

Commercial Feasibility to Produce Feedlot in Argentina

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ABSTRACT: *Historically, livestock production has been one of the traditional activities and an important support for the economic growth of Argentina. This activity led the country to enter the international market as a provider of beef, and placed it as one of the largest exporters of beef in the world. In the present work, the feasibility of carrying out the development of a company whose purpose is the fattening and sale of cattle of bovine origin under the modality of feedlot or fattening in a pen, by a company located in the city of Villa Ocampo, province of Santa Fe, to supply the refrigerators of the region. For this, a market study is carried out that considers the four pillars: demand, supply, price and marketing analysis. In addition, a technical study is made describing the location of the enterprise and its facilities. Finally, in the Economic-Financial study, the investments, costs and benefits of the project and the profitability obtained are detailed according to the number of heads of animals produced per period of time.*

KEYWORDS: *factibilidad, producción, feedlot.*

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I. INTRODUCTION

Traditionally, livestock production in Argentina has been developed on extensive productive plans, but, since the 90s, the territorial advance of the agricultural frontier due to the expansion of extensive crops in the Pampean Region has led to cattle ranching, of lower relative profitability, has yielded the best lands, adjusting its development to smaller areas and fields of lower soil quality. This has meant the start-up of a process of relocation of livestock, especially in the stage of rearing and final completion. This last factor, added to the strong climatic changes of the last decade, results in a lower production of calves for primary production, conditioning the subsequent stages of fattening (Alassia et al., 2008; Arelovich, 2011; Guerava and Grünwaldt, 2012; Pordomingo, 2013).

In this context, the fattening in corral appeared as a complement to increase the receptivity of the soil, increase the productivity of livestock establishments and decrease the incidence of financial cost, given the increase in land prices.

Therefore, feedlot calves are fed to be fattened and finish their growth for later commercialization, or animals that have been fattened to pasture and end up in confinement until reaching the weight required for sale. The main objectives of the feedlot are to obtain the highest kilos gain in the shortest possible time and at the lowest cost, therefore, the challenge is focused on maximizing the conversion efficiency, that is, the amount of food necessary to achieve a kilo of meat. (Vernet, 2005; Grünwaldt and Guerava, 2011).

In the present work, a market study is carried out to determine the possibility of producing and marketing live bovine cattle (young-steers and y heifers). In this way, a production of high meat quality would be obtained, which would allow to supply the national market and export refrigerators.

The site in which the project is carried out is located in the town of Villa Ocampo, a few kilometers from Provincial Route No. 32 and National Route No. 11. Counting on a high availability of raw materials, due to the great agricultural activity of the region, as well as a considerable portfolio of potential clients close to the establishment. It should be clarified that the project is part of the business plan of an agricultural company that is looking to expand its commercial borders.

The fattening system chosen is the so called "intensive", where the animal remains locked since it is received, until it reaches the desired weight for commercialization (between 300 and 340 kg).

This type of production is characterized by a large consumption of water and a balanced diet, which is covered with commercial mixtures or formulated on the premises.

II. METHODOLOGY

There are two types of information sources. The so-called primary information sources, which have their origin basically in field investigations, such as interviews and questionnaires, and sources of secondary information composed of primary information synthesized and reorganized on the subject under study. The latter can be of two types, the one that comes from the company (internal) and the one that is foreign to the company (external). This project is based on a developing enterprise, so primary information is not available, for this reason it is used external sources of information, such as government statistics (Ministry of Agriculture, Livestock and Fisheries), Liniers Market, Stock Market Comercio de Rosario and reports from the National Institute of Agricultural Technology (INTA).

III. MARKET ESTUDY

3.1. Per capita consumption of meat in the country

Argentina was always characterized by consuming meat of bovine origin in greater proportion to that of porcine and avian origin. However, in the last decade the consumption of beef suffered a decline due to a sharp reduction in production in 2010, causing an increase in the consumption of poultry meat and, to a lesser extent, pork. This situation improved from the year 2012, achieving an increase in the consumption of bovine meat, even so, the consumption of pork and poultry meat continues with an upward trend (Ministry of Agroindustry, 2017). Table 1 shows the per capita consumption of meat in Argentina:

Consumption of national meat (Kg / inhabitant)				
Year	Avian	Porcine	Bovine	Total MeatConsumption
2010	34,9	8,1	57,8	100,8
2011	39	8,6	55,4	103
2012	40,2	8,6	58,8	107,6
2013	39,6	10,4	63,1	113,1
2014	40,4	10,7	58,3	109,4
2015	42,85	11,3	59,4	113,55
2016	42,58	12,8	59,9	115,28
2017	44,69	14,05	60,12	118,86

Table 1. Per capita consumption of meat in Argentina.

