance	2966411.818	0	2,966,412
			0
Total Cost	35628867.05	-775,981	34,852,886
NET RESOURCE FLOW BEFORE TAXES	44223808.34	2,777,352	47,001,160
Income Tax	20094903.78	-20,094,904	0
NET AFTER-TAX CASH FLOW	**24,128,904.56**	**22,872,256**	**47,001,160**

According to the statement of reconciliation, the externality is equal to **37,420,073**. The difference between the economic NPV and financial NPV of 52,780,239 and 15,360,167 gives that result.

To define externalities of the project, a statement of externalities has to be prepared. The externalities that are calculated are therefore distributed to the groups of stakeholders.

6.2 Beneficiary and Stakeholder Analysis

1. Government
2. Investors
3. Farmers

Chapter 7

RISK ANALYSIS

7.1 Scope of Risk Analysis

From the analysis done as seen ın the appendix table, the financial, economic and distributive analysis are dependent on some deterministic assumptions with a high percentage of getting the deterministic estimated outcomes (ENPV, EIRR, FNPV, FIRR, ADSCR and the project gains and losses attributable to the various stakeholders. But this may not be so correct or true in the real world scenarios as a result of uncertainty that may occur over the life of a project.

The analysis carried out as shown in the financial model, is seen as the best guess based on the available information considering some current factors or variables like inflation, real exchange rate etc. And the entire variables are subjected to change. Therefore these variables have significant impact on the financial profitability and the economic viability of the plant. So based on the outcome gotten the project can be accepted or rejected. Due to the uncertainties of the future. Risk analysis, therefore is aimed at identifying, managing, and maintaining expected risks or uncertainties. Sensitivity test is therefore one of the analytical test carried out. (Jenkins, Harberger, & Kuo, 2013).

7.2 Sensitivity Analysis

The initial step obtained by the sensitivity test is where risky variables are identified. Sensitivity analysis checkmates if and which outputs of the project are sensitive to

any changes in the project. These variables are divided into financial net present value, economic net present value, gains or losses to the various groups of stakeholders. These kinds of variables can be financial and economic NPVs, gains or losses to different groups of stakeholders. For instance, if the price of fertilizer varies by a certain percentage, this would influence or cause a change in the financial net present value. The sensitivity analysis could be called the 'what if' analysis. Likewise, it is likely the price of fertilizer to affect the financial net present value significantly, while the economic net present value may likely have a comparative insignificant influence.

7.3 Financial Sensitivity Analysis

A sensitivity analysis is done considering the critical variable as mentioned below and this determines the degree of failure or successes the projected would get.

The variables that could be subjected to change are:

1. C.I.F price of urea
2. Real exchange rate
3. Investment cost overrun
4. Inflation rate
5. Imported inputs
6. Domestic price of natural gas

7.3.1 C.I.F Price of Urea

Based on the analysis done the current C.I.F price of urea is 80 USD foreign per ton. There is a decrease or increase in the net present value as the price increase or decrease due to its sensitivity to change. If so, then ENPV will change from 47,001,160 at the C.I.F price of 80 USD to 56,378,715 at the C.I.F price of 90 USD which is an increase by 9,377,555 USD. Despite the decrease in price to 50 USD the plant would still make profit of 18,868497 ENPV and 5,769,478 FNPV. The sensitivity test shows that if the losses increase from one percent to two, the FNPV will be reduced by six percent. It also reveals that the resulting FNPV values are still positive even when the losses increase to seven percent.

Table 11: Sensitivity Test on the C.I.F Price of Urea

%	price	NPV	IRR	ADSCR	LLCR
	80	19,421,110	50.157%	1.317	2.54
-38%	50	5,769,478	27.783%	0.898	1.56
-25%	60	10,320,022	36.372%	1.038	1.88
-13%	70	14,870,566	43.709%	1.177	2.21
0%	**80**	**19,421,110**	**50.157%**	**1.317**	**2.54**
13%	90	23,971,654	55.939%	1.457	2.86
25%	100	28,522,198	61.203%	1.596	3.19
38%	110	33,072,742	66.050%	1.736	3.52
50%	120	37,623,286	70.555%	1.876	3.84

7.3.2 Real Exchange Rate

The analysis carried out, shows that the real exchange rate varies due to range of variables that is highlighted depending on the data gotten as regards the real

exchange rate in Nigeria. The current exchange rate of 1$ to ₦315, and it is assumed that rate remains constant for a while due to the current instability in Nigeria.

