**NEW GRAIN DISCHARGE TERMINAL AT
SANTOS PORT, BRAZIL**


by


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**ABSTRACT**

The thesis assesses the viability of investing in a new grain discharge terminal at the port of Santos, located in the Brazilian southern region, used mostly for wheat but also for malt and malting barley operations. ABC Intl suffered losses of more than USD 1.0 million in 2006 due to demurrage costs at berth 39, used by ABC Intl to export and import grains, sugar and soybean. Congestion tends to increase with the growth of Brazilian soybean and sugar cane production and exports (average 5.0% per year) and 2.0% growth of wheat imports. Demurrage losses are expected to amount to USD 3.0 million by the year 2011 if no investments are made.

A brief summary of Brazilian wheat supply and demand for the last five years is presented. Brazil is a net importer between 6.0 and 8.0 million metric tons of wheat per year, to supply the 10.0 million metric ton internal demand. Brazilian wheat imports through the port of Santos average 1.6 million metric tons per year from 2000 to 2006. Sao Paulo is the most populated Brazilian city with more than 18.0 million inhabitants. Its wheat consumption amounts to a third of the total Brazilian consumption and represents around 3.0 million metric tons per year.

The thesis analyzes data related to berth 39 activities in the past seven years. A 56-day lineup in 2006 represented more than USD 1.0 million demurrage costs. The thesis forecasts the activity of berth 39 for next five years with and without investment at the new terminal. The new terminal will result in an average of USD 1.8 million savings on demurrage costs over five years. Codesp, Companhia Docas de Sao Paulo, the governmental authority in the port of Santos, is offering a unique opportunity for ABC Intl to invest in a new terminal for grain imports granting the land at no cost. The new terminal would be located at the middle of the port (berth 13/14) close to the railroad and the main

avenue in the port of Santos, allowing discharging, storing and loading grain to trucks and wagons. ABC Intl needs to invest USD 5.0 million in the new terminal. It comprises the dismantling and rebuilding of all the grain discharge equipment that will be moved from shed 39 to the new terminal, including two suckers and conveyor belts.

The thesis analyzes four different wheat import scenarios for the next five years. In addition, the same scenarios are analyzed for a 10-year period for comparison purposes. The weighted average of the Net Present Value of the four different investment scenarios, considering the probability of each occurring, is a positive USD 78,908 with 13.1% Internal Rate of Return, compared to 9.0 % ABC Intl opportunity cost of capital. It must be considered that the Net Present Value is a conservative figure since it does not take into account the savings on demurrage at berth 39, forecasted to be more than USD 3.0 million in the year 2011 if the company does not invest in the new terminal construction. It is recommended the ABC Intl invest in the new terminal to improve the overall logistics of the port and the quality of the service. This will avoid unnecessary demurrage costs and improving shareholders wealth by investing in a project with positive Net Present Value.

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**CHAPTER 1: INTRODUCTION**

This thesis investigates the viability of investing in a new grain discharge terminal at the Santos' port, located in the Brazilian southern region, mainly for wheat but also for the malt and malting barley discharge operation. ABC Intl lost more than USD 1.0 million in demurrage costs at berth 39 located at Santos in 2006 because of the congestion at that berth, used by ABC Intl to export and import grains, sugar and soybean. The congestion at berth 39 has increased over time with the growth of Brazilian soybean and sugar cane production and exports, meaning that without any new investments demurrage losses could increase to more than USD 3.0 million in the year 2011.

**1.1 Objectives**

The purpose of this thesis is to analyze the Brazilian wheat supply and demand situation, the Santos port situation, soybean and sugar exports through berth 39, wheat imports through the Santos port, specifically through berth 39, and to analyze the viability of investing in a new terminal, with the objective to use the entire capacity of berth 39 for exports alone and the new terminal to be built for grain imports (basically wheat).

The thesis considers the volume of wheat imported by ABC Intl in the Santos port since 2000. This supplies the wheat milling market for Sao Paulo state, which consumes more than 3.0 million tons of wheat per year or about a third of Brazilian wheat consumption.

**1.2 Brazilian Wheat – Supply and Demand**

Brazil is among the five largest countries in the world with an area of 8.5 million square kilometers (IBGE – Brazilian Statistics and Geographic Institute 2010). Located in the center of the South American continent, it is one of the largest agricultural producers in

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the world, with 45 million hectares (HA) of all kinds of agricultural crops (CONAB – Brazilian National Supply Company 2010).

Brazil's major crops are soybean with 60.0 million metric tons grown on 20.0 million hectares, sugar cane with 25.0 million metric tons sugar production grown on 6.0 million hectares and corn with 50.0 million metric tons grown on 13.0 million hectares.

Brazil's weather conditions do not allow for wheat areas much larger than 1.80 million hectares (last 10 years' average). Wheat requires cold and dry weather and usually suffers from rain from the middle until the final stages of the growth period.

Brazil is located in the tropical area of the South American continent with just a few states in Brazil's southern region (basically Parana and Rio Grande do Sul) properly suited for wheat production. Nevertheless, sometimes frost and rain destroys or decreases wheat production with significant losses for farmers and agriculture cooperatives.

Average wheat consumption in Brazil is 10.0 million metric tons per year, and its population amounts to 185 million people (IBGE – Brazilian Statistics and Geographic Institute 2010) (ABITRIGO – Brazilian wheat milling association 2010).

With an average of 1.8 million hectares of wheat planted with average yield of 2,000 kg/HA, Brazil produces between 3.5 to 4.0 million metric tons of wheat per year. Brazil has been importing between 6.0 and 8.0 million tons of wheat per year (USDA – United States Department of Agriculture 2010), which makes of it one of the largest wheat importing countries in the world (Table 1.1).

**Table 1.1 Brazilian wheat supply and demand (in 1,000 tons) – 1999 to 2006**

| Crop commercial year | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|
| Carry in (Aug. 1st) | 826 | 959 | 268 | 374 | 398 | 166 | 439 | 520 |
| Production | 2,310 | 1,642 | 3,062 | 2,934 | 5,518 | 5,934 | 4,711 | 2,205 |
| Imports | 7,703 | 7,618 | 7,024 | 7,220 | 5,600 | 4,400 | 6,300 | 7,800 |
| *Grains* | *7,455* | *7,397* | *6,806* | *7,000* | *5,300* | *4,000* | *5,800* | *7,300* |
| *Flour (Eq Wheat)* | *248* | *220* | *218* | *220* | *300* | *400* | *500* | *500* |
| **Total offer** | **10,839** | **10,218** | **10,354** | **10,528** | **11,516** | **10,500** | **11,450** | **10,525** |
| Milling wheat | 9,400 | 9,450 | 9,600 | 9,700 | 9,600 | 9,600 | 9,700 | 9,700 |
| Feed wheat | 250 | 250 | 90 | 100 | 100 | 100 | 100 | 300 |
| Seed / Residues | 230 | 250 | 290 | 330 | 350 | 350 | 350 | 350 |
| Exports | - | - | - | - | 1.300 | 11 | 780 | - |
| **Total demand** | **9,880** | **9,950** | **9,980** | **10,130** | **11,350** | **10,061** | **10,930** | **10,350** |
| Carry out (July 31st) | 959 | 268 | 374 | 398 | 166 | 439 | 520 | 175 |

Table 1.2 shows the Brazilian wheat production by total planted area from 2002

through 2010. For 2006 through 2010, there has been an increase in area harvested.