3.2. Analysis of demand

Demand is defined as the quantity of goods and services that the market requires or requests in order to seek the satisfaction of a specific need at a specific price. The purpose of this study is to determine the consumption of the product under study in the geographical area influenced by the project, taking into account the data of the amounts consumed both in the past and in the present and the factors with the greatest influence on consumption, for to be able to make a forecast as accurate as possible of future demand.

This project is based on a developing enterprise, so no primary information is available, which have their origin basically in field investigations, such as interviews and questionnaires, for this reason we resort to sources of external information, such as statistics. such as the Ministry of Agriculture, Livestock and Fisheries (MAGyP), Liniers Market (Buenos Aires, Argentina), Rosario Stock Exchange (Santa Fe, Argentina) and reports from the National Institute of Agricultural Technology (INTA, Argentina).

For the development of this venture, Table 2 analyzes the national consumption in aggregate tons of bovine meat for the period 2009 - 2017, where there is information regarding slaughter, production, exports and consumption per capita (SENASA, 2017).

In the information collected it can be seen that, from 2009 to 2011, there was a drop in the levels of production and consumption, reaching a minimum in 2011, mainly due to the droughts of 2009 that forced the sale of livestock, having an impact on the pregnancy and calving rates.

From 2012 to the present, an improvement was observed in the production, slaughter and consumption indexes, suffering a slight fall in 2014.

Regarding exports, it is observed that as of 2010 there is a strong drop due to government policies that limited exports to cope with low production levels, reaching a minimum in 2012. From 2013 to currently, the volumes of meat exported remain relatively constant.

Year	Bovine Slaughter (Heads)	Production (Tons res with bone)	Exportation (Tons res with bone)	Per capita consumption (Kg/Hab)
2009	16053055	3376000	631378	68,36
2010	11882706	2626000	313133	57,78
2011	10861896	2497000	234387	55,79
2012	11428791	2596000	188407	58,64
2013	12625513	2822000	201292	63,09
2014	12100979	2674000	211629	58,61
2015	12156600	2727000	200562	59,44
2016	11720350	2644287	214532	59,9
2017	12605677	2841106	215987	60,12

Table 2. Annual evolution of indicators.

Forecast of demand

To obtain an approximation of the national demand with the periods in which information is available, the National Apparent Consumption (CNA) is used as an indicator of it, which is obtained by making the sum between production and imports and subtracting exports. Because Argentina is an exclusively producer/exporter of beef, imports are not considered in the calculation.

The national demand obtained is expressed in aggregate tons of beef, which is used to obtain the forecast of the same.

Year	Demand (Tons)
2009	2744622.00
2010	2312867.00
2011	2262613.00
2012	2407593.00
2013	2620708.00
2014	2462371.00
2015	2526438.00
2016	2429755.00
2017	2625119.00
2018	2699140.69
2019	2757978.15
2020	2816815.61
2021	2875653.10
2022	2934490.58

Table 3. Historical demand and forecasted demand.

Once the demand is obtained, it is plotted to observe if it presents trends of growth/decrease, seasonality, dispersion, cyclicity, which are the factors that characterize a series, and it is these that are used to select the method/s more accurate forecasts to make the projection of it over time.

According to the information collected, the real demand data series presents notable characteristics of randomness and tendency, therefore, to perform demand projections, the Two Parameters Exponential Smoothing method is applied, with values $\alpha = 0,6$ and $\gamma = 0,9$.

In Table 3, we find the historical information of the demand and the forecast demand for the period 2018-2022 obtained with the aforementioned method. As you can see, there is a positive trend in the projections from 2018 to 2022.

3.3. Analysis of the offer

Offer is understood as the quantity of goods and services that a certain number of suppliers (producers) are willing to make available to the market at a specific price.

According to the report of bovine stocks of the National Service of Health and Agri-Food Quality (SENASA), the national supply of cows, or bovine stock, is concentrated in the provinces of Buenos Aires, Santa Fe, Corrientes, Córdoba and Entre Ríos, which in together, they correspond to 74% of the country's total stocks. In Santa Fe (where the company is located), in the southern area are almost 49% of refrigerators; the northern zone has almost 29% of the refrigerators and 61% of heads; finally, the central area with almost 22% of refrigerators and 26% of heads.

