An Integrated Investment Appraisal of Broiler Production in Rwanda

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ABSTRACT

The aim of this thesis is to identify the main opportunities and risks facing each farmer in broiler projects in Rwanda.

Although a deterministic cost-benefit analysis showed that this kind of project have a highly satisfactory net present value (NPV), a risk analysis using an integrated financial, economic and stakeholder model detected many risk variables that might make this project unfeasible. Some essential risk includes the uncertainty of the price of chicken, the price of feeds and the real exchange rate.

The study point out that exporting to nearby countries like D.R. Congo is very important and helpful if possible. The analysis also recommends some of the alternatives that can be used to reduce the cost for feeds effectively.

Keywords: integrated investment appraisal, financial analysis, economic analysis, risk analysis, broiler production, Rwanda

ÖZ

Bu çalışmanın amacı Ruanda'da piliç üreticilerinin karşı karşıya olduğu riskleri ve temel fırsatları belirlemektir.

Deterministik maliyet-fayda analizi piliç üretim projelerinin hayli yeterli Net Bugünkü Değer'e sahip olduğunu ortaya koymasına rağmen, bütünleşmiş finansal, ekonomik ve paydaş analiz kullanılarak uygulanan risk analizi, bu tür projelerin fizibilitesini etkileyecek derecede fazla riskli değişken saptamıştır. Piliç fiyatlarındaki belirsizlikler, piliç yemlerinin fiyatı ve reel döviz kuru önemli riskli değişkenlerin birkaçıdır.

Bu çalışma üretilen piliç etinin Kongo gibi komşu ülkelere ihracatının önemine işaret etmektedir. Ayrıca, yaptığımız analiz piliç yemlerinin etkin bir şekilde fiyatını azaltabilecek bazı alternatifleri önermektedir.

Anahtar Kelimeler: Yatırım Değerlendirmesi, Finansal Analiz, Ekonomik Analiz, Risk Analizi, Piliç Üretimi, Ruanda.

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To my lovely Family

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LIST OF ABBREVIATIONS

ADSCR   Annual Debt Service Coverage Ratios

CSCF   Commodity Specific Conversion Factors

EIRR   Economic Internal Rate of Return

ENPV   Economic Net Present Value

EOCK   Economic Opportunity Cost of Capital

FEP   Foreign Exchange Premium

FNPV   Financial Net Present Value

GDP   Gross Domestic Product

IMF   International Monetary Fund

IRR   Internal Rate of Return

LLCR   Loan Life Coverage Ratios

MINAGRI   Ministry of Agriculture and Animal Resources

MINECOFIN   Ministry of Finance and Economic Planning

NISR   National institute of statistics of Rwanda

NTP   Non-tradable Premium

VAT   Value Added Tax

WHO   World Health Organizati

Chapter 1

INTRODUCTION

1.1 Background

Rwanda is known to be one of the smallest countries in East Africa. Its surroundings are the Democratic Republic of Congo which is located on the western border, Tanzania on the eastern border, Uganda on the northern border, and Burundi on the southern border. Rwanda's population growth is approximated at 2.9% per year, and its Population reached to 11.5 million as of 2015 estimations according to the National institute of statistics of Rwanda, (NISR, 2015). Rwanda has about 407 residents per square kilometer, and some areas have a density greater than 1000 residents per square kilometer, which makes Rwanda the country with the highest population density in Africa, (Ministry of Agriculture and Animal Resources, MINAGRI 2012).

Rwanda has been able to increase its economic growth rate in recent years by making important economic structural reforms with funding from the World Bank and International Monetary Fund (IMF). Exceeding the projected 6.0% Real Gross Domestic Product (GDP) increased by 7.0% in 2014, 2.3% higher than 2013. The agriculture and services sectors led growth during this period. And it is predicted to reach 7.5% in both 2015 and 2016, (African Economic Outlook 2015). Although, Rwanda is one of the world's poorest countries, with about 60% of its population living below the poverty line with an annual per capita income 540 U.S. dollars depriving most of its inhabitants from having a good life (MINAGRI 2012).

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According to the Ministry of Agriculture and Animal Resources, 28% of the total economic growth can be attributed to the agricultural sector, along with 32.7% of the GDP. This sector also contributes to about 80% of the total exports in Rwanda and employs approximately 90% of the total population. (National institute of statistics of Rwanda). The rural population's living standards is closely tied with the agricultural sector and any development in that sector would encourage regional development and will contribute to eliminating poverty. (FAO, 2015).

The livestock sector in Rwanda contributes around 12% of the country's GDP and about 30% of Agricultural GDP, and that is projected to rise up to 50% over the next 20 years. (MINAGRI, 2012).

1.2 Aim of the Study

The purpose of this thesis is to identify and cost the needed interventions to have a competitive Rwandan poultry sector as a livestock sub sector and to inform GoR on the required policies that could improve the environment for private investment.

1.3 Method Used in the Study

1.3.1 Data Sources

The majority of the data acquire in this thesis has been taken from Rwanda. The study is attained by literature review acquired by using different sources, from different books, articles, virtual libraries, and worldwide web sources.

1.3.2 Study Approach

The study used Integrated Investment Appraisal for investment decisions which is a part of the Cost-Benefit Analysis. Which focus on evaluating the project through the Financial, Economic, Stakeholder and Risk Analysis. Cost-Benefit Analysis assists to

avoid good projects from being rejected and bad project from being accepted (Jenkins, Kuo and Harberger, 2014).

The gathered data was analyzed by the above-mentioned method, by inserting all relevant data into a financial model that enable one to conduct reasonable analysis. The feasibility of the proposed project is evaluated by deriving the Net Present Value (NPV). By using the model, the risky variables are identified as being critical using sensitivity analysis.

1.4 Structure of the Thesis

The thesis begins with a brief background about Rwanda, followed by explanation of the aim and method of research. Chapter 2 then proceeds to discuss the agricultural sector in Rwanda, focusing on poultry broilers and attempts by the GoR to develop that sector. Chapter 3 will gives an idea about the concept of the project, the structure and its inputs, while the methodology for the research will be analyzed in Chapter 4.

The study will encompass the four pillars of analysis according to the IIA. Chapter 5 will evaluate the Financial Analysis. Economic Analysis will be covered in Chapter 6, followed by stakeholders Analysis in Chapter 7. The final pillar which is Risk analysis will be discussed in Chapter 8. While chapter 9 provide the conclusion of this study.

Chapter 2

LITERATURE REVIEW

2.1 Chicken Meat as Compared to Bordering Countries

As compared to the African average, the meat per capita ingestion in Rwanda is very small. It is in a growing tendency since 2004 but it is still beneath 10 Kg per year and according to the FAO, the average is at 32 Kg for African countries per year (FAO).

According to the food and agriculture organization, East Africa produces 5% of the Africa's total production of chicken meat. And stated the chicken meat production of Rwanda (2,500 tonnes) is far below those from DR Congo (12,500 tonnes), Kenya (24,500 tonnes), Uganda (38,000 tonnes), Tanzania (47,000 tonnes), and twice lower than those of Burundi (6,800 tonnes). In the last 10 years, however, Rwanda's chicken meat production increased by 78.8%. It is therefore hardly 2% of the bordering countries production. (FAO 2015).

Making Rwanda an Exporter of poultry meat may seem presumptuous at first glance; however, these countries still need to import to fill their domestic market because none of these is self-sufficient.

Rwanda will have to concentrate on nearby attainable markets like Burundi, DR Congo, and Congo, because it seems premature to compete with such countries like Tanzania, Uganda and Kenya.

2.2 Strengths and Contributing Factors to the Poultry Industry

2.2.1 The Poultry Development Framework

Different reform guidelines have given Rwanda a framework supporting the development of the poultry industry.

- Decentralization policy of Rwanda's government adopted to bring services like creating "Umurenge" the central unit for development close to the population;

- The policy of new land: the goal is to encourage investments in farming by secure land tenure;

- The veterinary profession strengthening: the future Order of Veterinarians and Veterinary Association (ARMV) will play an important part in animal husbandry and other aspects of veterinary service delivery.

2.2.2 Development Policies and the Poultry Sector

By changing the fledgling poultry industry in Rwanda into a high-performance poultry industry (e.g. meeting the same standards as Tanzania, Uganda, and Kenya), the country will have built an important asset to achieve the Economic Development and Poverty Reduction Strategy (EDPRS), and accomplishing the Millennium Development Goals (MDG) targets.

2.2.3 The Basis of a Modern Poultry Industry

- Private sector participation including the private sector in livestock development, is a goal of the public authorities. Private investors are more likely to make investments in such projects than in other livestock activities. Poultry farmers in Rwanda have problems improving their capacities to meet the growing demand. Unlike other countries, where investors are involved in a

strong competition in a marketplace more or less satiated, this is not the situation in Rwanda.

- The Rwanda Poultry Industry Association (RPIA), is a proficient organization containing all stakeholders that participate in the poultry industry these include farmers, feed manufacturers, hatcheries, importers and exporters.

- Typical weather for rearing poultry: In many African countries, poultry production faces challenges due to the dry and hot climate through a long period of the year. Rwanda is less subject to such constraints thanks to a relatively temperate climate. (MINAGRI, 2012).

2.3 Type of Production

Table 1 contains a brief description of the main ways that poultry is reared.

Rwanda has 2 production systems shared by the population;

- A poultry production in villages which is (system 4),

- A poultry production for commercial purposes which is (system 3).

Systems 1 and 2 are absent in Rwanda, they are pointers of the growth level of the poultry division.