**Table 1.2 Brazilian wheat production – 2002 to 2010**

| Year | Total Area (000 HA) | Total Production (Million Tons) | Average Yield (KG/HA) |
|---|---|---|---|
| 2002 | 1,954 | 2,934 | 1,501.62 |
| 2003 | 2,454 | 5,518 | 2,248.59 |
| 2004 | 2,664 | 5,934 | 2,227.65 |
| 2005 | 2,366 | 4,711 | 1,990.98 |
| 2006 | 1,780 | 2,214 | 1,243.93 |
| 2007 | 1,817 | 3,633 | 2,000.00 |
| 2008 | 1,854 | 3,708 | 2,000.00 |
| 2009 | 1,892 | 3,784 | 2,000.00 |
| 2010 | 1,931 | 3,862 | 2,000.00 |

## 1.3 Sao Paulo state – Market share / Wheat milling industries

With 40 million people (22% of the total Brazilian population) and 249 million

Km$^2$ (3.0 % of the total Brazilian area) in the southwestern region of the country, São Paulo

is Brazil's most populated state. The city of Sao Paulo has more than 18 million

inhabitants, a figure that increases to 20.0 million people on working days, considering the transitory citizens that move from their homes to work in São Paulo.

Out of a total of 10 million metric tons of wheat consumption per year in Brazil, the state of São Paulo is responsible for 3.0 million metric tons, producing no more than 100,000 tons of wheat per year.

Thus, the state of São Paulo alone is a net importer of 2.9 million tons of wheat per year. Part of the supply comes from domestic *production* from Parana or Rio Grande do Sul and the rest is imported wheat from abroad.

The state of São Paulo has one of the largest ports in South America, the Santos port, located 100 km from Sao Paulo City (Figure 1.1). The port is connected to São Paulo by two very good highways and a reasonable railroad system.

**Figure 1.1 Brazilian ports map**



There are many wheat milling companies in Sao Paulo state. They are located in Santos City (3), São Paulo City (6), and São Paulo's Inland (2). The monthly capacity and location of the mills are:

Santos City (with direct connection to the port):

    Pacifico – 35,000 metric tons

    Bunge – 35,000 metric tons

    Paulista – 25,000 metric tons

São Paulo City:

> Anaconda – 25,000 metric tons

> Agua Branca – 25,000 metric tons

> Richard Saigh – 12,000 metric tons

> Ocrim – 12,000 metric tons

> Santo Andre – 10,000 metric tons

> Sao Jorge – 10,000metric tons

São Paulo's Inland:

> Sao Valentin – 15,000 metric tons

> Hortolandia / Guacu Mirim – 8,000 metric tons

The state of São Paulo has 212,000 metric tons monthly of wheat milling capacity or 2.5 million metric tons per year. This allows a production of 1.9 million metric tons of wheat flour per year, which amounts to 83.0 % of São Paulo's state total wheat flour demand per year. The rest of the flour demanded by São Paulo state comes from other states.

## 1.4 Santos port

With 13 km of length, the Santos port is the largest in South America and one of the largest ports in the world. The port consists of 64 berths in a natural basin, fully protected from any kind of climate constraints, such as rough sea and/or thunderstorms.

The history of operations at the port dates back from 1892, together with the sugar and coffee export logistics operation. In February 2, 1892, the vessel *Nasmith* took berth at the first 260 meter quay constructed at the Santos basin, and represented the beginning of what is called today Porto Organizado de Santos (Organized Port of Santos). Since the inauguration of the port and following the growth of the nearby cities and Sao Paulo city,

which is 80 km from the Santos port, the port never stopped growing in terms of new quays and port terminals, for all kinds of cargo, from passengers to any kind of bulk cargo, passing through cars and containers terminals.

In 2006, this port was responsible for moving more than 60 million metric tons of products from grains, oils, containers, industrialized products, fertilizer, petrochemicals, minerals plus the passenger terminal. The port of Santos has a total area of 7.8 million square kilometers, evenly divided between the two sides of the channel of the port.

## 1.5 Export and Import corridor – ABC Intl operation in Santos

Located at the very end of the port, the closest location to the open sea, is the export corridor complex, where ABC Intl operates 5.0 million metric-ton import/export throughput activities per year (Figure 1.2).

The port terminal complex was bought by ABC Intl in 1998. Before that, ABC Intl acted only as an agency business in Brazil, responsible for the export of soybean, soybean oil, soybean meal, citrus pulp pellets and corn as well as wheat and barley imports to Brazilian customers.

The export corridor complex is composed of three silos. The first (Shed 39) is the closest to the shore and is used for wheat imports. The other two (Sheds 41 and 43) are export terminals used for soybean, soybean meal, and sugar exports. Shed 39's (import terminal) static storage capacity is 40,000 tons. Sheds 41 and 43 static storage capacity is 110,000 tons combined. The port complex has two ship loaders, with an average of 8,000 tons per working day loading capacity and two suckers able to discharge 4,000 tons wheat per working day.

**Figure 1.2 Santos port map**



Source: (Panoramio 2010)

**Table 1.3 Berth utilization at shed 39 for year 2006**

| Product | Total (mt) | Load rate (mt/wkg day) | Berth use (days) |
|---|---|---|---|
| Soymeal (export) | 448,911 | 8,000 | 56 |
| Soybean (export) | 1,547.730 | 8,000 | 193 |
| Sugar (export) | 427,383 | 8,000 | 53 |
| Wheat (import) | 330,399 | 4,000 | 83 |
| Rains / Dredging | | | 20 |
| | | | |
| **Total** | 2,754,423 | | **406** |
| Working days / year | | | 350 |
| **Line uo year 2006 (days)** | | | **56** |

Avg demurrage daily rate:  USD $20,000.00/day
**Demurrage costs:  USD $1,112,055.01**

Table 1.3 also shows how the wheat discharge operation hampers the export operation. Discharging at half of the capacity (4,000 vs 8,000), the loading operation blocks twice the berth when a wheat vessel is under discharge, increasing the lineup and demurrages accordingly.