It is the commercial policy of the organization to focus the business plan of this project to supply an important refrigerator that is close to the establishment, which will be the main buyer of already fattened cattle and, at the same time, the sale is considered to 2 other refrigerators in the region. It should be clarified that the company already has commercial ties with the aforementioned refrigerators, therefore, its objective is to expand this relationship.

3.4. Analysis of the evolution of the price

The reference values used in the marketing of live cattle are published daily by the Liniers Market, these values are divided by animal category: steers, young bulls, heifers, calves, cows and bulls. The MAGyP also publishes this data and also makes weekly and monthly reports.

To carry out the projection of the price of the standing cash cow, the data obtained from the MAGyP's monthly reports are converted, linking them with the average value of the dollar corresponding to each year (Ministry of Agriculture Livestock and Fisheries, 2017).

Year	Calf (USD/Kg)	Heifers(USD/Kg)	Young-Steer (USD/Kg)
2009	0,944	0,891	0,933
2010	1,837	1,554	1,704
2011	2,258	2,005	2,160
2012	2,229	1,942	2,140
2013	2,012	1,751	1,961
2014	2,085	1,843	2,039
2015	2,164	1,919	2,060
2016	2,175	1,945	2,080
2017	2,253	2,064	2,174
2018	2,331	2,184	2,268
2019	2,409	2,404	2,362
2020	2,489	2,524	2,456
2021	2,567	2,644	2,550
2022	2,646	2,764	2,644

Table 4. Historical prices and predicted prices for categories of cattle.

The annual prices for the corresponding period from 2009 to 2017 are used for each bovine category, to make the price projections based on the analysis of the variables and the predicted values using the Two Parameters Exponential Smoothing method, adjusting the value of α and γ for each category, since this is the one that best adapts to the historical series and has the most favorable values according to the evaluation parameters used. Table 4 shows the historical price information for the different bovine categories and the predicted prices for the period 2018-2022 obtained with the aforementioned method. As can be seen, the evolution of the price of the different beef categories tends to increase in the period considered. Therefore, it is an important variable to decide the marketing of them.

To determine the price of the product, the market structure, the price analysis of the competition and the costs were taken into account. In this way, the company performs an analysis of the prices of the

competition, detecting that the sale value of the kilo in standing of calves, young bulls and heifers, is above the value stipulated in Table 4, in a range of 3 to 10%.

As a commercial strategy for the first two years, it is considered to use the market penetration method for low prices, which consists of defining low prices to penetrate quickly and deeply into the market, competing with existing producers. It is intended that potential buyers choose the product from the price, and added to the combination of excellent quality, end up being the preferred alternative.

In this way, it is defined that the first year the sale price is 15% lower than the lowest price of the main competitors. For the second year there is an increase of 10% of the price of the first year, positioning 5% below the lowest selling price of the main competitors. Then, for the rest of the planning horizon, price is equated with the lowest price competitor, allowing some margin to increase the sale price in the future.

3.5. Analysis of the commercialization

The cattle and beef commercialization chain has the characteristic of developing different activities in its interior from the breeding stage to the final consumer through various channels, each of which determines circuits whose marketing costs vary according to the transportation costs, documentation, fees, etc. (Tkachuk, 2014).

The farm sold for fattening or fattening by the same producer in another establishment can be marketed by direct route, from the breeder to the wintering (which fattens the calves weaned in the stage of breeding until its completion and subsequent shipment to slaughter), or by means of a commission agent/consignee who will act as intermediary between both parties directly or through auction auctions organized by the same in localities of the interior.

Then, the commercialization to slaughter could be: direct sale to refrigeration industries, on behalf of the same company; direct sale to refrigerators through a commission agent who is in charge of the commercial process; sales in a concentrator market; sales through consignees in auctions and fairs. Later, after the industrialization in slaughterhouses or slaughterhouses, the meat is distributed as *media res* in butcher shops or in courts in supermarkets or hypermarkets (Ministry of Agriculture, Livestock and Fisheries, 2015).

The channel of commercialization chosen by the company turns out to be mixed, that is to say, for long distances it will contract and for short it will use the transport infrastructure with which it has. This is because its main customers will be refrigerators in the area where it is located.

IV. TECHNICAL STUDY

The size of the project is measured according to its productive capacity based on a unit of time, assuming normal operating conditions, this means that the production level is obtained by considering a certain number of characteristics of the environment where it is intended to the business and in this case also considering the biological qualities of animals.

The capacity of the project in question is 150 heads, due both to issues of land restriction and the interest of the entrepreneur in operating to that capacity.