Table 1: Production Systems Classification of Poultry by FAO

Systems	Characteristics
System 1	Industrial integrated system that birds/products marketed commercially and with a high level of biosecurity (e.g. farms that are a portion of an integrated broiler production enterprise with evidently clear and applied standard functioning processes for biosecurity).
System 2	Commercial poultry production system that birds/products typically marketed commercially and with reasonable to high biosecurity (e.g. farms with birds kept inside constantly; firmly avoiding interaction with other poultry or wildlife).
System 3	Commercial poultry production system that birds/products entering live bird market and with little to negligible biosecurity (e.g. a detained layer farm with birds in exposed cabins; farm with poultry spending time outside the shed; a farm producing chickens and waterfowl).
System 4	Village or courtyard production that birds/products consumed locally and with negligible biosecurity

Source: FAO animal health and production division

2.4 Day-Old Chickens

Rwanda does not have enough supply for day old chickens. To supplement this; most of the chickens are imported from other countries, mainly Uganda, Netherlands, and Belgium. Delivery of the chickens can take a long time from Uganda, however the prices can be much lower, in contrast, delivery from Netherland can be as short as 2 weeks. Furthermore, there is a competition Rwanda faces from South Sudan and DR Congo which have sturdy demand. This makes the building of a National hatchery even more urgent. (East Africa Agribusiness Magazine).

2.5 Nutritional

According to the Ministry of Agriculture and Animal Resources, the emergence of a high-performance poultry industry is related to the development of a poultry feed industry which forces farmers to make the feed themselves due to the nonexistence of the industry. Due to the lack of economic of scale feed prices are high, not to mention quality issues. Therefore, prices of nutrition vary from 260 to 330 Rwf/kg. and the revenue of farmers is significantly reduced due to the production cycle which is around 45 days, (MINAGRI 2012).

In the domestic market, many of the ingredients used are fairly scarce and very expensive, for example: maize, soybean meal, cotton seed meal, methionine, sunflower meal, lysine, premixes, fish meal. moreover, there is an uncertainty of prices that vary greatly over the time.

The problems listed below are related to the main ingredients:

Table 2: Poultry Feeds Ingredients Difficulties

Ingredients	Constraints
Fish	• Prices are high (590-1070 Rwf/kg) • Imports from Tanzania and Uganda • Inconsistency in supply
maize	• Prices are high (200-300 Rwf/kg) • Studies on biofuel • Rivalry with Rwandan feeding
Soya	• 1/3 of the requirements produced in Rwanda, the rest from DR Congo
Cotton seed	• Prices are high (350-500 Rwf/kg) • Imports from Tanzania

Source: MINAGRI 2012

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2.6 Health

As many reports from the Ministry of Agriculture and Animal Resources showed, the health of the poultry is fairly decent. Nonetheless, its density is projected to rise in the future, which will therefore increase the dangers of diseases. This gives importance to the requirement to anticipate by applying a well-organized health management system.

2.7 Opportunities in Rwanda

If the pressures that obstruct its expansion are detached, Rwanda has openings to build up a sturdy poultry industry. The leading openings are:

- Increased tourism demands high quality meat and egg products.

- An appropriate political context for the emergence of a strong poultry industry; the public authorities highlight the small animals for meat production;

- Opportunities for commercial production:
  - Enormous potential in the domestic market: in order to just reach the African average (4.8 kg gutted weight/year). This target would request for make Rwanda had to increase its production 20 times.

  - Huge potential in the regional market: several of the countries in the area are lacking in chicken products and it imports to fulfill the gap.

Chapter 3

PROJECT DESCRIPTION

3.1 Project Concept

Meat production from chicken is an industry that tends to expand rapidly as income in a country rise. However, it is very much constrained by the feed supply chain. Rwanda is an important example in Africa of country that although poor is striving through sound economic policies to increase the standard of living of its residents. At the present time, there are a small number of commercial broilers producers in the country. Rwanda cannot produce poultry feed that is competitive with imported feed from Uganda. However, it has access to market in the DR Congo that Uganda poultry producers are not able to access competitively.

This project acts like a base case to the study acknowledges interest in evaluating and assessing possible financial and economic potentials and/or drawback that an investor could face when deciding to undertake project financing for the purpose of producing chickens and entering into the exports market. Besides, it is an exemplary company engaged in diverse business activities, which include the production, marketing and sale of chicken meat inside and outside the country.

3.1.1 Project Objectives

A project in itself could be interpreted by different people in different ways depending on the nature and scope of activities. Jenkins (2014) defines a project as "a series of activities and task that have a specific objective and that have to be completed within

certain specifications and within a given time frame". Clearly, a project involves a network of activities and tasks undertaken for a particular purpose within a time reach. Any project with no clear objective and time frame is bound to face difficulties when undertaken.

In the context of this study and as stipulated by Jenkins (2014), concerning projects, "a project may be viewed as an instrument available to planners and policy makers for achieving the objectives and development goals of a country or province".

The proposed project would provide the opportunity for involvement in the exporting market of poultry broilers and be in a position to capture the lucrative worth of it. In addition, it would strengthen the project existence and boost its local business functioning units as well. This would provide an incremental broilers production and also an improvement in the project earnings.

3.2 Project Components

The project is an integrated response towards maintaining and sustaining the existing poultry production in Rwanda. It consists of different components ranging from land coverage to asset composition, and from raw material needed to management and administrative aspects. All of these components are geared towards the realization of the activities of the project's broiler chicken production. The project components are outlined as follows:

3.2.1 Land Area and Construction

The land composition for the project is 2,500 square meters. Land was bought for 2 million FRw, because the cost of land in Rwanda is 8 million in average. And we

assumed that the land will be purchased because Rwandans prefer owning their own landed properties rather than renting it for a period.

The project consists of office room, storage room and 4 hen houses, which cost about 5.2 million FRw in total.

3.2.2 Project Cost and Financing

The proposed project would be financed by a loan from a local commercial bank denominated in local currency, the Rwandan Franc (FRw). This loan would fund the project with the owner's contribution. The loan total amount is FRw 3.6 Million with 20 percent nominal interest rate and there is a one year grace period during which interest is capitalized. Loan repayment would be in five annual equal principal installments plus interest. The owner guarantees the loan with the assets of the project. The amount of the equity contribution to the project is FRw 3.59 Million.

The total project investment cost is estimated at FRw 7.19 Million, out of which the bank loan would fund FRw 3.6 Million and the owner FRw 3.59 Million. The contribution of the bank is almost 50 percent of the total investment cost and the owner is 50 percent. The local commercial bank funds would be used to finance the buildings. The owner's contribution is in the form of part of buildings, the land, cover part of the operating and other production expenses and would also be used for rehabilitation purposes when necessary.

The building is depreciated for tax purposes by using the straight-line depreciation method over a 10-year period (A guide to taxation in Rwanda, 2015)

3.2.3 Market Conditions and Prices

Market conditions for poultry in Rwanda have evidently been favorable for farmers. The demand has been increasing while at the same time producers are trying to increase their production to meet the growing demand of customers. Nonetheless, chickens' prices in the domestic market are determined by the forces of demand and supply rather than by producers themselves. At the time of this study, the domestic price per chicken was FRw 2800, which is approximately 3.5 United States Dollars (USD).

Rwanda's chickens external markets have also been showing favorable trends in the last years. The huge potential is now a source of substantial earning for poultry farmers and has been a catalyst to the improvement of their daily standards of living. The external price for chickens is neither determined by producers nor by their government but rather   by the forces of the international market conditions and the impact of foreign inflations. The FOB price of chickens when sell it to D.R. Congo is $7.27 USD/chicken (FRw 5800). This price is considerably higher than that of the domestic price.

3.2.4 Production

The project consists of three hen houses. For the first two weeks, we assume that we have 526 chickens in each house, and from the third week to the end we can assume 500 chickens are alive. Because the mortality rate is 5% percent in average and happens in the first two weeks. And there will be a forth hen house to enable farmer to deliver each two weeks.

Each cycle of production for broilers needs 45 days, and another 15 days after that for preparation and sanitary.

3.2.5 Feeding

Feeding requires change in three different periods of each cycle. Feeding required per head start at around 20 grams per day and will gradually increase up to 130 grams. On the average, we can assume that each chicken consumes 2.95 Kgs of food per cycle, at FRw 280 per Kg.

3.3 Operating Expenses

A project's operating expenses include all those costs that are incurred during a project's production and operating cycle the project's operating costs are categorized into fixed and variable cost. The fixed costs include electricity expenses, general and administration expenditures are independent of the production capacity utilization and hence stay constant nonetheless of change in it. However, the variable cost of the project is like the cost of raw material (chickens, feed and vaccine) is a function the production volume utilization and differs with respect to changes in the production volume utilization.

3.3.1 Day-Old Chickens

One of the main inputs for the production of broilers is Day old chickens. Day old chickens are purchased from Netherlands and it needs 2 weeks for delivery. It has 5 percent mortality rate and it cost around $1 USD/chicken which equal FRw 800.

3.3.2 Feeding Cost

Another main input for broilers production is feeds. And most of the feeds are imported from Uganda because it's cheaper from there. Each chicken needs 2.95 kg during its life which costs 280 FRw/kg.

3.3.3 Equipment

Equipment required are; feeders, drinkers, jerry cans and some other stuffs. The total cost of equipment is FRw 706,000, with 5 years of useful life.

The following table shows equipment in details and cost of each.

Table 3: Cost of Equipment

Type of equipment	Cost	Number needed	Total cost
Feeders for young chickens	3,000	10	30,000
Feeders for old chickens	6,000	40	240,000
Drinkers for young chickens	3,000	10	30,000
Drinkers for old chickens	7,000	20	140,000
Jerry cans	1,500	60	90,000
Pump	20,000	2	40,000
Shelters	8,000	16	128,000
Thermometer	8,000	1	8,000
Total Cost			**706,000**

3.3.4 Heater

Heater will be used to requlate the temperature adjustment for young chickens' room

and it costs FRw 30,000 with 2 years of useful life.

3.3.5 Labor

The labor requirement for the broiler project is segregated into skilled and unskilled

labor. On one hand, the skilled labor who is the manager. On the other hand, the

unskilled labor constitutes manpower workers and cleaners.

There is one skilled labors with FRw 100,000 per month and two unskilled labors with

FRw 40,000 per month each.