Table 12: Sensitivity Test on Real Exchange Rate

	315.000		NPV	IRR	ADSCR	LLCR
			19,421,110	50.2%	1.317	2.54
	-19.0%	255.00	**14,982,167**	**48.8%**	**1.286**	**2.48**
	-14.3%	270.00	**16,091,903**	**49.2%**	**1.295**	**2.49**
	-9.5%	285.00	**17,201,639**	**49.6%**	**1.303**	**2.51**
	-4.8%	300.00	**18,311,375**	**49.9%**	**1.310**	**2.52**
	0.0%	**315.00**	**19,421,110**	**50.2%**	**1.317**	**2.54**
	4.8%	330.00	**20,530,846**	**50.4%**	**1.323**	**2.55**
	9.5%	345.00	**21,640,582**	**50.6%**	**1.328**	**2.56**
	14.3%	360.00	**22,750,318**	**50.9%**	**1.333**	**2.57**
	19.0%	375.00	**21,640,582**	**50.6%**	**0.962**	**2.96**
	23.8%	390.00	**22,750,318**	**50.9%**	**0.966**	**2.97**
	28.6%	405.00	**21,640,582**	**50.6%**	**0.962**	**2.96**
	33.3%	420.00	**20,530,846**	**50.4%**	**0.958**	**2.95**
	38.1%	435.00	**19,421,110**	**50.2%**	**0.955**	**2.94**
	42.9%	450.00	**18,311,375**	**50.0%**	**0.951**	**2.92**

The above result shows that the fluctuations in the real exchange rate would have a significant impact on the project outcome. If the exchange rate increase by 4.8% the FNPV increases but if the real exchange fall the FNPV falls. The more the exchange rate fall, there is a constant decrease in the FNPV, so it means the increase in the exchange rate is to the plant favor. Likewise the FIRR, ADSCR and LLCR, if there is a fall in the exchange rate the FIRR, ADSCR and LLCR falls, vis a vis.

7.3.3 Investment Cost Overrun

The investment cost over-run is assumed to be 0% in the deterministic analysis. However the values used for the sensitivity test range between -30% minimum to

50% maximum, this is because most of the investment in African are within that range. This would assist the project manager plan properly to be able to hedge against risks. As the investment cost overrun increases the FNPV reduces and as it investment cost over-run fall to negative the FNPV increases. it has a significant impact on the FNPV.

Table 13: Sensitivity Test on Investment Cost Over-run

Investment cost over-run		NPV	IRR	ADSCR	LLCR
		19421110.421	50.2%	1.3169	2.54
	3.0%	**18808598.892**	**46.5%**	**1.3135**	**2.53**
	2.0%	**19012769.401**	**47.6%**	**1.3146**	**2.53**
	1.0%	**19216939.911**	**48.9%**	**1.3158**	**2.53**
	0.0%	**19421110.421**	**50.2%**	**1.3169**	**2.54**
	-1.0%	**19625280.931**	**51.5%**	**1.3181**	**2.54**
	-2.0%	**19829451.440**	**53.0%**	**1.3192**	**2.54**
	-3.0%	**20033621.950**	**54.6%**	**1.3204**	**2.55**
	-4.0%	**20237792.460**	**56.3%**	**1.3215**	**2.55**
	-5.0%	**20441962.969**	**58.2%**	**1.3227**	**2.55**

7.3.4 Inflation rate

The inflation rate is assumed to increase at a constant rate of 8.40% through the entire life the project. The inflation rate is sensitive to change from the analysis carried – out. As the inflation rate increase by 0.10% the FNPV and FIRR reduces which shows that the inflation has a significant impact on the final output. So it has to be carefully looked into before proceeding into the business.