In 2006, ABC Intl demurrages costs amounted to more than USD 1.1 million at berth 39 exporting 2.4 million metric tons of products and importing 330,000 tons wheat. The demurrage cost refers to unexpected expenses due to discharging delay that causes the berth to be occupied by the vessel for more time than agreed previously, therefore preventing other vessels from using the berth.

Assuming a 5.0% growth on exports and 2.0% growth on imports, the demurrage amount will be expected to be more than USD 3.0 million by 2011, a direct loss that is desired to be avoided. The savings in demurrage costs that may come from building the new terminal are not considered when calculating the economic viability of the project, because ABC Intl believes that the project should be viable by itself, not considering savings it will cause at its other terminals.

ABC Intl discharges an average of 410,000 tons of imported wheat per year in Shed 39. 25% of the last 5 years' imports through the Santos port, which is 1.6 million metric tons in total.

Table 1.4 shows the wheat imports through Santos port by port terminal, the total wheat imports in Brazil and the total wheat Brazilian production. Wheat imports decline when domestic production increases and vice-versa.

**Table 1.4 Wheat imports per year by port terminal in Santos**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | Average 2000-2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **39 New terminal** | 537,182 | 546,206 | 492,948 | 444,450 | 257,149 | 262,660 | 330,399 | 337,007 | 343,747 | 350,622 | 357,635 | 364,787 | 410,142 |
| 12A / Bunge | 395,356 | 421,289 | 385,940 | 390,000 | 243,733 | 318,778 | 357,620 | 364,773 | 372,068 | 379,509 | 387,100 | 394,842 | 358,960 |
| 13/14 (direct truck) | 433,814 | 322,532 | 355,696 | 32,525 | 700 | 14,900 | 17,000 | 0 | 0 | 0 | 0 | 0 | 168,167 |
| 26 / Private | 131,792 | 22,419 | 15,750 | 582,794 | 385,672 | 334,879 | 375,683 | 383,197 | 390,861 | 398,678 | 406,651 | 414,784 | 264,141 |
| 29 / Pacifico | 572,123 | 513,864 | 554,752 | 393,196 | 273,768 | 351,504 | 358,911 | 366,089 | 373,411 | 380,879 | 388,496 | 396,266 | 431,160 |
| | | | | | | | | | | | | | |
| Santos imports | 2,070,269 | 1,826,311 | 1,805,087 | 1,842,965 | 1,161,022 | 1,282,721 | 1,439,613 | 1,468,405 | 1,497,773 | 1,527,729 | 1,558,283 | 1,589,449 | 1,632,570 |
| Brazil imports | 7,618,000 | 7,024,000 | 7,220,000 | 5,600,000 | 4,400,000 | 6,300,000 | 7,800,000 | 7,956,000 | 8,115,120 | 8,277,422 | 8,442,971 | 8,611,830 | 6,566,000 |
| Brazil production | 1,641,850 | 3,062,365 | 2,934,014 | 5,518,100 | 5,934,500 | 4,710,700 | 2,214,200 | 2,258,484 | 2,303,654 | 2,349,727 | 2,396,721 | 2,444,656 | 3,716,533 |
| | | | | | | | | | | | | | |
| Santos / Brazil | 27.2% | 26.0% | 25.0% | 32.9% | 26.4% | 20.4% | 18.5% | 18.5% | 18.5% | 18.5% | 18.5% | 18.5% | 24.86% |

Growth rate: 2.0% per year

Table 1.5 shows the total discharge structure in Santos by import terminals and the turnover per year per terminal.

**Table 1.5 Wheat discharge facilities at Santos Port**

| Shed structures in Santos | Storage capacity | Discharge rate/ day | Total use berth year 2006 – days | Turn over year 2006 |
|---|---|---|---|---|
| **39 New terminal** | 40,000 | 4,000 | 83 | 7 |
| 12A / Bunge | 35,000 | 5,000 | 72 | 9 |
| 13/14 (direct truck) | - | 2,000 | 9 | - |
| 26 / Private | 35,000 | 4,000 | 94 | 10 |
| 29 / Pacifico | 70,000 | 6,000 | 60 | 5 |

## 1.6 Summary

Brazil's wheat consumption amounts to 10.0 million MT per year, but weather conditions do not allow for wheat production in most areas of the country. This situation makes Brazil one of the biggest wheat importing countries in the world.

São Paulo state, Brazil's most populated state, is responsible for almost 3 million tons of wheat consumed per year. The wheat is discharged through Santos port, one of the largest ports in South America, which is located near São Paulo City, the capital of the state.

ABC Intl operates an export corridor complex located at the end of the port, which is composed of 3 silos. One of these, Shed 39, is used for wheat imports. Wheat imports hamper the export operation, because the wheat is discharged at half the capacity, which increases the lineup and demurrage. The lineup and demurrage are expected to grow over time.

To prevent further loss, ABC Intl is considering building a new terminal only for imports. The financial viability of this project will be analyzed in this thesis.

**CHAPTER 2: CONCEPTUAL INVESTMENT MODEL**

The financial viability of the project was analyzed using two financial concepts: the

Net Present Value (NPV) and the Internal Rate of Return (IRR). These concepts analyze

the project's financial return considering different outcomes and comparing profits with the

profit that the same amount of money would bring if invested in other projects. Excel was

used to make the calculations. Each of these tools is discussed in more details below.

**2.1 Net Present Value**

A basic principle of finance is that "a dollar today is worth more than a dollar

tomorrow" (Brealey 2006) because a dollar today can be invested to start earning interest.

To calculate the return of the investment to the shareholders of ABC Intl, net

present value (NPV) is the conceptual model used to calculate the many different scenarios

in terms of investment analysis.

Net present value is an investment model that calculates, based on a *discount factor*,

how much an investment today, with all costs and revenues that will exist over the life of

the investment, is represented in terms of a *dollar today,* considering that ABC Intl could

have made another investment with higher net present values.

The discount factor is the value today of $1 received in the future and is expressed

as the reciprocal of 1 plus a rate of return (*r*):

$$\text{Discount factor} = \frac{1}{(1+r)}$$

The NPV of an investment is calculated based on the return of the investment

during the life of the project, discounted to the Present Value (PV) minus the initial amount

to be invested in the project.