3.3.6 Veterinary Services

Veterinary Services divided into veterinary expense which costs 100 FRw/chicken and

the vaccine, drugs and vitamins which cost 40.4 FRw/chicken.

3.3.7 Utilities

Utilities for the project involve electricity, water and communication. The average cost for each of them is 10,000 20,000 10,000 respectively.

3.3.8 Transportation

Transportation cost for the project segregated into two parts, transportation cost for importing day-old chickens from Netherland, and transportation cost for selling chicken and exporting it. The total transportation cost for the project is about 255,000 FRw/month.

3.3.9 Slaughtering and Packaging

There is no need to have machines for slaughtering and packaging chickens because it is not a major production project. So, chickens will be sent to someone who will cost 50 FRw/chicken for slaughtering and packaging.

3.3.10 Other Operating Cost

Other operating cost such as charcoal and wood dust that will be used for the heater and other such things that will be used for the project, costs about 28,000 FRw/month.

Chapter 4

RESEARCH METHODOLOGY

This study is based on the integrated financial, economic and stakeholder analysis which is a tool developed by Jenkins and Harberger. It is done by comparing each and every financial profile on periodic based rather than summarizing them on single statistical ground as in taking their net present value (NPV) or internal rate of return (IRR). The reason behind the periodic computation of financial profiles is to accurately assess the sustainability or riskiness of the project. By doing so, the project stakeholder risk avoiding the forgoing of an eminent economic benefit what would be created in the progress of the project undertaking.

The computation in the analysis make use of only a single unit of account. Preferably, the analysis has expressed all variable in domestic prices at their domestic price levels in which the Rwandan market operates. The essence of which is to maintain a consistent valuation among the financial and economic approaches of the outputs and inputs of the project.

4.1 Overview of the Financial Analysis

The financial analysis which helps determine the project's financial sustainability outlines the project cash inflows and outflows to arrive at its expected net financial cash flows to the total investment accrued to equity and debt holders. It begins with a projection of the cash flows from two different perspective – the banker's and owner's points of view;

The cash flow projection under the banker's point of view for the scenarios of the project includes the projections of the financial receipts generated through capital investment cost, input materials, salaries and labour expenses, operating and recurrent expenses and working capital requirement. The cash flows projection under the owner's point of view, on the other hand, includes, in addition to the banker's cash flow projection, the financing of the project whereby loan are treated as inflows and repayments as outflows.

To ascertain the financial and/or economic viability of the project, the financial net present value (NPV) criterion is being used in parallel with both the financial and economic analyses. Furthermore, the debt-service coverage ratio (DSCR) is also applied upon the annual net cash flow from the total investment (banker's) point of view in the financial analysis to define the project's capacity to pay its operating expenses and meet its debt service obligations. Each of these strategies will be explained in particulars in chapter 5.

4.2 Overview of the Economic Analysis

In whichever investment undertaking, focusing on the financial aspects alone is a feeble and dangerous approach to ascertaining the true viable worth of a project. The economic aspect, which helps to ascertain the impact of the economic variables in the project, should also be drawn into focus.

While the financial analysis of the project tends to concentrate only on the project's financial sustainability, the economic analysis will focus on the full assessment of the project's ultimate impact on the Rwandan society as a whole. As such, the concern over the economic analysis is not just to analyze the cash receipt and expenditures of

the project but also to assess the economic benefits and costs that the project contribute to the Rwandan society.

To perform the economic analysis, all costs are measured in term of their economic values as opposed to their financial values. This measurement involves the conversion of financial costs into viable economic values through the application of economic conversion factors. Details of the economic analysis are provided in chapter 6.

4.3 Overview of the Distributive Analysis

Within the scope of the financial and economic analyses there will be monetary and non-monetary impacts affected parties that originate from the project's incremental investment undertaking. The distributive analysis shows the exact groups that the project is likely to affect in an economy as a result of the project's additional undertaking. Since the analysis on the project generates externalities resulting from the differences in comparison of the project's economic benefit and cost to its financial inflows and outflows (in terms of their real and incremental values). The need then arises to establish the gainers and losers within the scope of the project implementation and as well quantity the amount each of these groups is bound to lose or gain. In chapter 7, the different groups that project outcome would directly or indirectly affect are shown and a detailed explanation is given on the magnitude to which they would affected.

4.4 Overview of the Sensitive and Risk Analyses

The sensitivity and risk analyses are intertwined, in that their computations follow a discretionary mode different to those of the financial and economic analysis. The sensitivity analysis done on the financial and economic outcomes of the project determines the relative sensitivity changes of the project's selected risk variables. A

set of variables will be identified in order to include the risky parameters that would impact the project outcomes the most. These earmarked risk variables to project are listed as follows:

- ➤ Number of birds in the cycle
- ➤ Day old chicks cost
- ➤ Price per Kg of mixed feeds
- ➤ Selling prices
- ➤ Export percentage
- ➤ Real exchange rate

Detailed explanation on each of these risks and other sensitive variables would be given in chapter 8.

The sensitivity analysis is an integral component to identifying key risk variables that would result into the undertaking of the risk analysis. Whereas the sensitivity analysis helps assess the relative sensitive change of the project's key risk variables, the risk analysis, on the other hand, helps determine the strength or weakness if the likely exertion of the risk variable to the project with every passing time. Chapter 8 would further examine the effect of the project's most risky variables through the result of the risk analysis.

Chapter 5

FINANCIAL ANALYSIS

The financial appraisal helps in defining the feasibility of the project, and it shows the projects possibility for success or failure. It gives us all the needed information through the process of decision making and in deciding whether the project is viable and should be accepted according to the given situations or not, and also what is the changes that should be made consequently so the project can be viable.

5.1 Parameters and Assumptions

Price of Chicken

The price of chicken in Rwanda at the local market is FRw 2800 per chicken in 2016. These prices are expected to rise at the rate of inflation which is 5 percent, as used in this study.

Production of Chicken

- The annual production after the 5% percent morality rate is 12,000 chickens.

Investment Cost and Financing

- The total investment cost of the project is FRw 7.19 Million including the land and buildings.

- The financing of investment would be by a loan from a local commercial bank with a total amount of FRw 3.6 Million at 20 percent nominal interest rate. The rest of the investment cost is paid by the owner of the project.

Operating Costs

- Inputs requirement for the project are given in details in Section 3.3 but here is a summary table for it.

Table 4: Operating Cost Summary

Type of cost	Unit	Cost
Day-old chicken	FRw/chicken	800.00
Feed	FRw/kg	280.00
Equipment	FRw/5years	706,000.00
Heater	FRw/2years	30,000.00
Labor	FRw/month	180,000.00
Veterinary Services	FRw/chicken	40.40
Utilities	FRw/month	55,000.00
Transportation	FRw/month	255,000.00
Slaughtering and Packaging	FRw/chicken	50.00
Other Operating Cost	FRw/month	28,000.00

Working Capital

- We assumed that account receivable and account payable will be 10 percent.

Life of Assets and Residual Values

- All equipment such as feeders, drinkers, jerry cans and shelters are expected to serve for a period of 5 years. However, heaters are projected to work for 2 years.

- Buildings such as office, storage and hen houses are projected to last 10 years.

Taxation

- Income is exempted from tax when it is derived from agricultural and livestock activities, and if it doesn't exceed FRw 12,000,000 in tax period.

- Indirect Taxes and Import Duty: generally, there is no VAT or import duty on agricultural project inputs or capital assets, however, there is 18 percent VAT on

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electricity, water and communication, and there is a tax which is 5 percent on some imports.

Inflation

- The inflation rate in Rwanda is expected to stay constant at 5 percent per year.

Required Rate of Return

- For this project the opportunity cost of capital is 12 percent real. And it has been selected to represent the project rate of retune with these conditions.

5.2 Banker's Perspective (Total Investment)

The financial cash flow statement is calculated from the banker's point of view to know if the broilers project would be able to generate enough cash to cover its debt obligation or not. This will support and guide the Rwandan's banks, which are the lenders for the project, if the project will be able to generate adequate and sustainable revenues to cover its investment costs, operational expenses, debt repayment, in addition to extra returns to equity holders.

Revenues generated from the project are from selling chickens in domestic market. The inflows are attained from the sales, residual values of assets and land and change in account receivable. The outflows are spent on the investment cost including day-old chicken, labour requirement both skilled and unskilled, electricity, water, other operating costs and change in account payable. To generate the net cash flow for the project before financing we subtracted the total cash outflows from the total cash inflows. In order to determine the bankability of the project we calculated the ratio of debt service by dividing annual net cash flow to annual debt service. The banker's point of view is detected through estimating the debt service ratio which is the crucial and

fundamental criteria to measure the capability of the project to cover its debt obligation.

5.2.1 Debt Service Coverage Ratios

The broiler project need to ensure enough and sustainable project financing from any financial institution. The lender or that financial institution will set annual service coverage ratios (ADSCR) that be attained by the project throughout its lifetime. The project's ADSCR should at its minimum meet the benchmark set by the bank which is 1.5. The financial institution will provide 50% of the total broiler project financing; therefore the major criteria to determine whether they should go and finance this broiler project or not is the ADSCR ratios of the project. The debt repayment capability of the project is the only concern for the financial institution determining if the project is bankable or not. The financial institutions have other criterion that measures the projects bankability, which are the Loan life coverage ratios (LLCR). The set annual service coverage ratios is the ratio of annual cash flow available for debt service (CFADS) to the ratio of annual total debt service (TDS) the ADSCR shows the capacity of the project to develop adequate net cash flows to cover its annual principal and interested repayments. Furthermore, the LLCR shows the project's capability to produce an acceptable and sustainable cash in the following years and retrieve bridge financing when there are not enough cash flows to service the debt. The schedules below presents the ADSCR and LLCR ratios of the broiler project;

Table 5: Debt Service Coverage Ratios

Year	2017	2018	2019	2020	2021
NCFADS	4.54	6.11	6.50	6.89	7.23
Debt principal repayment	0.72	0.72	0.72	0.72	0.72
Debt interest expense	0.72	0.58	0.43	0.29	0.14
DSCR	**3.15**	**4.71**	**5.64**	**6.83**	**8.37**

Table 6: Loan Life Coverage Ratios

Year	2017	2018	2019	2020	2021
PVNCFADS	24.68	22.55	18.42	13.35	7.23
PV principal repayment	2.91	2.45	1.94	1.36	0.72
PV interest expense	1.88	1.29	0.80	0.42	0.14
LLCR	**5.16**	**6.02**	**6.72**	**7.50**	**8.37**

Table 7: Minimum and Average ADSCR and LLCR

	Minimum	**Average**
ADSCR	3.15	5.74
LLCR	5.16	6.76

As shown in the tables above, the minimum ADSCR is equal to 3.15. This shows that the broiler project is bankable and there is even no need for LLCR ratios of bridge financing. The average ADSCR of 5.74 times is a valuable indicator to any financial institution showing a high probability of debt recovery. Additionally, the LLCR shows minimum and average of 5.16 and 6.76 times correspondingly.