Table 14: Sensitivity test on Inflation rate

			NPV	IRR	ADSCR	LLCR
			19,421,110	50.16%	1.317	2.54
	-2.4%	8.20%	**19,475,568**	**50.28%**	**1.324**	**2.54**
	-1.2%	8.30%	**19,448,283**	**50.22%**	**1.320**	**2.54**
	0.0%	**8.40%**	**19,421,110**	**50.16%**	**1.317**	**2.54**
	1.2%	8.50%	**19,394,047**	**50.10%**	**1.314**	**2.53**
	2.4%	8.60%	**19,367,092**	**50.03%**	**1.310**	**2.53**
	3.6%	8.70%	**19,340,244**	**49.97%**	**1.307**	**2.53**
	4.8%	8.80%	**19,313,502**	**49.91%**	**1.304**	**2.53**
	6.0%	8.90%	**19,286,863**	**49.85%**	**1.300**	**2.52**

7.3.5 Imported Input

The imported input of the deterministic analysis is assumed to cost $ 5 (₦1575) per ton of urea. An increase in the cost of the imported input would affect the cost of input for producing a ton of urea. From the sensitivity table as the imported input increase the FNPV and the FNPV falls drastically, this shows it has a significant impact on the NPV and IRR while ADSCR and LLCR reduces also.

Table 15: Sensitivity test on Imported Inputs

	5.00	rice	NPV	IRR	ADSCR	LLCR
			19,421,110	50.2%	1.317	2.54
	-500.0%	(20.00)	**32,413,462**	**68.0%**	**1.808**	**3.45**
	-300.0%	(10.00)	**27,216,521**	**61.3%**	**1.612**	**3.09**
	0.0%	**5.00**	**19,421,110**	**50.2%**	**1.317**	**2.54**
	100.0%	10.00	**16,822,640**	**46.1%**	**1.219**	**2.35**
	300.0%	20.00	**11,625,700**	**37.4%**	**1.022**	**1.99**
	500.0%	30.00	**6,428,759**	**27.7%**	**0.826**	**1.62**
	700.0%	40.00	**1,231,819**	**16.8%**	**0.629**	**1.25**
	900.0%	50.00	**-4,020,552**	**4.2%**	**0.351**	**0.88**

7.3.6 Domestic Price of Natural Gas

Natural gas is for essential in the production of urea because has the price of natural gas increase the price of urea should also increase. This shows they have a corresponding relationship. Nigeria is one of the countries that is rich in natural gas.

Table 16: Sensitivity test on the domestic price of natural gas

Domestic Price of Natural Gas			NPV	IRR	ADSCR	LLCR
	3,600.00		19,421,110	50.16%	1.317	2.54
	-42%	2,100.00	**21,778,000**	**53.7%**	**1.406**	**2.70**
	-28%	2,600.00	**20,992,370**	**52.5%**	**1.376**	**2.65**
	-14%	3,100.00	**20,206,740**	**51.3%**	**1.347**	**2.59**
	0%	3,600.00	**20,206,740**	**51.3%**	**1.347**	**2.59**
	14%	4,100.00	**18,635,481**	**49.0%**	**1.287**	**2.48**
	28%	4,600.00	**17,849,851**	**47.7%**	**1.258**	**2.43**
	42%	5,100.00	**17,064,221**	**46.5%**	**1.228**	**2.37**
	56%	5,600.00	**16,278,592**	**45.2%**	**1.198**	**2.32**
	69%	6,100.00	**15,492,962**	**44.0%**	**1.168**	**2.26**

Based on the above table from the analysis carried-out the test shows that as the price of natural gas increases, the FNPV and FIRR falls as a result of the cost that incurred. This means that if the price increase the price of urea would also increase since the urea price is dependence on the price of natural gas. Natural gas is a key variable that can affect the urea production.

Chapter 8

CONCLUSION

The appraisal of fertilizer project was undertaken using the integrated investment appraisal approach. This appraisal entails the assessment of the economic, stakeholder, financial and risk analysis to enable an effective and efficient long term feasibility and sustainability of the fertilizer plant.

The proposed projection was created to help in the development and promotion of the Nigeria agricultural sector, which would enhance its productivity and high marketing initiative with emphasis on the urea usefulness in production. The government is to encourage individual to go into a more advanced or mechanized farming with the use of fertilizer to aid its production. Individuals are to be educated as regards the proper use of the fertilizer.

The reason for conducting a financial analysis is to assess the entire sustainability of the urea plant from the banker's and owner's point of view in determining whether the cash flows gotten by the plant can sufficiently service its debt repayment without default and also earn high returns for the equity holders. The analysis done shows that the FNPV of the urea plant is ₦19, 421,110 and a FIRR of 50.16%. While the debt service ratio shows incapability of the bank to pay its debt in the 4^{th} which is the first year of debt repayment since they were given a 3years grace period. Also the

bench mark is 1.5. But the subsequent years shows a sufficient net cash flow to offset its debt.