In a mathematical form, the NPV equals the PV of the investment minus the required investment, or:

$$NPV = C_0 + \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} \dots + \frac{C_T}{(1+r)^T}.$$

Considering that $C_0$ is the cash flow at time 0, basically the initial investment in the new terminal and $C_1$ to $C_T$ represents the cash flow to be produced during the maturity of the project discounted by the discount factor that the company needs to undertake for this investment.

When analyzing this investment, ABC Intl uses a 9.0% opportunity cost of capital (r) that must be used by all divisions when considering any investment analysis. The 9.0% is related to the cost of borrowing money to support the investment. ABC Intl does not get the same 9.0% when investing capital in a first class international bank or first class investment fund, but, considering the country risk of Brazil compared to investing in a first class international bank or US treasury bills (assuming basically no risk) the company takes into consideration the country risk to account for the risk of the project.

**2.2 Other investments financial analysis results – IRR**

For comparison purposes, the investment project can also be analyzed based on the Internal Rate of Return (IRR) which is the rate of discount that makes NPV equal to 0.

This means that to find the IRR for an investment project lasting T years, we must solve the following expression for the interest rate (IRR):

$$NPV = C_0 + \frac{C_1}{(1 + IRR)} + \frac{C_2}{(1 + IRR)^2} + \frac{C_3}{(1 + IRR)^3} + \dots + \frac{C_T}{(1 + IRR)^T} = 0$$

The IRR rule is to accept an investment project if the opportunity cost of capital is less than the IRR.

**2.3 Excel and Solver – Sensitive scenario analysis**

To understand the investment, the project was calculated under different scenarios, taking into consideration four financial scenarios – a base scenario that considers an initial investment of US$5.0 million and a discharge of 350,000 tons, a second scenario considering increased costs and volumes, a third scenario considering increased volume and the base cost and a fourth scenario considering the base volume and increased costs. The standard analysis was based on these four scenarios over a 5-year period. The same scenarios were also examined over a 10-year period for comparison.

An Excel spreadsheet and the solver tool were used to analyze the project. A suite of commands called what-if analysis tools were also used. With Solver, it is possible to find an optimal value (either the maximum or the minimum value) for a formula in one cell — called the target cell — on a worksheet. Solver works with a group of cells that are related, either directly or indirectly, to the formula in the target cell. Solver adjusts the values in the variable cells — called the adjustable cells — without breaking restrictions – called constraints, and analyzes the result of different combinations in the target cell. This way, it is possible to determine the values of the adjustable cells that solve the problem. Solver can find multiple optimal solutions, a unique solution or none. In this case, there was only one result.  All Excel spreadsheet results are shown in tables.

# CHAPTER 3: DATA COLLECTION AND SENSITIVITY ANALYSIS FOR A 5-YEAR PERIOD

ABC Intl's project is to build a new terminal for grain discharge. The analysis of the project was based on four different scenarios, so the directors of the company have a chance to evaluate the investment project based on multiple scenarios that may occur during the 5-year period that the company is using to evaluate the project. The company desires to analyze the investment over a 5-year period considering that future political or economic risk could affect the return on the investment after that period.

Each scenario differs in the total investment and the volume of discharge. The following assumptions were considered unchanged in all the scenarios:

a) No cost of land acquisition in the terminal.

The land is a concession of the port of Santos and belongs to Codesp - Companhia Docas de São Paulo (São Paulo Berth Company), a governmental company. The port is interested in having the new terminal built by a private company to improve the export corridor and berth 13's turnaround with the new terminal.

b) A fixed cost of USD 11.00 per metric ton.

These costs include all port administration fees and taxes plus the labor force and energy costs.

c) Two different prices for the wheat discharge operation:

USD 14.00/ton for customers willing to work on a take or pay basis. A minimum of 50,000 tons must be committed on such price differentiation. USD 16.00/ton for all other customers.

## 3.1 New terminal details

Since 2005, ABC Intl and Codesp (Santos port authority) have been negotiating the investment for the building of a new terminal for only wheat (and possibly malt and malting barley) imports.

The terminal is to be located in the middle of the port (berth 13/14) close to the railroad line and the main Santos port avenue, with possibility of discharging, storing and loading wheat to trucks and wagons (Figure 3.1).

**Figure 3.1 Santos port map**



Source: (Panoramio 2010)

The main idea of the construction of the new terminal is to dismantle all discharge equipment in Shed 39 and to move it to the new terminal. This way the 2 suckers with

conveyor belts plus all in and out discharge and load equipment will be moved to the new terminal. Later on, Shed 39 is to be used as an export elevator. An engineering company was hired to develop the project considering 40,000 metric ton silos with storage capacity divided into 12 concrete vertical silos of about 3,333 metric tons each.

The 12 vertical silos will grant ABC Intl the possibility of segregating different qualities of grain, meaning an improvement in trading possibilities. Since Shed 39 currently has a horizontal flat silo, the company is able to import only one type of grain, with no segregation option. The project drawing can be seen in Figure 3.2.