5.3 Equity Holder's Perspective

Deriving the net cash flows statement from the equity holder's point of view is the same as the financial institution of lenders point of view. The major difference between both cash flow statements is the financing part. Both cash flow statements are the indifferent till we calculate the net cash flow before financing All calculations are measured in nominal values then transformed to real values through the price index. The major difference is that debts or loans are measured cash inflows and all debt repayments are computed as outflows. As a result, the FRw 3.6 million disbursements of the loan taken by the broiler project from the bank in 2016 is listed as a cash flow

and both interest and principal starting from 2017 are recorded as outflows during the loan period to reach the real net cash flow after financing.

Now with those real values of net cash flows after financing we out the net worth of the broiler project. The two major criteria used to calculate the net worth of the project, showing the equity holder perspective is the Net Present Value (NPV) and the Modified Internal Rate of Return (MIRR). Using the opportunity cost of capital of 12% as a discount rate, we identified a positive financial NPV and MIRR of FRw 31.40 million and 21.34% respectively. The results showed that the broiler project is qualified and capable of producing sustainable and adequate net cash flow during the appraisal period of the project to cover the investment cost, and to get rate of return to investors that is approximately 9.5% higher than the required rate of return of 12%. The broiler project is financially feasible depending on the deterministic presumptions made. Equity holders should go ahead and invest their money in the project. Wealth created to equity holders by investing their money in the broiler project generates higher returns that investing their money in the capital market. The financial cash flow statements from both the banker's and owner's perspective is displayed below

Table 8: Financial Cash Flow (Real)

Construction vs Operating		Construction	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Residual
Financial year ending		2016	2017	2018	2019	2020	2025	2030	2034	2035	2036	2037
Model column counter	Total	-	1	2	3	4	9	14	18	19	20	21
Receipts												
Domestic Sales	672.00	-	33.60	33.60	33.60	33.60	33.60	33.60	33.60	33.60	33.60	-
D.R. Congo Sales	-	-	-	-	-	-	-	-	-	-	-	-
Manure revenues	6.48	-	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	-
Change in Accounts receivable	-	-	(3.39)	-	-	-	-	-	-	-	-	3.39
Residual value of land	-	-	-	-	-	-	-	-	-	-	-	2.00
Total inflows	675.09	-	30.53	33.92	33.92	33.92	33.92	33.92	33.92	33.92	33.92	5.39
Expenditures												
Construction cost	5.19	5.19	-	-	-	-	-	-	-	-	-	-
Land cost	2.00	2.00	-	-	-	-	-	-	-	-	-	-
Day-old chickens	201.98	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	-
Feeding	197.74	-	9.89	9.89	9.89	9.89	9.89	9.89	9.89	9.89	9.89	-
Equipment	2.82	-	0.71	-	-	-	-	-	-	-	-	-
Heater	0.30	-	0.03	-	0.03	-	0.03	-	-	0.03	-	-
Skilled labours	24.00	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	-
Unskilled labours	19.20	-	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	-
Vaccine, drugs and vitamins	9.70	-	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	-
Veterinary expense	24.00	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	-
Electricity	3.60	-	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	-
Water	7.20	-	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	-
Communication	2.40	-	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	-
Transportation	61.20	-	3.06	3.06	3.06	3.06	3.06	3.06	3.06	3.06	3.06	-
Slaughtering and packaging	12.00	-	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
Other operating cost	6.72	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	-
Change in account payable	-	-	(2.92)	0.07	(0.00)	0.00	(0.00)	0.00	0.00	(0.00)	0.00	2.85
Tax expense	-	-	-	-	-	-	-	-	0.27	0.34	0.41	-
Tax paid for land	0.50	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-
Total outflows	578.94	7.19	26.32	28.59	28.54	28.52	28.54	28.52	28.79	28.87	28.93	2.85
Net Cash flow before financing	96.15	(7.19)	4.21	5.34	5.38	5.41	5.38	5.41	5.14	5.05	5.00	2.54
Loan	3.60	3.60	-	-	-	-	-	-	-	-	-	-
Senior debt principal repayment	2.98	-	0.67	0.63	0.59	0.56	-	-	-	-	-	-
Senior debt interest expense	1.86	-	0.67	0.50	0.36	0.22	0.00	0.00	0.00	0.00	0.00	0.00
Net Cash flow after financing, FRw	94.91	(3.59)	2.87	4.21	4.44	4.62	5.38	5.41	5.14	5.05	5.00	2.54
Real exchange rate	-	798	798	798	798	798	798	798	798	798	798	798
Net Cash flow after financing , USD		(0.004)	0.004	0.005	0.006	0.006	0.007	0.007	0.006	0.006	0.006	0.003
FNPV, FRw	Million FRw	31.40										
FNPV, USD	USD	43,845										

Table 9: Financial Cash Flow (Nominal)

Construction vs Operating		Construction	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Residual
Financial year ending		2016	2017	2018	2019	2020	2025	2030	2034	2035	2036	2037
Model column counter	Total	-	1	2	3	4	9	14	18	19	20	21
Receipts												
Domestic Sales	1,276.95	-	36.29	38.65	40.77	43.01	56.22	73.48	91.02	96.03	101.31	-
D.R. Congo Sales	-	-	-	-	-	-	-	-	-	-	-	-
Manure revenues	12.31	-	0.35	0.37	0.39	0.41	0.54	0.71	0.88	0.93	0.98	-
Change in Accounts receivable	-	-	(3.66)	(0.24)	(0.21)	(0.23)	(0.30)	(0.39)	(0.48)	(0.51)	(0.53)	10.23
Residual value of land	-	-	-	-	-	-	-	-	-	-	-	6.36
Total inflows	**1,279.04**	**-**	**32.97**	**38.78**	**40.95**	**43.20**	**56.46**	**73.80**	**91.42**	**96.45**	**101.75**	**16.59**
Expenditures												
Construction cost	5.19	5.19	-	-	-	-	-	-	-	-	-	-
Land cost	2.00	2.00	-	-	-	-	-	-	-	-	-	-
Day-old chickens	383.81	-	10.91	11.62	12.25	12.93	16.90	22.08	27.36	28.86	30.45	-
Total cost for feeding	375.76	-	10.68	11.37	12.00	12.66	16.54	21.62	26.78	28.26	29.81	-
Equipment	4.80	-	0.76	-	-	-	-	-	-	-	-	-
Heater	0.55	-	0.03	-	0.04	-	0.05	-	-	0.09	-	-
Skilled labours	45.61	-	1.30	1.38	1.46	1.54	2.01	2.62	3.25	3.43	3.62	-
Unskilled labours	36.48	-	1.04	1.10	1.16	1.23	1.61	2.10	2.60	2.74	2.89	-
Vaccine, drugs and vitamins	18.42	-	0.52	0.56	0.59	0.62	0.81	1.06	1.31	1.39	1.46	-
Veterinary expense	45.61	-	1.30	1.38	1.46	1.54	2.01	2.62	3.25	3.43	3.62	-
Electricity	6.84	-	0.19	0.21	0.22	0.23	0.30	0.39	0.49	0.51	0.54	-
Water	13.68	-	0.39	0.41	0.44	0.46	0.60	0.79	0.98	1.03	1.09	-
Communication	4.56	-	0.13	0.14	0.15	0.15	0.20	0.26	0.33	0.34	0.36	-
Transportation	116.29	-	3.30	3.52	3.71	3.92	5.12	6.69	8.29	8.75	9.23	-
Slaughtering and packaging	22.80	-	0.65	0.69	0.73	0.77	1.00	1.31	1.63	1.71	1.81	-
Other operating cost	12.77	-	0.36	0.39	0.41	0.43	0.56	0.73	0.91	0.96	1.01	-
Change in accounts payable	-	-	(3.16)	(0.12)	(0.18)	(0.19)	(0.25)	(0.32)	(0.39)	(0.43)	(0.44)	8.59
Tax expense POS	3.49	-	-	-	-	-	-	-	0.74	0.96	1.24	-
Tax paid for land	0.95	-	0.03	0.03	0.03	0.03	0.04	0.05	0.07	0.07	0.08	-
Total outflows	**1,091.03**	**7.19**	**28.43**	**32.67**	**34.45**	**36.31**	**47.50**	**62.03**	**77.59**	**82.10**	**86.77**	**8.59**
Net Cash flow before financing		**(7.19)**	**4.54**	**6.11**	**6.50**	**6.89**	**8.96**	**11.77**	**13.84**	**14.35**	**14.98**	**8.00**

5.4 Second Scenario (Export)

Some farmers might have the opportunity to export some of their production to nearby countries such as D.R. Congo. We assumed that 20 percent of the production is export to D.R. Congo. The selling price in D.R. Congo is $7.267 US per chicken for year 2016 which equal FRw 5800. Prices are assumed to increase by five percent rate of inflation. The equity perspective under this assumption with a rate of return of 12%, the NPV is FRw 76.20 million and MIRR 25.87%. And ADSCR and LLCR ratios are presented in the following tables.