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Appendix

Appendix A: Economic Resource Flow

ECONOMIC RESOURCE FLOW			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BENEFITS																							
Gross sales	86,217,717	1.0250	0.0	0.0	0.0	7,495,714.1	13,806,123.4	16,484,512.1	16,955,031.6	16,882,186.4	16,814,986.0	16,752,993.0	16,695,803.9	16,643,046.4	16,594,377.2	16,549,479.4	16,508,060.7	16,469,851.6	16,434,603.3	16,402,086.5	16,372,089.4	16,344,416.8	0.0
Sales tax	0	0.0000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net sales revenue	86,217,717	1.0250	0.0	0.0	0.0	7,495,714.1	13,806,123.4	16,484,512.1	16,955,031.6	16,882,186.4	16,814,986.0	16,752,993.0	16,695,803.9	16,643,046.4	16,594,377.2	16,549,479.4	16,508,060.7	16,469,851.6	16,434,603.3	16,402,086.5	16,372,089.4	16,344,416.8	0.0
Change in account recievable	-4,560,858	1.0250	0	0	0	-2,248,714	-2,067,377	-1,124,471	-524,375	-372,304	-372,304	-372,304	-372,304	-372,304	-372,304	-372,304	-372,304	-372,304	-372,304	-372,304	-372,304	-372,304	4,523,363
Liquidation value:																							
Land	518.3	1.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,000
Equipment	-195,643.3	0.9631	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1,887,233
Building	392,312.0	1.0058	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,784,357
Total Benefits	81,854,046.4		0	0	0	5,247,000	11,738,746	15,360,041	16,430,656	16,509,882	16,442,682	16,380,689	16,323,500	16,270,742	16,222,073	16,177,175	16,135,757	16,097,548	16,062,299	16,029,783	15,999,785	15,972,113	6,425,487
COSTS																							
Investment cost:																							
Land	5,000.0	1.0000	5,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment	7,836,094.8	0.9631	0	6,067,653	3,033,826	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Building	8,592,215.5	1.0058	0	6,653,133	3,326,566	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operation Cost:																							
Domestic Input	11,532,850.7	1.0000	0	0	0	1,080,000	1,800,000	2,160,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	0
Imported Input	4,762,405.5	0.9631	0	0	0	0	796,379	955,655	987,510	987,510	987,510	987,510	987,510	987,510	987,510	987,510	987,510	987,510	987,510	987,510	987,510	987,510	0
Labour	32,227.3	1.0000	0	0	0	3,879	3,924	3,968	4,014	6,382	6,458	6,534	6,612	6,690	6,770	6,851	6,932	7,015	7,099	7,184	7,270	7,357	7,446
Overheads	5,679.9	1.0000	0	0	0	541	552	563	574	1,172	1,195	1,219	1,243	1,268	1,294	1,319	1,346	1,373	1,400	1,428	1,457	1,486	1,516
Change in account payable	-879,999.4	0.9884	0	0	0	-467,348	-347,781	-216,141	-103,587	-74,845	-74,845	-74,845	-74,845	-74,845	-74,845	-74,845	-74,845	-74,845	-74,845	-74,845	-74,845	-74,845	891,008
Change in cash balance	2,966,411.8	1.0000	0	0	0	1,462,578	1,344,636	731,363	341,057	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	-2,942,024
Total Cost	34,852,886.0		5,000	12,720,785	6,360,393	2,079,651	3,597,710	3,635,408	3,461,569	3,394,369	3,394,468	3,394,568	3,394,670	3,394,773	3,394,878	3,394,985	3,395,093	3,395,203	3,395,314	3,395,427	3,395,542	3,395,658	-2,042,055
NET RESOURCE FLOW BEFORE TAXES	47,001,160.4		-5,000	-12,720,785	-6,360,393	3,167,349	8,141,036	11,724,633	12,969,088	13,115,514	13,048,214	12,986,121	12,928,830	12,875,969	12,827,195	12,782,191	12,740,664	12,702,345	12,666,985	12,634,356	12,604,244	12,576,455	8,467,541
Income Tax	0	0.0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NET ECONOMIC BENEFIT	47,001,160.35		-5,000	-12,720,785	-6,360,393	3,167,349	8,141,036	11,724,633	12,969,088	13,115,514	13,048,214	12,986,121	12,928,830	12,875,969	12,827,195	12,782,191	12,740,664	12,702,345	12,666,985	12,634,356	12,604,244	12,576,455	8,467,541