**Figure 3.2 New terminal draft project**
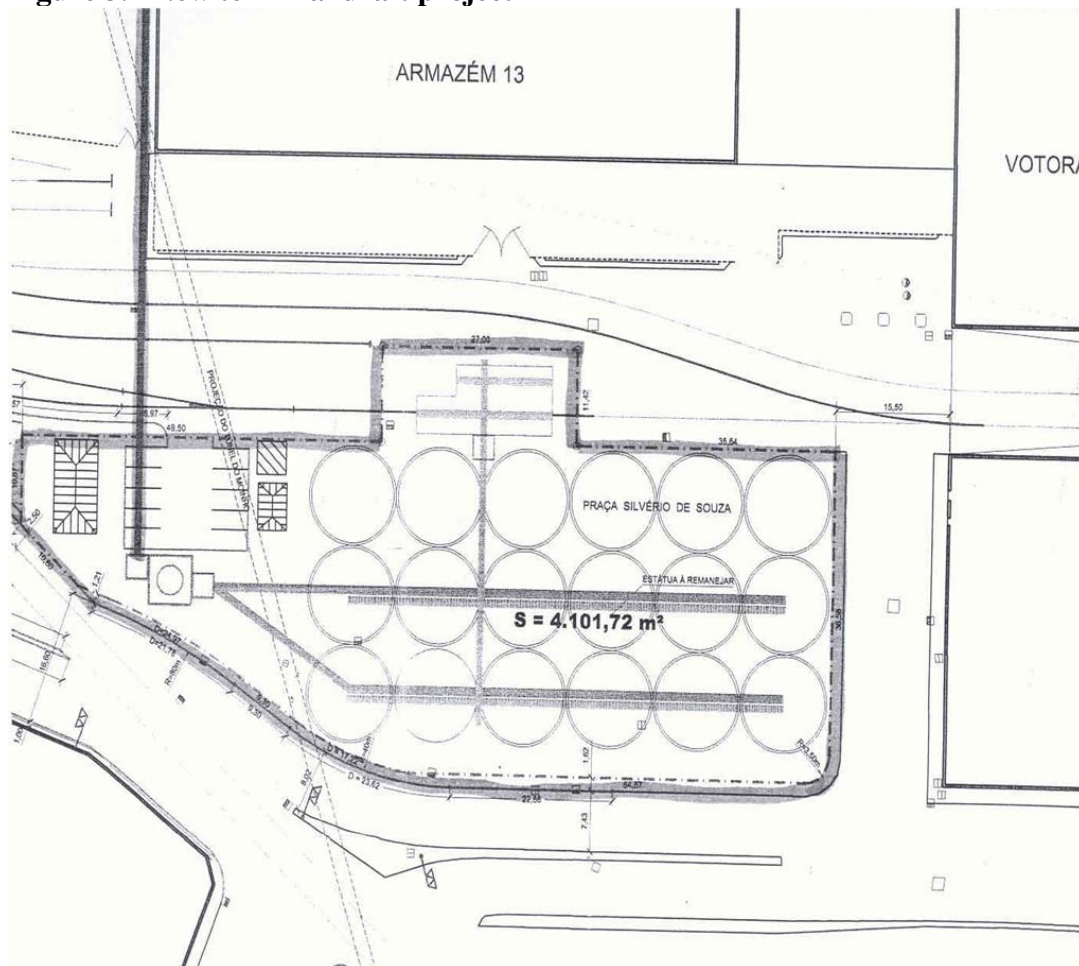
**3.2 Scenario 1 – Basic scenario for investment analysis (5 years)**

This scenario considers a minimum discharge of 350,000 tons per year during the next 5 years. Considering the average 410,000 tons discharged per year in the last 7 years (Table 1.4), ABC Intl is being conservative when considering 350,000 tons of total discharge per year. Because of the company's historical expertise in importing wheat through the Santos port and the confidence and relationships with the wheat milling industries, ABC Intl believes that the company will face no problem in achieving the minimum 350,000 tons imports operation per year.

In this scenario, the company considers that at least three out of the six wheat mills located in São Paulo would commit to a take or pay contract amounting to 150,000 tons discharged. Regular customers would be responsible for the remaining 200,000 tons. This scenario also considers a USD 5.0 million investment that is enough for all the civil and electrical work of the project as well as for the removal and rebuilding of parts and suckers from Shed 39 to the new terminal.

Table 3.1 shows the assumptions for this scenario and table 3.2 shows the income statements for the five year period.

**Table 3.1 Basic scenario financial calculations (5 years)**

| Total movement per year | MT | PCT |
|---|---:|---:|
| Take or pay costumers | 150,000 | 43% |
| Regular costumers | 200,000 | 57% |
| Total | 350,000 | |
| Take or pay costumers | $14.00 | |
| Regular costumers | $16.00 | |
| Average discharge sales price | $15.14 | |
| Total discharge costs | $11.00 | |
| Gross profit per MT | $4.14 | |
| Initial investment | $5,000,000.00 | |
| Depreciation | 20% straight line per year | |
| Tax rate | 25% | |
| Opp cost of capital | 9% | |

**Table 3.2 Basic scenario operational cash flow (5 years)**

| Years | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---:|---:|---:|---:|---:|---:|
| Total Sales | | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 |
| Total Costs | | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 |
| Depreciation | | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 |
| Profit | | 450,000 | 450,000 | 450,000 | 450,000 | 450,000 |
| Tax | | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 |
| After Tax Profit | | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 |
| | | | | | | |
| Operational Cash Flow | | 1,337,500 | 1,337,500 | 1,337,500 | 1,337,500 | 1,337,500 |
| Initial Investment | (5,000,000) | | | | | |
| NET Cash Flow | (5,000,000) | 1,337,500 | 1,337,500 | 1,337,500 | 1,337,500 | 1,337,500 |
| NPV results | $202,408.56 | | | | | |
| IRR | 10.55% | | | | | |

The NPV calculated for this scenario is positive and the IRR is higher than the cost of capital (9%), therefore, the investment in the new terminal would be profitable for this scenario.

**3.3 Scenario 2 – Increasing total costs and volume scenario (5 years)**

In this scenario, the company used Solver to calculate how many metric tons were necessary to be discharged per year to have a 10% Internal Rate of Return, while also increasing the total cost of the investment from USD 5.0 million to USD 6.0 million (20% increase). The increase in the volume discharged occurs from the regular customers, while the volume discharged on the take or pay contract remains unchanged. The amount of wheat necessary for financial viability increases from 350,000 metric tons to 402,076 metric tons, a 14.9% increase (Table 3.3).

**Table 3.3 Increasing costs and volume scenario financial calculations**

| Total movement per year | MT | PCT |
|---|---|---|
| Take or pay costumers | 150,000 | 37% |
| Regular costumers | 252,076 | 63% |
| Total | 402,076 | |
| Take or pay costumers | $14.00 | |
| Regular costumers | $16.00 | |
| Average discharge sales price | $15.25 | |
| Total discharge costs | $11.00 | |
| Gross profit per MT | $4.25 | |
| Initial investment | $6,000,000.00 | |
| Depreciation | 20% straight line per year | |
| Tax | 25% | |
| Opp cost of capital | 9% | |

**Table 3.4 Increasing costs and volume operational cash flow**

| Years | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Total Sales | | 6,133,223 | 6,133,223 | 6,133,223 | 6,133,223 | 6,133,223 |
| Total Costs | | 4,422,841 | 4,422,841 | 4,422,841 | 4,422,841 | 4,422,841 |
| Depreciation | | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 |
| Profit | | 510,382 | 510,382 | 510,382 | 510,382 | 510,382 |
| Tax | | 127,596 | 127,596 | 127,596 | 127,596 | 127,596 |
| After Tax Profit | | 382,787 | 382,787 | 382,787 | 382,787 | 382,787 |
| | | | | | | |
| Operational Cash Flow | | 1,582,787 | 1,582,787 | 1,582,787 | 1,582,787 | 1,582,787 |
| Initial Investment | (6,000.000) | | | | | |
| NET Cash Flow | (6,000.000) | 1,582,787 | 1,582,787 | 1,582,787 | 1,582,787 | 1,582,787 |
| NPV | $156,487.91 | | | | | |
| IRR | 10.00% | | | | | |

The NPV is positive and the IRR is higher than the cost of capital, so the investment would also be profitable in this scenario (Table 3.4).