Table 10: Debt Service Coverage Ratios – Exporting Case

Year	2017	2018	2019	2020	2021
NCFADS	11.54	13.83	14.41	14.97	15.52
Principal repayment	0.72	0.72	0.72	0.72	0.72
Interest expense	0.72	0.58	0.43	0.29	0.14
DSCR	**8.01**	**10.67**	**12.51**	**14.85**	**17.96**

Table 11: Loan Life Coverage Ratios - Exporting Case

Year	2017	2018	2019	2020	2021
PVNCFADS	55.89	49.67	40.15	28.83	15.52
PV principal repayment	2.91	2.45	1.94	1.36	0.72
PV interest expense	1.88	1.29	0.80	0.42	0.14
LLCR	**11.69**	**13.27**	**14.65**	**16.20**	**17.96**

Table 12: Financial Cash Flow (Real) - Exporting Case

Construction vs Operating		Construction	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Residual
Financial year ending		2016	2017	2018	2019	2020	2025	2030	2034	2035	2036	2037
Model column counter	Total	-	1	2	3	4	9	14	18	19	20	21
Receipts												
Domestic Sales	537.60	-	26.88	26.88	26.88	26.88	26.88	26.88	26.88	26.88	26.88	-
D.R. Congo Sales	278	-	13.92	13.92	13.92	13.92	13.92	13.92	13.92	13.92	13.92	-
Manure revenues	6.48	-	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	-
Change in Accounts receivable	-	-	(4.11)	-	-	-	-	-	-	-	-	4.11
Residual value of land	-	-	-	-	-	-	-	-	-	-	-	2.00
Total inflows	**366.00**	**-**	**37.01**	**41.12**	**41.12**	**41.12**	**41.12**	**41.12**	**41.12**	**41.12**	**41.12**	**6.11**
Expenditures												
Construction cost	5.19	5.19	-	-	-	-	-	-	-	-	-	-
Land cost	2.00	2.00	-	-	-	-	-	-	-	-	-	-
Day-old chickens	201.98	-	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	10.10	-
Feeding	197.74	-	9.89	9.89	9.89	9.89	9.89	9.89	9.89	9.89	9.89	-
Equipment	2.82	-	0.71	-	-	-	-	-	-	-	-	-
Heater	0.30	-	0.03	-	0.03	-	0.03	-	-	0.03	-	-
Skilled labours	24.00	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	-
Unskilled labours	19.20	-	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	-
Vaccine, drugs and vitamins	9.70	-	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	-
Veterinary expense	24.00	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	-
Electricity	3.60	-	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	-
Water	7.20	-	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	-
Communication	2.40	-	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	-
Transportation	61.20	-	3.06	3.06	3.06	3.06	3.06	3.06	3.06	3.06	3.06	-
Slaughtering and packaging	12.00	-	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	-
Other operating cost	6.72	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	-
Change in account payable	-	-	(2.92)	0.07	(0.00)	0.00	(0.00)	0.00	0.00	(0.00)	0.00	2.85
Tax expense	-	-	-	0.44	0.64	0.85	1.58	2.11	2.43	2.50	2.57	-
Tax paid for land	0.50	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-
Total outflows	**274.90**	**7.19**	**26.32**	**29.03**	**29.18**	**29.37**	**30.12**	**30.62**	**30.95**	**31.03**	**31.09**	**2.85**
Net Cash flow before financing	**91**	**(7.19)**	**10.69**	**12.09**	**11.94**	**11.76**	**11.00**	**10.50**	**10.18**	**10.09**	**10.04**	**3.26**
Loan	3.60	3.60	-	-	-	-	-	-	-	-	-	-
Senior debt principal repayment	2.98	-	0.67	0.63	0.59	0.56	-	-	-	-	-	-
Senior debt interest expense	1.86	-	0.67	0.50	0.36	0.22	0.00	0.00	0.00	0.00	0.00	0.00
Net Cash flow after financing , FRw	90.50	(3.59)	9.35	10.97	10.99	10.97	11.00	10.50	10.18	10.09	10.04	3.26
Net Cash flow after financing , USD		(0.004)	0.012	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013	0.004
FNPV, FRw	Million FRw	76.20										
FNPV, USD	USD	99.983										
FMIRR	%	25.87%										

Table 13: Financial Cash Flow (Nominal) - Exporting Case

Construction vs Operating	Total	Construction	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Residual
Financial year ending		2016	2017	2018	2019	2020	2025	2030	2034	2035	2036	2037
Model column counter	**Total**	-	1	2	3	4	9	14	18	19	20	21
Receipts												
Domestic Sales	1,021.56	-	29.03	30.92	32.62	34.41	44.97	58.78	72.82	76.82	81.05	-
D.R. Congo Sales	529.02	-	15.03	16.01	16.89	17.82	23.29	30.44	37.71	39.78	41.97	-
Manure revenues	12.31	-	0.35	0.37	0.39	0.41	0.54	0.71	0.88	0.93	0.98	-
Change in Accounts receivable	-	-	(4.44)	(0.29)	(0.26)	(0.27)	(0.36)	(0.47)	(0.58)	(0.61)	(0.65)	12.40
Residual value of land	-	-	-	-	-	-	-	-	-	-	-	6.36
Total inflows	**698.01**	**-**	**39.97**	**47.01**	**49.64**	**52.37**	**68.45**	**89.46**	**110.83**	**116.92**	**123.35**	**18.76**
Expenditures												
Construction cost	5.19	5.19	-	-	-	-	-	-	-	-	-	-
Land cost	2.00	2.00	-	-	-	-	-	-	-	-	-	-
Day-old chickens	383.81	-	10.91	11.62	12.25	12.93	16.90	22.08	27.36	28.86	30.45	-
Total cost for feeding	375.76	-	10.68	11.37	12.00	12.66	16.54	21.62	26.78	28.26	29.81	-
Equipment	4.80	-	0.76	-	-	-	-	-	-	-	-	-
Heater	0.55	-	0.03	-	0.04	-	0.05	-	-	0.09	-	-
Skilled labours	45.61	-	1.30	1.38	1.46	1.54	2.01	2.62	3.25	3.43	3.62	-
Unskilled labours	36.48	-	1.04	1.10	1.16	1.23	1.61	2.10	2.60	2.74	2.89	-
Vaccine, drugs and vitamins	18.42	-	0.52	0.56	0.59	0.62	0.81	1.06	1.31	1.39	1.46	-
Veterinary expense	45.61	-	1.30	1.38	1.46	1.54	2.01	2.62	3.25	3.43	3.62	-
Electricity	6.84	-	0.19	0.21	0.22	0.23	0.30	0.39	0.49	0.51	0.54	-
Water	13.68	-	0.39	0.41	0.44	0.46	0.60	0.79	0.98	1.03	1.09	-
Communication	4.56	-	0.13	0.14	0.15	0.15	0.20	0.26	0.33	0.34	0.36	-
Transportation	116.29	-	3.30	3.52	3.71	3.92	5.12	6.69	8.29	8.75	9.23	-
Slaughtering and packaging	22.80	-	0.65	0.69	0.73	0.77	1.00	1.31	1.63	1.71	1.81	-
Other operating cost	12.77	-	0.36	0.39	0.41	0.43	0.56	0.73	0.91	0.96	1.01	-
Change in accounts payable	-	-	(3.16)	(0.12)	(0.18)	(0.19)	(0.25)	(0.32)	(0.39)	(0.43)	(0.44)	8.59
Tax expense POS	68.30	-	-	0.51	0.78	1.09	2.65	4.61	6.59	7.13	7.75	-
Tax paid for land	0.95	-	0.03	0.03	0.03	0.03	0.04	0.05	0.07	0.07	0.08	-
Total outflows	**523.23**	**7.19**	**28.43**	**33.18**	**35.23**	**37.40**	**50.15**	**66.64**	**83.44**	**88.27**	**93.28**	**8.59**
Net Cash flow before financing		**(7.19)**	**11.54**	**13.83**	**14.41**	**14.97**	**18.30**	**22.82**	**27.39**	**28.65**	**30.07**	**10.17**

Chapter 6

ECONOMIC ANALYSIS

The financial analysis reflects the benefits of bankers and equity holders; the main aim of economic analysis is to predict entire country's and societies' well-being by evaluating the economic benefit.

Therefore, the project has to be analyzed from the economic point of view and this would assist the groups to know if they are losing or gaining from the project.

6.1 Economic Parameters and Assumptions

Many of other parameters and assumptions should to be done for the economic analysis in addition to the financial parameters of the project.

National Parameters

- The economic opportunity cost of capital is 12 percent in real terms for Rwanda.

- The estimated non-tradable outlay (NTP) and the foreign exchange premium (FEP) for Rwanda are 5.37 percent and 1.07 percent respectively.

Taxes

- Day-old chickens, Equipment and feeds are imported with the approval of the government of Rwanda and do not have VAT or import duty to encourage the investment in the agriculture sector.

- All other imported goods and locally supplied inputs attract 5 percent tax.

- Services and non-traded goods used in the project include, electricity, water, construction, communication and domestic transportation which are sourced domestically attract a VAT of 18 percent, NPT of 1.07 percent, FEP of 5.37 percent and effective tax rate on tradable and non-tradable of 12.3 percent.

Labour

- The supply price approach has been used to calculate the economic cost of Labour (ECOL).

- The salaries of the skilled workers are likely to pay personal income tax at 30% after the exemption on the first 30,000 FRw they get.

- Unskilled workers are expected to pay no tax because they get fewer wages.

Working Capital

- The change in accounts receivable is related with the selling of chicken in case of exporting or just in local market, and therefore is attached with the FEP in case of exporting.

- The changes in accounts payable's conversion factor is basically a compound conversion factor based on the weighted average of their respective shares and conversion factors (CSCFs).

All conversion factors can be calculated with this information and these are in Table 14.