NPVe	47,001,160.35
IRRe	37.7%

FINANCIAL CASH FLOW STATEMENT - Nominal Prices	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total Investment Point of View																					
RECEIPTS																					
Gross sales	0	0	0	9,314,874	18,597,947	24,071,250	26,838,018	28,967,419	31,275,690	33,777,856	36,490,204	39,430,389	42,617,550	46,072,432	49,817,524	53,877,204	58,277,898	63,048,249	68,219,310	73,824,740	0
Sales tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross sales revenue	0	0	0	9,314,874	18,597,947	24,071,250	26,838,018	28,967,419	31,275,690	33,777,856	36,490,204	39,430,389	42,617,550	46,072,432	49,817,524	53,877,204	58,277,898	63,048,249	68,219,310	73,824,740	0
Change in accounts receivable	0	0	0	-2,794,462	-2,784,922	-1,641,991	-830,030	-638,820	-692,481	-750,650	-813,704	-882,056	-956,148	-1,036,465	-1,123,528	-1,217,904	-1,320,208	-1,431,105	-1,551,318	-1,681,629	22,147,422
Liquidation value																					
Land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25,093
Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-9,834,016
Buildings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18,883,452
Total Inflows	**0**	**0**	**0**	**6,520,412**	**15,813,025**	**22,429,259**	**26,007,987**	**28,328,599**	**30,583,209**	**33,027,206**	**35,676,500**	**38,548,334**	**41,661,402**	**45,035,967**	**48,693,997**	**52,659,300**	**56,957,690**	**61,617,144**	**66,667,992**	**72,143,111**	**31,221,951**
EXPENDITURES																					
Investment cost:																					
Land	5,000																				
Equipment (incl. duty)	0	6,829,200	3,701,426																		
Buildings	0	7,170,660	3,886,498																		
Operating costs:																					
Domestic inputs	0	0	0	1,375,662	2,485,362	3,232,959	3,621,345	3,925,538	4,255,283	4,612,727	5,000,196	5,420,212	5,875,510	6,369,053	6,904,053	7,483,994	8,112,649	8,794,112	9,532,817	10,333,574	0
Imported inputs	0	0	0	631,945	1,141,713	1,485,140	1,663,555	1,803,294	1,954,771	2,118,971	2,296,965	2,489,910	2,699,062	2,925,784	3,171,550	3,437,960	3,726,748	4,039,795	4,379,138	4,746,986	0
Labour	0	0	0	4,941	5,418	5,940	6,512	11,225	12,312	13,504	14,812	16,247	17,821	19,548	21,443	23,522	25,803	28,305	31,050	34,063	37,368
Overheads	0	0	0	689	762	843	932	2,061	2,278	2,519	2,785	3,080	3,405	3,765	4,163	4,603	5,089	5,627	6,222	6,880	7,607
Change in accounts payable	0	0	0	-602,282	-485,841	-327,307	-170,040	-133,179	-144,367	-156,493	-169,639	-183,888	-199,335	-216,079	-234,230	-253,905	-275,233	-298,353	-323,414	-350,581	4,524,168
Change in cash balance	0	0	0	1,862,975	1,856,615	1,094,661	553,354	425,880	461,654	500,433	542,470	588,037	637,432	690,976	749,018	811,936	880,139	954,070	1,034,212	1,121,086	-14,764,948
Total Outflows	**5,000**	**13,999,860**	**7,587,924**	**3,273,930**	**5,004,029**	**5,492,235**	**5,675,657**	**6,034,818**	**6,541,931**	**7,091,661**	**7,687,589**	**8,333,598**	**9,033,896**	**9,793,047**	**10,615,998**	**11,508,109**	**12,475,195**	**13,523,557**	**14,660,025**	**15,892,006**	**-10,195,806**
NET CASH FLOW BEFORE TAXES	**-5,000**	**-13,999,860**	**-7,587,924**	**3,246,482**	**10,808,997**	**16,937,024**	**20,332,330**	**22,293,781**	**24,041,277**	**25,935,545**	**27,988,911**	**30,214,736**	**32,627,506**	**35,242,920**	**38,077,999**	**41,151,191**	**44,482,495**	**48,093,587**	**52,007,966**	**56,251,105**	**41,417,757**
Income tax	0	0	0	2459278.54	3649945.606	5474715.611	6440356.622	7215127.585	8067523.98	9004826.4	10036634.21	11173920.96	12429166	13816593	15352452	16636978.21	18029393.52	0	0	0	0
NET AFTER-TAX CASH FLOW	**-5,000**	**-13,999,860**	**-7,587,924**	**787,203**	**7,159,051**	**11,462,309**	**13,891,973**	**15,078,653**	**15,973,753**	**16,930,719**	**17,952,276**	**19,040,815**	**20,198,340**	**21,426,327**	**22,725,547**	**24,514,213**	**26,453,101**	**48,093,587**	**52,007,966**	**56,251,105**	**41,417,757**