## 3.4 Scenario 3 – Increasing volume but not increasing investment costs scenario (5 years)

In this scenario, the company considers an increase of 50,000 tons in the total volume discharged on a take or pay basis (Table 3.5). The initial investment is USD 5.0 million. This scenario considers the highest values for the volume, without changing the investment cost considered in the basic scenario. This scenario presents the highest NPV value and is, therefore, the most favorable.

**Table 3.5 Increasing volume, but not costs scenario financial calculations (5 years)**

| Total movement per year | MT | PCT |
|---|---|---|
| Take or pay costumers | 200,000 | 50% |
| Regular costumers | 200,000 | 50% |
| Total | 400,000 | |
| Take or pay costumers | $14.00 | |
| Regular costumers | $16.00 | |
| Average discharge sales price | $15.00 | |
| Total discharge costs | $11.00 | |
| Gross profit per MT | $4.00 | |
| Initial investment | $5,000,000.00 | |
| Depreciation | 20% straight line per year | |
| Tax | 25% | |
| Opp cost of capital | 9% | |

**Table 3.6 Increasing volume, but not costs scenario operational cash flow (5 years)**

| Years | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Total Sales | | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 |
| Total Costs | | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 |
| Depreciation | | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 |
| Profit | | 600,000 | 600,000 | 600,000 | 600,000 | 600,000 |
| Tax | | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 |
| After Tax Profit | | 450,000 | 450,000 | 450,000 | 450,000 | 450,000 |
| | | | | | | |
| Operational Cash Flow | | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 |
| Initial Investment | (5,000,000) | | | | | |
| NET Cash Flow | (5,000,000) | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 |
| NPV | $639,994.33 | | | | | |
| IRR | 13.82% | | | | | |

The NPV calculated for this scenario is positive and the IRR is higher than the cost of capital, so the investment is profitable in this scenario (Table 3.6). The NPV and the IRR are also the highest among all the scenarios considered, making this scenario the best scenario analyzed.

**3.5 Scenario 4 – Increasing investment costs and decreasing volume scenario (5 years)**

In this scenario, investments costs are USD 6.0 million. The volume discharged by regular customers decreases by 50,000 tons leading to a total of 300,000 tons discharged (Table 3.7). This results in the worst scenario considered, with negative NPV (Table 3.8). In this scenario, there is no profit; therefore, there is no tax under the Brazilian tax code.

**Table 3.7 Increasing costs and decreasing volume scenario financial calculations (5 years)**

| Total movement per year | MT | PCT |
|---|---|---|
| Take or pay costumers | 150,000 | 50% |
| Regular costumers | 150,000 | 50% |
| Total | 300,000 | |
| Take or pay costumers | $14.00 | |
| Regular costumers | $16.00 | |
| Average discharge sales price | $15.00 | |
| Total discharge costs | $11.00 | |
| Gross profit per MT | $4.00 | |
| Initial investment | $6,000,000.00 | |
| Depreciation | 20% straight line per year | |
| Tax | 25% | |
| Opp cost of capital | 9% | |

**Table 3.8 Increasing costs and decreasing volume scenario operational cash flow (5 years)**

| Years | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Total Sales | | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 |
| Total Costs | | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 |
| Depreciation | | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 |
| Profit | | - | - | - | - | - |
| Tax | | - | - | - | - | - |
| After Tax Profit | | - | - | - | - | - |
| | | | | | | |
| Operational Cash Flow | | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 |
| Initial Investment | (6,000,000) | | | | | |
| NET Cash Flow | (6,000,000) | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 |
| NPV | ($1,332,418.48) | | | | | |
| IRR | 0.00% | | | | | |

In this scenario, the NPV calculated is negative and the IRR is 0%, therefore the investment would be disadvantageous for the company causing a monetary loss (Table

3.8). This is the only scenario that foresees money loss, so this is the worst among all the scenarios considered.

## 3.6 Summary of four investment scenarios for a 5-year calculation

The project considers that there is 50% chance that during the maturity of the investment, the 'take or pay' customers will have 150,000 MT wheat discharged during each year, paying USD 14.00/MT for wheat discharged and additional 200,000 MT wheat to be discharged to regular customers, paying USD 16.00/MT for discharge service without 'take or pay' compromise (Scenario 1).

There is 30% chance that there will be an increase in the total investment costs, from USD 5.0 to USD 6.0 million, 20% increase, take or pay customers to remain the same 150,000 MT but regular customers must increase for minimum 252,076 MT to guarantee 10.0% IRR (Scenario 2).

The sensitivity analysis scenario leaves a 10% chance for the best scenario (Scenario 3) where the company is planning a USD 5.00 million investment cost but a total volume discharged of 400,000 MT, where 200,000 MT occurs on a take or pay basis and 200,000 MT on a regular customer basis. In this best case scenario the NPV is USD 639,994 with a 13.82 % IRR.

In the worst scenario (Scenario 4), also 10% chance to happen, an increase in the investment cost is considered, from USD 5.0 to USD 6.0 million but a decrease in volume also is assumed. The take or pay customers remains that same 150,000 MT but regular customers are calculated just for another 150,000 MT, 50,000 MT lower than the initial expectation. In this worst case scenario, the NPV is USD -1,332,418.48 with a 0% IRR.

The final result considering all scenarios for a 5-year project is a positive USD

78,908 Net Present Value suggesting a positive recommendation to go ahead with the

project (Table 3.9).

**Table 3.9 Summary of four investment scenario for 5-year calculation**

| Scenarios – 5 year period | Pct chance | NPV | NPV X Chance | IRR |
|---|---|---|---|---|
| Scenario 1 | 50% | $202,408.56 | 101,204.28 | 10.55% |
| Scenario 2 | 30% | $156,487.91 | 46,946.37 | 21.41% |
| Scenario 3 | 10% | $639,994.33 | 63,999.43 | 13.82% |
| Scenario 4 | 10% | ($1,332,418.48) | (133,241.85) | 0.00% |
| Average | 100% | | 78,908.24 | |

Given the above explanations and sensitivity analysis calculation, ABC Intl should

go ahead with above mentioned project. The project brings logistics advantages to the

company at the port of Santos and projects a positive Net Present Value, not just based in

one cash flow scenario, but taking into consideration multiple scenarios with a probability-

weighted average calculation for each scenario.

## CHAPTER 4: SENSITIVITY ANALYSIS FOR A 10-YEAR PERIOD

ABC Intl is using a 5-year life on investments, but ABC Intl also examined the Net

Present Value results and IRR for a 10-year period, assuming the same four scenarios

initially calculated for a 5-year period but for a 10-year period.