6.2 Economic Feasibility

Table 15 shown the economic cash flow statement which has been calculated from the investor perspective (Financial Cash flow table 8), with the recent adjustments for

different market distortions. All objects of the financial cash flow are adjusted using the economic conversion factors. The conversion factors alter cash flow items into their corresponding economic values of the services and goods demanded supplied and by the project.

The net economic benefits during the project are then discounted using EOCK of 12 percent. The economic NPV is FRw 39.70 million and the economic IRR is 22.51%. This demonstrates that the project would improve the well-being of the inhabitants specifically the farmers.

Table 14: Summary of Economic Conversion Factors

Item	DSCF	Comments
Construction	0.885	Non-tradable item, adjusted for FEP and tax distortions
Land	1.000	Land conversion factor is one
Day-old chicken	1.004	Tradable item, adjusted for FEP and tax distortions
Feeding cost	1.004	Tradable item, adjusted for FEP and tax distortions
Equipment	1.004	Tradable item, adjusted for FEP and tax distortions
Heater and thermometer	1.004	Tradable item, adjusted for FEP and tax distortions
Skilled labors	0.927	Skilled labour, adjusted for tax distortions
Unskilled labors	0.991	Unskilled labour, adjusted for tax distortions
Vaccine and drugs	1.004	Tradable item, adjusted for FEP and tax distortions
Veterinary Services	1.037	Tradable item, adjusted for FEP and tax distortions
Electricity	0.874	Non-tradable item, adjusted for FEP and tax distortions
Water	1.000	Water conversion factor is one
Communication	0.863	Non-tradable item, adjusted for FEP and tax distortions
Transportation	0.873	Non-tradable item, adjusted for FEP and tax distortions
Slaughtering and packaging	0.892	Tradable item, adjusted for FEP and tax distortions
Other operating	1.004	Tradable item, adjusted for FEP and tax distortions
Chickens	1.004	Tradable item, adjusted for FEP and tax distortions
Manure	1.054	Tradable item, adjusted for FEP
Accounts receivable	1.004	Weighted average for the sales
Accounts payable	0.981	Weighted average for the expenses
Tax	0.000	Tax conversion factor is just zero

Most of the conversion factors shown above have been calculated using the

Commodity-Specific Conversion Factor Database for the Republic of Rwanda.

(MINECOFIN, 2014).

Table 15: Economic Cash Flow (Real)

Construction vs Operating			Construction	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Residual
Financial year ending			2016	2017	2018	2019	2020	2025	2030	2034	2035	2036	2037
Model column counter	CF	Total	-	1	2	3	4	9	14	18	19	20	21
Receipts													
Domestic Sales	1.0029	672.00	-	33.70	33.70	33.70	33.70	33.70	33.70	33.70	33.70	33.70	-
D.R. Congo	1.0029	-	-	-	-	-	-	-	-	-	-	-	-
Manure revenues	1.0537	6.48	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	-
Change in Accounts receivable	1.0040	-	-	(3.41)	-	-	-	-	-	-	-	-	3.41
Residual value of land	1.0000	-	-	-	-	-	-	-	-	-	-	-	2.00
Total inflows	-	675.09	-	30.63	34.04	34.04	34.04	34.04	34.04	34.04	34.04	34.04	5.41
Expenditures													
Construction cost	0.8845	4.59	4.59	-	-	-	-	-	-	-	-	-	-
Land cost	1.0000	2.00	2.00	-	-	-	-	-	-	-	-	-	-
Day-old chickens	1.0035	202.69	-	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	-
Feeding	1.0035	198.44	-	9.92	9.92	9.92	9.92	9.92	9.92	9.92	9.92	9.92	-
Equipment	1.0035	2.83	-	0.71	-	-	-	-	-	-	-	-	-
Heater	1.0035	0.30	-	0.03	-	0.03	-	0.03	-	-	0.03	-	-
Skilled labours	0.9272	22.25	-	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	-
Unskilled labours	0.9905	19.02	-	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	-
Vaccine, drugs and vitamins	1.0035	9.73	-	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	-
Veterinary expense	1.0370	24.89	-	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	-
Electricity	0.8736	3.14	-	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	-
Water	1.0000	7.20	-	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	-
Communication	0.8627	2.07	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-
Transportation	0.8728	53.42	-	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	-
Slaughtering and packaging	0.8924	10.71	-	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	-
Other operating cost	1.0035	6.74	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	-
Change in account payable	0.9835	-	-	(2.88)	0.07	(0.00)	0.00	(0.00)	0.00	0.00	(0.00)	0.00	2.80
Tax expense	-	-	-	-	-	-	-	-	-	-	-	-	-
Tax paid for land	-	-	-	-	-	-	-	-	-	-	-	-	-
Total outflows	-	567.22	6.59	25.88	28.09	28.04	28.02	28.04	28.02	28.02	28.04	28.02	2.80
Net Cash Flow	-	96.15	(6.59)	4.76	5.95	6.00	6.02	6.00	6.02	6.02	6.00	6.02	2.60

ENPV	-	Million FRw	36.70
EMIRR		%	22.51%

6.3 Second Scenario (Export)

The annual net economic benefit over the project duration are discounted using the EOCK of 12 percent is used to calculate the NPV and IRR based on the second scenario. We obtained economic NPV of FRw 90.06 million and MIRR of 27.28%. This demonstrates that even after this export scenario the project is going to improve the well-being of the country specifically the farmers.

Table 16: Economic Cash Flow (Real) – Exporting Case

Construction vs Operating			Construction	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Operating	Residual
Financial year ending			2016	2017	2018	2019	2020	2025	2030	2034	2035	2036	2037
Model column counter	CF	Total	-	1	2	3	4	9	14	18	19	20	21
Receipts													
Domestic Sales	1.0029	537.60	-	26.96	26.96	26.96	26.96	26.96	26.96	26.96	26.96	26.96	-
D.R. Congo	1.0029	278.40	-	13.96	13.96	13.96	13.96	13.96	13.96	13.96	13.96	13.96	-
Manure revenues	1.0537	6.48	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	-
Change in Accounts receivable	1.0039	-	-	(4.13)	-	-	-	-	-	-	-	-	4.13
Residual value of land	1.0000	-	-	-	-	-	-	-	-	-	-	-	2.00
Total inflows		818.37	-	37.13	41.26	41.26	41.26	41.26	41.26	41.26	41.26	41.26	6.13
Expenditures													
Construction cost	0.8845	4.59	4.59	-	-	-	-	-	-	-	-	-	-
Land cost	1.0000	2.00	2.00	-	-	-	-	-	-	-	-	-	-
Day-old chickens	1.0035	91.21	-	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	10.13	-
Feeding	1.0035	89.30	-	9.92	9.92	9.92	9.92	9.92	9.92	9.92	9.92	9.92	-
Equipment	1.0035	0.71	-	0.71	-	-	-	-	-	-	-	-	-
Heater	1.0035	0.12	-	0.03	-	0.03	-	0.03	-	-	0.03	-	-
Skilled labours	0.9272	10.01	-	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	-
Unskilled labours	0.9905	8.56	-	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	-
Vaccine, drugs and vitamins	1.0035	4.38	-	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	-
Veterinary expense	1.0370	11.20	-	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	-
Electricity	0.8736	1.42	-	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	-
Water	1.0000	3.24	-	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	-
Communication	0.8627	0.93	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-
Transportation	0.8728	24.04	-	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	-
Slaughtering and packaging	0.8924	4.82	-	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	-
Other operating cost	1.0035	3.03	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	-
Change in account payable	0.9835	-	-	(2.88)	0.07	(0.00)	0.00	(0.00)	0.00	0.00	(0.00)	0.00	2.80
Tax expense	-	-	-	-	-	-	-	-	-	-	-	-	-
Tax paid for land	-	-	-	-	-	-	-	-	-	-	-	-	-
Total outflows		256.75	6.59	25.88	28.09	28.04	28.02	28.04	28.02	28.02	28.04	28.02	2.80
Net Cash Flow		208.87	(6.59)	11.25	13.17	13.22	13.24	13.22	13.24	13.24	13.22	13.24	3.32

ENPV	Million FRw	90.06
EMIRR	%	27.28%

Chapter 7

STAKEHOLDER ANALYSIS

The stakeholder analysis evaluates the consequences of the project on the disparate interest groups sophisticated and the intensity of the consequences; to be able to quantify those gains or losses.

The analysis is encountered by examining if the financial NPV and externalities PV are equal to the economic NPV, using the economic opportunity cost as a discount rate. Table 17 shows the financial, economic and externalities' PVs of the project, discounted by 12%. The results from the economic NPV are the same as the shown in Table 15; as well as the financial NPV.

The reconciliation of the financial, economic and externality flows show that the economic benefits created are shared mostly among the government and farmers. Table 17 shows that the financial gain by farmers before financing at a discount rate of 12 percent real is 31.43 million. In the meanwhile, the project has an influence of a net benefit of FRw 36.70 million. The NPV of externalities is FRw 5.27 million. The reconciles of this integrated approach is that the externalities of stakeholder gains and losses. And in this project, the government of Rwanda got all externalities.