FINANCIAL CASH FLOW STATEMENT - Real Prices	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Domestic inflation index	1.000	1.084	1.175	1.274	1.381	1.497	1.622	1.759	1.906	2.067	2.240	2.428	2.632	2.854	3.093	3.353	3.635	3.940	4.271	4.630	5.019
EOCK	12%																				
Total Investment Point of View																					
RECEIPTS																					
Gross sales	84,114,846.3	0	0	0	7,312,892	13,469,389	16,082,451	16,541,494	16,470,426	16,404,864	16,344,383	16,288,589	16,237,118	16,189,636	16,145,834	16,105,425	16,068,148	16,033,759	16,002,036	15,972,770	15,945,773	0
Sales tax	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net sales revenue	84,114,846.3	0	0	0	7,312,892	13,469,389	16,082,451	16,541,494	16,470,426	16,404,864	16,344,383	16,288,589	16,237,118	16,189,636	16,145,834	16,105,425	16,068,148	16,033,759	16,002,036	15,972,770	15,945,773	0
Change in accounts receivable	-4,449,617.7	0	0	0	-2,193,868	-2,016,954	-1,097,045	-511,586	-363,223	-363,223	-363,223	-363,223	-363,223	-363,223	-363,223	-363,223	-363,223	-363,223	-363,223	-363,223	4,413,037
Liquidation value:																					
Land	518	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,000
Equipment	-203,135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-1,959,500
Buildings	390,063	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,762,667
Total Inflows	79,852,675.4	0	0	0	5,119,024	11,452,435	14,985,406	16,029,909	16,107,202	16,041,641	15,981,160	15,925,366	15,873,895	15,826,413	15,782,610	15,742,202	15,704,924	15,670,536	15,638,812	15,609,547	15,582,549	6,221,203
EXPENDITURES																					
Investment cost:																					
Land	5,000	5,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment (incl. duty)	8,136,161	0	6,300,000	3,150,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buildings	8,542,969	0	6,615,000	3,307,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating costs:																					
Domestic inputs	11,532,850.7	0	0	0	1,080,000	1,800,000	2,160,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	2,232,000	0
Imported inputs	5,297,903.3	0	0	0	496,125	826,875	992,250	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	1,025,325	0
Labour	32,227.3	0	0	0	3,879	3,924	3,968	4,014	6,382	6,458	6,534	6,612	6,690	6,770	6,851	6,932	7,015	7,099	7,184	7,270	7,357	7,446
Overheads	5,679.9	0	0	0	541	552	563	574	1,172	1,195	1,219	1,243	1,268	1,294	1,319	1,346	1,373	1,400	1,428	1,457	1,486	1,516
Change in accounts payable	-890,335.4	0	0	0	-472,838	-351,866	-218,680	-104,804	-75,724	-75,724	-75,724	-75,724	-75,724	-75,724	-75,724	-75,724	-75,724	-75,724	-75,724	-75,724	-75,724	901,474
Change in cash balance	2,966,411.8	0	0	0	1,462,578	1,344,636	731,363	341,057	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	242,149	-2,942,024
Total Outflows	35,628,867.1	5,000	12,915,000	6,457,500	2,570,286	3,624,121	3,669,464	3,498,166	3,431,304	3,431,403	3,431,503	3,431,605	3,431,709	3,431,814	3,431,920	3,432,028	3,432,138	3,432,249	3,432,362	3,432,477	3,432,593	-2,031,589
NET CASH FLOW BEFORE TAXES	44,223,808.3	-5,000	-12,915,000	-6,457,500	2,548,738	7,828,314	11,315,942	12,531,742	12,675,898	12,610,238	12,549,657	12,493,760	12,442,186	12,394,599	12,350,690	12,310,173	12,272,786	12,238,287	12,206,450	12,177,070	12,149,956	8,252,793
Income tax	20,094,903.8	0	0	0	1,930,723	2,643,439	3,657,760	3,969,486	4,102,410	4,231,614	4,357,243	4,480,178	4,601,331	4,721,615	4,841,950	4,963,269	4,961,754	4,960,353	0	0	0	0
NET AFTER-TAX CASH FLOW	24,128,904.6	-5,000	-12,915,000	-6,457,500	618,015	5,184,876	7,658,182	8,562,257	8,573,489	8,378,624	8,192,413	8,013,582	7,840,855	7,672,984	7,508,740	7,346,904	7,311,033	7,277,933	12,206,450	12,177,070	12,149,956	8,252,793