Considering that, according to Brazilian law, the depreciation costs in Brazil are

calculated on a 5-year period, straight line 20.0% depreciation in this case, it is expected

that NPV and IRR for a 10-year period would be better compared to 5-year period analysis.

### 4.1 Scenario 5 – Basic scenario for investment analysis (10 years)

The financial calculations for the basic scenario are presented below. The volume

discharged and the total costs are the same as in the original scenario (Table 4.1).

**Table 4.1 Basic scenario financial calculations (10 years)**

| Total movement per year | MT | PCT |
|---|---:|---:|
| Take or pay costumers | 150,000 | 43% |
| Regular costumers | 200,000 | 57% |
| Total | 350,000 | |
| Take or pay costumers | $14.00 | |
| Regular costumers | $16.00 | |
| Average discharge sales price | $15.14 | |
| Total discharge costs | $11.00 | |
| Gross profit per MT | $4.14 | |
| Initial investment | $5,000,000.00 | |
| Depreciation | 20% straight line per year | |
| Tax | 25% | |
| Opp cost of capital | 9% | |

**Table 4.2 Basic scenario operational cash flow (10 years)**

| Years | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Sales | | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 | 5,300,000 |
| Total Costs | | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 | 3,850,000 |
| Depreciation | | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | - | - | - | - | - |
| Profit | | 450,000 | 450,000 | 450,000 | 450,000 | 450,000 | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 |
| Tax | | 112,500 | 112,500 | 112,500 | 112,500 | 112,500 | 362,500 | 362,500 | 362,500 | 362,500 | 362,500 |
| After Tax Profit | | 337,500 | 337,500 | 337,500 | 337,500 | 337,500 | 1,087,500 | 1,087,500 | 1,087,500 | 1,087,500 | 1,087,500 |
| | | | | | | | | | | | |
| Operational Cash Flow | | 1,337,500 | 1,337,500 | 1,337,500 | 1,337,500 | 1,337,500 | 1,087,500 | 1,087,500 | 1,087,500 | 1,087,500 | 1,087,500 |
| Initial Investment | (5,000,000) | | | | | | | | | | |
| NET Cash Flow | (5,000,000) | 1,337,500 | 1,337,500 | 1,337,500 | 1,337,500 | 1,337,500 | 1,087,500 | 1,087,500 | 1,087,500 | 1,087,500 | 1,087,500 |

| | |
|---|---|
| NPV | $2,951,615.57 |
| IRR | 21.89% |

The NPV and the IRR calculated for this scenario are higher than calculated for the basic scenario considering five years, which indicates that the investment is not only advantageous but more profitable (Table 4.2).

## 4.2 Scenario 6 – Increasing total costs and volume scenario (10 years)

In the original scenario, considering five years, the company calculated using Solver, it was necessary to discharge 252,076 tons per year in the regular contract to remain with 10% Internal Rate of Return if the total cost of the investment was increased from USD 5.0 million to USD 6.0 million. When considering 10 years, this same volume was used to make all the financial calculations, resulting in a higher IRR (Table 4.3)

**Table 4.3 Increasing costs and volume scenario financial calculations**

| Total movement per year | MT | PCT |
|---|---:|---:|
| Take or pay costumers | 150,000 | 37% |
| Regular costumers | 252,076 | 63% |
| Total | 402,076 | |
| Take or pay costumers | $14.00 | |
| Regular costumers | $16.00 | |
| Average discharge sales price | $15.25 | |
| Total discharge costs | $11.00 | |
| Gross profit per MT | $4.25 | |
| Initial investment | $6,000,000.00 | |
| Depreciation | | 20% straight line per year |
| Tax | | 25% |
| Opp cost of capital | | 9% |

**Table 4.4 Increasing costs and volume operational cash flow**

| Years | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Sales | | 6,133,222 | 6,133,222 | 6,133,222 | 6,133,222 | 6,133,222 | 6,133,222 | 6,133,222 | 6,133,222 | 6,133,222 | 6,133,222 |
| Total Costs | | 4,422,840 | 4,422,840 | 4,422,840 | 4,422,840 | 4,422,840 | 4,422,840 | 4,422,840 | 4,422,840 | 4,422,840 | 4,422,840 |
| Depreciation | | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | - | - | - | - | - |
| Profit | | 510,382 | 510,382 | 510,382 | 510,382 | 510,382 | 1,710,382 | 1,710,382 | 1,710,382 | 1,710,382 | 1,710,382 |
| Tax | | 127,595 | 127,595 | 127,595 | 127,595 | 127,595 | 427,595 | 427,595 | 427,595 | 427,595 | 427,595 |
| After Tax Profit | | 382,786 | 382,786 | 382,786 | 382,786 | 382,786 | 1,282,786 | 1,282,786 | 1,282,786 | 1,282,786 | 1,282,786 |
| Operational Cash Flow | | 1,582,786 | 1,582,786 | 1,582,786 | 1,582,786 | 1,582,786 | 1,282,786 | 1,282,786 | 1,282,786 | 1,282,786 | 1,282,786 |
| Initial Investment | (6,000,000) | | | | | | | | | | |
| NET Cash Flow | (6,000,000) | 1,582,786 | 1,582,786 | 1,582,786 | 1,582,786 | 1,582,786 | 1,282,786 | 1,282,786 | 1,282,786 | 1,282,786 | 1,282,786 |

| NPV | $3,399,379.88 |
|---|---|
| IRR | 21.41% |

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In this scenario, the NPV and the IRR are also higher than calculated for the original

scenario, considering five years, as was expected (Table 4.4).

## 4.3 Scenario 7 – Increasing volume but not increasing investment costs scenario (10 years)

In this scenario, the volume discharged is considered to increase to 400,000 metric

tons, due to a 50,000 metric tons increase in the volume discharged in the take or pay basis.

The investment costs are considered to be the same as in the basic scenario (Table 4.5).