Table 17: Reconciliation of Financial, Economic and Stakeholders' Statement

	Unit	Financial	Externality	Economic	Fin. + Ext.	[Check]
Inflows						
Domestic Sales	Million FRw	250.97	0.73	251.70	251.70	**OK**
D.R. Congo	Million FRw	-	-	-	-	**OK**
Manure revenues	Million FRw	2.42	0.13	2.55	2.55	**OK**
Change in A/R	Million FRw	(3.03)	(0.01)	(3.04)	(3.04)	**OK**
Residual value of land	Million FRw	-	-	-	-	**OK**
Total inflows	**Million FRw**	**250.36**	**0.85**	**251.21**	**251.21**	**OK**
Outflow						
Construction cost	Million FRw	5.19	(0.60)	4.59	4.59	OK
Land cost	Million FRw	2.00	-	2.00	2.00	OK
Day-old chickens	Million FRw	75.43	0.26	75.70	75.70	OK
Feeding	Million FRw	73.85	0.26	74.11	74.11	OK
Equipment	Million FRw	1.31	0.00	1.31	1.31	OK
Heater	Million FRw	0.12	0.00	0.12	0.12	OK
Skilled labours	Million FRw	8.96	(0.65)	8.31	8.31	OK
Unskilled labours	Million FRw	7.17	(0.07)	7.10	7.10	OK
Vaccine, drugs and vitamins	Million FRw	3.62	0.01	3.63	3.63	OK
Veterinary expense	Million FRw	8.96	0.33	9.29	9.29	OK
Electricity	Million FRw	1.34	(0.17)	1.17	1.17	OK
Water	Million FRw	2.69	-	2.69	2.69	OK
Communication	Million FRw	0.90	(0.12)	0.77	0.77	OK
Transportation	Million FRw	22.86	(2.91)	19.95	19.95	OK
Slaughtering	Million FRw	4.48	(0.48)	4.00	4.00	OK
Other operating cost	Million FRw	2.51	0.01	2.52	2.52	OK
Change in A/P	Million FRw	(2.56)	0.04	(2.52)	(2.52)	OK
Tax expense	Million FRw	0.15	(0.15)	-	-	OK
Tax paid for land	Million FRw	0.19	(0.19)	-	-	OK
Total outflows	**Million FRw**	**219.17**	**(4.42)**	**214.75**	**214.75**	OK
Net resource flows	**Million FRw**	**31.20**	**5.26**	**36.46**	**36.46**	**OK**

Second Scenario (Export)

The reconciliation of the financial, economic and externality flows in the export scenario specify that the financial gain by farmers before financing at 12 percent real as a discount rate is 75.93 million. In the meanwhile, the impact on the economy of the project is FRw 89.75 million. The NPV of project externalities is FRw 12.82 million. The reconciles of the integrated approach is that externalities of stakeholder gains and losses. In this project, all externalities are due to the government of Rwanda.

Table 18: Reconciliation of Financial, Economic and Stakeholder's Statements (Nominal)

	Unit	Financial	Externality	Economic	Fin. + Ext.	[Check]
Inflows						
Domestic Sales	Million FRw	200.78	0.58	201.36	201.36	OK
D.R. Congo revenues	Million FRw	103.98	0.30	104.28	104.28	OK
Manure revenues	Million FRw	2.42	0.13	2.55	2.55	OK
Change in A/R	Million FRw	(3.67)	(0.01)	(3.69)	(3.69)	OK
Residual value of land	Million FRw	-	-	-	-	OK
Total inflows	**Million FRw**	**303.50**	**1.00**	**304.50**	**304.50**	OK
Outflow						
Construction cost	Million FRw	5.19	(0.60)	4.59	4.59	OK
Land cost	Million FRw	2.00	-	2.00	2.00	OK
Day-old chickens	Million FRw	75.43	0.26	75.70	75.70	OK
Feeding	Million FRw	73.85	0.26	74.11	74.11	OK
Equipment	Million FRw	1.31	0.00	1.31	1.31	OK
Heater	Million FRw	0.12	0.00	0.12	0.12	OK
Skilled labours	Million FRw	8.96	(0.65)	8.31	8.31	OK
Unskilled labours	Million FRw	7.17	(0.07)	7.10	7.10	OK
Vaccine and drugs	Million FRw	3.62	0.01	3.63	3.63	OK
Veterinary expense	Million FRw	8.96	0.33	9.29	9.29	OK
Electricity	Million FRw	1.34	(0.17)	1.17	1.17	OK
Water	Million FRw	2.69	-	2.69	2.69	OK
Communication	Million FRw	0.90	(0.12)	0.77	0.77	OK
Transportation	Million FRw	22.86	(2.91)	19.95	19.95	OK
Slaughtering	Million FRw	4.48	(0.48)	4.00	4.00	OK
Other operating cost	Million FRw	2.51	0.01	2.52	2.52	OK
Change in A/P	Million FRw	(2.56)	0.04	(2.52)	(2.52)	OK
Tax expense	Million FRw	8.56	(8.56)	-	-	OK
Tax paid for land	Million FRw	0.19	(0.19)	-	-	OK
Total outflows	**Million FRw**	**227.58**	**(12.82)**	**214.75**	**214.75**	OK
Net resource flows	**Million FRw**	**75.93**	**13.82**	**89.75**	**89.75**	**OK**

Chapter 8

RISK ANALYSIS

8.1 Scope of Risk Analysis

The way of financial and economic analysis obtained so far is by assuming that the project variable can be given definite numbers, having definite estimations for the project NPV's. This method fails to account for the real-life uncertainties affecting key parameters used in project assessment. Hence, there is a need to test such variables whose changes would significantly impact the outcome of projects. They form the basis of riskiness for such project.

It is through a sensitivity analysis that we evaluate the riskiness of a project by detecting those variables that are most influential to a project's outcome and assess the actual extent of their influence. It is done by testing the effect of variations of a variable of a project's NPV and IRR.

For this study, the variable being tested are number of birds in the cycle, day-old chicken cost, price of mixed feeds, selling prices, real exchange rate and export percentage.

8.2 Base Case Sensitivity Analysis

8.2.1 Birds in the cycle

The initial production capacity in each cycle is 526 day-old chicken. Financial NPV improves from FRw 31.20 million to FRw 38.75 and the economic NPV improved from FRw 36.7 million to FRw 44.66 by increasing the number of chicken in the cycle by 10%. However, a 20% decrease in production capacity causes FNPV decline to FRw 15.29

million and the ENPV to FRw 20.56 million. The ADSCR drop to 1.86 times which still bankable. This positive relationship exists because the rise in NPV more than offset the increase in variable cost caused by the increase in production capacity and vice versa. This is because variable cost is a function of the process and changes with respect to changes in the production while fixed cost is independent of production capacity utilization.

Table 19: Sensitivity Test on Number of Birds in the Cycle

Number of birds in the cycle	Finacial NPV	Econ. NPV	1	2	ADCR 3	4	5
325	(0.58)	4.60	0.23	0.90	1.11	1.37	1.65
375	7.51	12.74	0.97	1.86	2.26	2.75	3.35
425	15.29	20.56	1.69	2.79	3.36	4.09	4.99
476	23.47	28.79	2.43	3.77	4.53	5.49	6.72
526	31.20	36.70	3.15	4.71	5.64	6.83	8.37
575	38.75	44.66	3.88	5.66	6.77	8.19	10.04

8.2.2 Day-old Chicken

The price of day-old chicken in the base case analysis is US$ 1.003. An increase in the price day-old chicken by 20% results in FNPV to fall from FRw 31.20 to FRw 16,44 million and the ENPV fall from FRw 36.70 million to FRw 51.68 million while the same 20% decrease cause FNPV raising to FRw 45.22 million and the ENPV to 21.72 million. The sensitivity results shown in the table below indicates that a negative relationship exist between the price of day-old chicken and the project outcomes. Therefore, increases in the price leads to a decrease in annual net cash flows generated from project operations and vice versa.

Table 20: Sensitivity Test on Price of Day-Old Chicken

Price of DOC		Financial NPV	Econ. NPV	1	2	ADCR 3	4	5
-30%	0.702	51.79	59.16	5.20	7.38	8.82	10.66	13.08
-20%	0.802	45.22	51.68	4.52	6.49	7.76	9.39	11.51
-10%	0.902	38.31	44.19	3.84	5.60	6.70	8.11	9.94
-	1.003	31.20	36.70	3.15	4.71	5.64	6.83	8.37
10%	1.103	23.88	29.21	2.47	3.82	4.58	5.56	6.80
20%	1.203	16.44	21.72	1.79	2.93	3.53	4.28	5.23
30%	1.303	8.99	14.23	1.11	2.04	2.47	3.01	3.66

8.2.3 Feeds

The price of the major input, feeds was tested through sensitivity to assess its effect on the project outcome. The results obtained revealed that, an inverse relationship exists between the price of feeds and the FNPV and ENPV. An increase in real price of feeds per Kg by 10% and 20% causes the FNPV to fall by 23% to FRw 24 million and 46.3% to FRw 16.75 million respectively. And the ENPV fall to FRw 29.37 million and FRw 14.70 million respectively

Conversely, a 30% decrease in the real price of feeds results in FNPV increasing by 65% to FRw 51.39 million and the ENPV to FRw 58.69 million. Since it is the major input to the production of chicken and constitutes a larger proportion of total cost of production, changes in its price causes an impact on FNPV and ENPV. The average ADSCR also has a negative affect with price of feeds. It increases to 5.16 times with a 30% decrease in price feeds and falls to 1.15 times with 30% increase. The sensitivity results are displayed in a schedule below:

Table 21: Sensitivity Test on Price of Mix Feeds

Price per Kg of mix feed		Financial NPV	Econ. NPV	1	2	ADCR 3	4	5
-30%	0.245	51.39	58.69	5.16	7.33	8.75	10.58	12.99
-20%	0.280	44.94	51.36	4.49	6.46	7.71	9.33	11.45
-10%	0.315	38.16	44.03	3.82	5.58	6.68	8.08	9.91
-	0.350	31.20	36.70	3.15	4.71	5.64	6.83	8.37
10%	0.385	24.03	29.37	2.49	3.84	4.61	5.58	6.84
20%	0.420	16.75	22.03	1.82	2.97	3.57	4.34	5.30
30%	0.455	9.45	14.70	1.15	2.10	2.53	3.09	3.76

8.2.4 Price of chicken

The price of chicken in the base case analysis is FRw 2,800. An increase in the price of chicken a lead by 20% results in FNPV rising by 72.8% from FRW 31.2 to FRw 73.33 million and the ENPV from 36.60 million to FRw 86.50 million while the same 20% decrease cause FNPV to fall to FRw -18.52 million and the ENPV to -13.10 million. The sensitivity results shown in the table below indicates that a positive relationship exist between the price of chicken and the project outcomes. Therefore, increases in the price of chicken leads to an increase in annual net cash flows generated from project operations and vice versa.