FINANCIAL CASH FLOW STATEMENT - Nominal Prices	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Equity Holder Point of View																					
Net after-tax cash flow before financing	-5,000	-13,999,860	-7,587,924	787,203	7,159,051	11,462,309	13,891,973	15,078,653	15,973,753	16,930,719	17,952,276	19,040,815	20,198,340	21,426,327	22,725,547	24,514,213	26,453,101	48,093,587	52,007,966	56,251,105	41,417,757
Loan cash flow	0	10,243,800	7,402,853	0	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	-5,436,182	0
Net after-tax cash flow after debt financing	-5,000	-3,756,060	-185,071	787,203	1,722,869	6,026,126	8,455,791	9,642,470	10,537,571	11,494,536	12,516,094	13,604,633	14,762,157	15,990,144	17,289,364	19,078,030	21,016,919	42,657,404	46,571,784	50,814,922	41,417,757
DSCR	n/a	n/a	n/a	n/a	1.32	2.11	2.56	2.77	2.94	3.11	3.30	3.50	3.72	3.94	4.18						
LLCR	n/a	n/a	n/a	n/a	2.54	2.86	3.07	3.22	3.36	3.50	3.64	3.78	3.91	4.05	4.18						

FINANCIAL CASH FLOW STATEMENT (Real Prices)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Equity Holder Point of View																					
Domestic inflation rate	1.00	1.08	1.18	1.27	1.38	1.50	1.62	1.76	1.91	2.07	2.24	2.43	2.63	2.85	3.09	3.35	3.63	3.94	4.27	4.63	5.02
Net after-tax cash flow before financing	-5,000	-12,915,000	-6,457,500	618,015	5,184,876	7,658,182	8,562,257	8,573,489	8,378,624	8,192,413	8,013,582	7,840,855	7,672,984	7,508,740	7,346,904	0.0	0.0	0.0	0.0	0.0	0.0
Loan cash flow	0	9,450,000	6,300,000	0	-3,937,104	-3,632,015	-3,350,567	-3,090,929	-2,851,411	-2,630,453	-2,426,617	-2,238,576	-2,065,107	-1,905,081	-1,757,454	0.0	0.0	0.0	0.0	0.0	0.0
Net after-tax cash flow after debt financing	-5,000	-3,465,000	-157,500	618,015	1,247,771	4,026,167	5,211,690	5,482,559	5,527,214	5,561,961	5,586,966	5,602,279	5,607,876	5,603,659	5,589,450	5,689,765	5,782,299	10,826,713	10,904,250	10,975,768	8,252,793
DSCR	n/a	n/a	n/a	n/a	1.32	2.11	2.56	2.77	2.94	3.11	3.30	3.50	3.72	3.94	4.18	0.0	0.0	0.0	0.0	0.0	0.0
LLCR	n/a	n/a	n/a	n/a	2.54	2.86	3.07	3.22	3.36	3.50	3.64	3.78	3.91	4.05	4.18	0.0	0.0	0.0	0.0	0.0	0.0

Discount rate of return	14.00%
Net Present Value	19,421,110
Internal Rate of Return	50.16%