**Table 4.5 Best case scenario financial calculations (10 years)**

| Total movement per year | MT | PCT |
|---|---|---|
| Take or pay costumers | 200,000 | 50% |
| Regular costumers | 200,000 | 50% |
| Total | 400,000 | |
| Take or pay costumers | $14.00 | |
| Regular costumers | $16.00 | |
| Average discharge sales price | $15.00 | |
| Total discharge costs | $11.00 | |
| Gross profit per MT | $4.00 | |
| Initial investment | $5,000,000.00 | |
| Depreciation | 20% straight line per year | |
| Tax | 25% | |
| Opp cost of capital | 9% | |

**Table 4.6 Best case scenario operational cash flow (10 years)**

| Years | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Sales | | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 | 6,000,000 |
| Total Costs | | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 | 4,400,000 |
| Depreciation | | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | - | - | - | - | - |
| Profit | | 600,000 | 600,000 | 600,000 | 600,000 | 600,000 | 1,600,000 | 1,600,000 | 1,600,000 | 1,600,000 | 1,600,000 |
| Tax | | 150,000 | 150,000 | 150,000 | 150,000 | 150,000 | 400,000 | 400,000 | 400,000 | 400,000 | 400,000 |
| After Tax Profit | | 450,000 | 450,000 | 450,000 | 450,000 | 450,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 |
| | | | | | | | | | | | |
| Operational Cash Flow | | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 |
| Initial Investment | (5,000,000) | | | | | | | | | | |
| NET Cash Flow | (5,000,000) | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 | 1,450,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 |

| | |
|---|---|
| NPV | $3,673,602.06 |
| IRR | 24.70% |

This scenario is the best among all the scenarios considered, because it has the highest NPV and IRR values, which indicate the most profit (Table 4.6).

## 4.4 Scenario 8 – Increasing investment costs and decreasing volume scenario (10 years)

In this scenario, like in scenario 4 for the 5-year calculation, the investments costs are considered to increase to USD 6 million and the volume discharged is considered to be the same as in the basic scenario (Table 4.7).

**Table 4.7 Worst case scenario financial calculations (10 years)**

| Total movement per year | MT | PCT |
|---|---:|---:|
| Take or pay costumers | 150,000 | 50% |
| Regular costumers | 150,000 | 50% |
| Total | 300,000 | |
| Take or pay costumers | $14.00 | |
| Regular costumers | $16.00 | |
| Average discharge sales price | $15.00 | |
| Total discharge costs | $11.00 | |
| Gross profit per MT | $4.00 | |
| Initial investment | $6,000,000.00 | |
| Depreciation | 20% straight line per year | |
| Tax | 25% | |
| Opp cost of capital | 9% | |

**Table 4.8 Worst case scenario operational cash flow (10 years)**

| Years | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Sales | | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 | 4,500,000 |
| Total Costs | | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 | 3,300,000 |
| Depreciation | | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | - | - | - | - | - |
| Profit | | - | - | - | - | - | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 |
| Tax | | - | - | - | - | - | 300,000 | 300,000 | 300,000 | 300,000 | 300,000 |
| After Tax Profit | | - | - | - | - | - | 900,000 | 900,000 | 900,000 | 900,000 | 900,000 |
| | | | | | | | | | | | |
| Operational Cash Flow | | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 900,000 | 900,000 | 900,000 | 900,000 | 900,000 |
| Initial Investment | (6,000,000) | | | | | | | | | | |
| NET Cash Flow | (6,000,000) | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 1,200,000 | 900,000 | 900,000 | 900,000 | 900,000 | 900,000 |

| NPV | $942,787.31 |
|---|---|
| IRR | 12.73% |

Unlike the scenario calculated for a 5-year period with the same assumptions that resulted in a negative NPV and null IRR, the NPV and the IRR calculated for this scenario are positive (Table 4.8). This occurs because sales accumulate for 10 years instead of five. Although, the NPV and the IRR are positive when considering 10 years, they are still the lowest among all the scenarios calculated on a 10-year period, so this is still the worst among these scenarios.

**4.5 Summary of four investment scenarios for a 10-year calculation**

As the scenarios considered are the same as the ones considered for the 5-year calculation, the chances of each one of them occurring is assumed to be the same as when considering five years.

Interestingly, when considering a 10-year investment analysis, even at the worst case scenario, where USD 6.0 million are necessary and the total volume discharged per year is equally divided 150,000 MT between take or pay customers and regular customers, the project has a positive NPV and an IRR greater than the cost of capital.

When comparing the average for the 10-year calculations and the average for the 5-year calculations, the former is expected to be approximately USD 2.8 million more profitable.

It is important to mention that the 10-year analysis was considered as a comparison to the 5-year cash flow analysis, since ABC Intl uses a standard five-year cash flow analysis for any investment project.

**Table 4.9 Summary of 4 investment scenario for 10-year calculations**

| SCENARIOS - 10 YEARS | PCT CHANCE | NPV | NPV X CHANCE | IRR |
|---|---|---|---|---|
| Scenario 5 | 50% | $2,951,615.57 | 1,475,807.78 | 21.89% |
| Scenario 6 | 30% | $3,399,379.88 | 1,019,813.96 | 21.41% |
| Scenario 7 | 10% | $3,673,602.06 | 367,360.21 | 24.70% |
| Scenario 8 | 10% | $942,787.31 | 94,278.73 | 12.73% |
| Average | 100% | | 2,957,260.68 | |

# CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

ABC Intl is facing a major logistic constraint at berth 39 where export and import vessels occupy the same berth. The constant growth of soybean and sugar crops in Brazil are demanding more and more export silos and berths to operate at full capacity. ABC Intl has been active in the wheat import market, supplying the yearly demand of Brazilian wheat milling industries for imported wheat. With an average of 410,000 metric tons imports per year from 2000 to 2006 at the port of Santos, ABC Intl is looking for a viable alternative to invest in a new import terminal to free Shed 39 for export activities and transferring the wheat imports to a new terminal.

The economic viability of building a new terminal was evaluated considering four different scenarios – a base scenario considering the expected investment cost and volume discharged, a second scenario increasing investment cost and volume discharged, a third scenario increasing volume discharged but not the investment cost and a fourth scenario increasing the investment cost but not the volume discharged. These scenarios were analyzed considering a 5-year period, which is the standard period considered by ABC Intl. The financial concepts used for the analysis were the Net Present Value and the Internal Rate of Return.

The new terminal based on the financial assumptions presented and the extra important savings on demurrage at Shed 39 is a more than viable alternative. It is important to remember that the NPV is calculated not considering demurrage savings the company will face on the other terminal. The financial assumptions do not take into account that Brazil also imports 800,000 metric tons of malt and malting barley, none of that through Santos' port, and that the segregation of different types of grains made possible in a vertical

silo that would enable the new terminal in Santos to realize part of the discharge operation share of malt and malting barley.

Considering that a summary of four investment scenario for 5-year calculation bring s a positive NPV USD 78,908 and the same scenario for a 10-year period the NPV is positive USD 2,957,261, it is recommended that ABC Intl go ahead with the New Terminal investment, improving the overall logistics of the port, improving the quality of service to customers, avoiding unnecessary demurrage costs and improving shareholders wealth by investing in a project with a positive Net Present Value.

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