Table 22: Sensitivity Test on Domestic Selling Price

Domestic selling price		Financial NPV	Econ. NPV	1	2	ADCR 3	4	5
-30%	1,960	(43.05)	(38.00)	(3.65)	(4.18)	(4.92)	(5.90)	(7.30)
-20%	2,240	(18.25)	(13.10)	(1.38)	(1.22)	(1.40)	(1.66)	(2.08)
-10%	2,520	6.55	11.80	0.89	1.75	2.12	2.59	3.15
-	2,800	31.20	36.70	3.15	4.71	5.64	6.83	8.37
10%	3,080	53.90	61.60	5.42	7.68	9.16	11.08	13.60
20%	3,360	73.33	86.50	7.69	10.37	12.16	14.43	17.44
30%	3,640	90.76	111.40	9.34	12.44	14.62	17.39	21.09

8.2.5 Real Exchange Rate

The real exchange rate is allowed to vary around a range of variable that is selected based on historical data on the real exchange rate in Rwanda. The highest exchange rate recorded so far is FRw 820/US$ in December 2016. The base case real exchange rate used is FRw 798/US$. The table below illustrates the variability of the project outcome as a result of fluctuations in real exchange rate.

Table 23: Sensitivity Test on Real Exchange Rate

Exchange Rate		Financial NPV	Econ. NPV	1	2	ADCR 3	4	5
-5%	758.10	38.23	44.11	3.83	5.59	6.69	8.10	9.93
-	798.00	31.20	36.70	3.15	4.71	5.64	6.83	8.37
5%	837.90	23.95	29.29	2.48	3.83	4.60	5.57	6.82
10%	877.80	16.60	21.88	1.81	2.95	3.55	4.31	5.27
15%	917.70	9.22	14.47	1.13	2.07	2.50	3.05	3.71
20%	959.60	1.48	6.69	0.42	1.14	1.40	1.72	2.08

According to the results obtained, fluctuations in real exchange rate have a significant impact on the project outcome. When real exchange rate increases by 5% and 10%, FNPV falls by 23% and 46.8% respectively. Also, a 20% increase in real exchange rate causes the FNPV decrease to FRw 1.48 million and the ENPV fall to 6.69 million. This relationship exists because all of the day-old chicken are imported from outside and most of the feeds is imported from Uganda.

ADSCR falls from 3.15 times to 1.13 times when the real exchange rate increase by 15%. And that will make the bridge financing necessary in that case.

8.3 Exporting scenario

8.3.1 Domestic Selling Price

After being a big source of risk, with only 20% of export of the broiler production to D.R. Congo, when domestic selling price fall by 30% the FNPV will decrease from FRw 76.23 million to FRw 25.17 million. And the ENPV falls from FRw 90.06 million to FRw 30.30 million.

Table 24: Sensitivity Test on Domestic Selling Price – Exporting Case

Domestic selling price		Financial NPV	Econ. NPV	1	2	ADCR 3	4	5
-30%	1,960	25.17	30.30	2.57	3.95	4.74	5.74	7.03
-20%	2,240	44.16	50.22	4.39	6.32	7.55	9.14	11.21
-10%	2,520	61.26	70.14	6.20	8.69	10.37	12.48	15.04
-	2,800	76.23	90.06	8.01	10.67	12.51	14.85	17.96
10%	3,080	90.10	109.98	9.25	12.33	14.48	17.22	20.88
20%	3,360	103.94	129.90	10.46	13.98	16.44	19.59	23.80
30%	3,640	117.78	149.82	11.67	15.64	18.41	21.97	26.72

8.3.2 D.R.Congo Selling price

The selling price of chicken in D.R. Congo in the base case analysis is US$ 7.27. An increase in the price results in FNPV rising from FRw 1,483 to Rwf 2,420 mil while the same 20% decrease cause FNPV to fall to Rwf 546 mil. The sensitivity results shown in the table below indicates that a positive relationship exist between the price of cassava starch and the project outcomes. Therefore, increases in the price of starch leads to an increase in annual net cash flows generated from project operations and vice versa.

Table 25: Sensitivity Test on D.R. Congo Selling Price – Exporting Case

D.R. Congo selling price		Financial NPV	Econ. NPV	1	2	ADCR 3	4	5
-30%	5.088	52.02	59.11	5.20	7.38	8.81	10.65	13.08
-20%	5.814	60.70	69.42	6.13	8.61	10.27	12.39	14.94
-10%	6.541	68.69	79.74	7.07	9.81	11.49	13.62	16.45
-	7.268	76.23	90.05	8.01	10.67	12.51	14.85	17.96
10%	7.995	83.42	100.37	8.67	11.53	13.53	16.08	19.48
20%	8.722	90.59	110.68	9.29	12.38	14.55	17.31	20.99
30%	9.448	97.76	121.00	9.92	13.24	15.56	18.53	22.50

8.3.3 Export Percentage

Exporting is not always 20% with FRw 76.23 million for FNPV and FRw 90.06 million, some farmers can export up to 50% with FNPV FRw 131.87 million and some other farmers may not be able to export at all and the FNPV is going to still FRw 31.43 million.

Table 26: Sensitivity Test on Export Percentage – Exporting Case

Export percentage	Financial NPV	Econ. NPV	1	2	ADCR 3	4	5
0%	31.43	36.70	3.15	4.71	5.64	6.83	8.37
5%	44.00	50.04	4.37	6.30	7.53	9.11	11.17
10%	55.69	63.38	5.58	7.89	9.41	11.38	13.97
15%	66.40	76.72	6.80	9.48	11.19	13.26	16.01
20%	76.23	90.06	8.01	10.67	12.51	14.85	17.96
25%	85.53	103.40	8.85	11.78	13.83	16.44	19.92
30%	94.80	116.74	9.66	12.89	15.14	18.03	21.87
45%	122.60	156.75	12.09	16.21	19.09	22.79	27.74
50%	131.87	170.09	12.90	17.32	20.41	24.38	29.69

8.3.4 Real Exchange Rate

The real exchange rate is not risky variable anymore because we are importing some inputs and exporting some of the production, which make the FNPV and ENPV FRw

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69.58 million and FRw 80.93 million respectively even with 20% increase in real exchange rate.

Table 27: Sensitivity Test on Real Exchange Rate – Exporting Case

Exchange Rate		Financial NPV	Econ. NPV	1	2	ADCR 3	4	5
-5%	758.10	77.82	92.31	8.18	10.86	12.73	15.12	18.29
-	798.00	76.23	90.06	8.01	10.67	12.51	14.85	17.96
5%	837.90	74.59	87.80	7.81	10.48	12.29	14.58	17.63
10%	877.80	72.94	85.55	7.60	10.30	12.06	14.31	17.31
15%	917.70	71.30	83.30	7.40	10.11	11.84	14.05	16.98
20%	959.60	69.58	80.93	7.19	9.91	11.61	13.77	16.63

Chapter 9

CONCLUSION

The appraisal of the broiler project was performed using the integrated investment appraisal approach. It includes the valuation of the financial, economic, stakeholder and risk analysis in order to effectively and efficiently measures the long-term viability and continuity of the project.

The project acts like a base case to the study acknowledges interest in assessing and evaluating possible financial and economic potentials problem that an investor might have when deciding to undertake project financing for the purpose of producing chickens and maybe entering into the exports market.

The results of the analysis indicate that the broiler project is viable as it generates a FNPV of FRw 31.40 million (US$ 43,845) and MIRR of 9% greater than the opportunity cost of capital. Meanwhile, the minimum ADSCR is equal to 3.15. This shows that the boiler project is bankable and there is even no need for LLCR ratios of bridge financing. Additionally, the LLCR shows a minimum of 5.16 times.

This kind of projects is very important to the government as it offer an opportunity for the success of its development objectives to improve the rural areas through the project value addition. Consequently, it is critical to evaluate the project from the economic perspective to ascertain whether the project will use its resources efficiently to improve

the well-being of Rwandans than if invested elsewhere in the economy. The project will be very valuable to the economy since the ENPV is FRw 36.70 million and the EIRR of 10.5% greater than the EOCK was used for the analysis.

The distributive analysis classifies the gainers and losers of the project. According to the distributive analysis, the externalities generated from the project accrue only to government since the externalities are caused by distortions such as taxes and FEP. The government earns FRw 5.27 million.

Some of the essential input variables were tested through sensitivity analysis to measure their influence on the project. Out of the variable tested, the number of chicken in the cycle, chickens' sales, feeds prices, DOC prices and the real exchange rate were identified to have significant result on the project. In order to reduce the risk associated with the broiler project, we should put in place some contractual arrangements to reduce the potential risk exposure of the project. Forwards, future Currency swap contracts are put in place to hedge any unexpected changes in real exchange rate. Also to mitigate the feeds or DOC price risk, supply contract should be made.

In addition to the feeds price risk mitigation, we can use some other alternatives for most of the components of the mix feeds for chicken, a major component in feeds is the maize which can be replaced by wheat, rice bran, cassava husks or sweet potato. And another major expensive component is the soybean which can be replaced by cottonseeds, sunflower meal or rubber seeds meal. And that will reduce the cost of feeds significantly.

To reduce the riskiness and the instability in the domestic sales, some farmers have the ability to export to D.R. Congo and they should take that opportunity because the selling prices there is too much higher and they will benefit from it if the domestic selling prices went a little lower to cover for loss if it happens, which is the second scenario in my model.

The assumption was if an investor could export 20 percent of his production to D.R.Congo, the broiler project generates a FNPV of FRw 76.20 million (US$ 99,983) and MIRR of 14 greater than the opportunity cost of capital. Meantime, the lowest ADSCR was 8.01.

The project will be highly beneficial to the economy if there was an export since the ENPV is FRw 90.06 million and the EIRR is 27.28% which is higher than the EOCK by 15%. The externalities generate from the project is FRw 13.83 million and it all goes to the government.

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