4.1. Facilities

The establishment is designed taking into account the availability of square meters in the property and its geometry. For this case, three feedlots, a nursing corral, streets for the circulation of animals and vehicles, a ditch for the waste drainage and a compost deposit need to be accommodated on the land.

Fattening pens

The dimensioning of the pens was based on a requirement of square meters per animal ranging from 12 to 40 m², in this case for the calculations a requirement per animal of 40 m² is used.

Drinkers

The drinkers are located in the opposite half of the feeders, thus preventing any spillage of liquid from going to the feeder sector. Providing clean and fresh water is essential to sustain a good fattening. The consumption of water can be estimated in two ways, considering approximately 13% of the weight of the animals or 7 liters of water per 50 kilograms of animal, plus evaporation, which is estimated at 7 millimeters per day per surface in contact with the air. In this case, it is calculated based on the percentage of the weight of the animal, based on a weight of 280 kilograms.

Nursing pen

This pen is intended to house animals that present health problems and should not remain in the feedlot.

It has a capacity of 10 animals with a dimension of 15 meters by 20 meters taking a requirement per animal of 30 m². This corral has 4 meters of feeders and a drinking trough of 240 liters.

4.2. Organizational, Legal and Environmental Study

The establishment will have a total allocation of 3 people, distributed between administrative and operational tasks.

The amount of the salaries of managers, assistants and foreman is based on the salary scale determined by the National Agrarian Labor Commission (Argentine Union of Rural Workers and Stevedores, UATRE).

The feedlot will also have a veterinarian who does not count as permanent staff, who will be paid for the services provided in the disease control sector. The same applies to the accountant, who will be paid for their financial management services.

The feedlot will operate under the legal status of a Limited Liability Company or S.R.L., since this type of company has the characteristic of protecting the personal assets of the partners, limiting their liability to the contribution of capital made.

In order for the feedlot to operate as such, it must comply with a series of requirements established by SENASA (National Service for Agrifood Health and Quality). This organism establishes that in order to be authorized for its operation, the establishment must be registered in the RENSPA (National Sanitary Registry of Agricultural Producers).

The feedlot is designed taking into account the requirements established by the municipality of the city of Villa Ocampo and the Secretariat of Environment of the province of Santa Fe. In addition, like all productive activities, it must respect a certain number of laws, decrees and resolutions that regulate the activity, such as Law N ° 25.675 (General Law of the Environment), Law N ° 11.717 (Law of Environment and Sustainable Development), Decree N ° 0101/03 and Resolution N ° 0023/09.

As products obtained from the feedlot system, there is the target product that is the finished beef for slaughter and, in addition, environmental contaminants: ruminal fermentation gases eliminated directly by the belching of cattle, manure and sewage effluents. all property.

Of the fermentation gases, the main gas is methane and depends on the volume of food consumed and the composition of the ration (FAO & New Zealand Agricultural Greenhouse Gas Research Centre, 2017). A higher proportion of high energy food in the diet (starch), lower volume consumed with less dry matter. In feedlot, fecal matter and urine form a single type of waste, which is called manure, since they can not be separated. The droppings contain nutrients, since the bovine absorbs very little in proportion of what it ingests.

The installation of the project will have an impact on the environment, so the possible environmental impacts that the operation of the project can cause are analyzed, for which mitigation measures are proposed, such as composting solid waste for the treatment of manure, and ditches for the treatment of effluents. (Susana B. Gil - "Intensive fattening (feedlot), elements that intervene and possible impacts on the environment" - 2006).

V. FINANCIAL ECONOMIC STUDY

The objective of the economic and financial study is to determine if it is feasible to carry out the project by analyzing the economic convenience of the project. In order to achieve this, it is nourished by data obtained from previous studies, as well as information generated by it (investment in working capital, value of project waste, etc.). All these elements are organized systematically in a box called "Cash Flow" for further evaluation. The tools that will be used to evaluate the profitability of this project will be the Current Net Value (VAN) and the Internal Rate of Return (TIR). To apply them, it is essential to determine the discount rate to be used in order to arrive at the current value of the cash flows, it represents the opportunity cost that exists when there are similar investments to the project, with the same risk profile, whose average yield is represented by said rate.

5.1. Investments

The investment is defined as the amount of resources necessary for the execution of the project, which include: fixed assets, intangible assets and working capital.

Investment in fixed assets

Are those that are made on tangible goods of a permanent, stable nature, are not available for sale, have a representative cost and have an operational character for the company, since they will be used in the process of transformation of raw materials or serve as support for the normal operation of the project such as land, machinery, buildings, furniture, etc.

For the enterprise in question, the fixed assets necessary to start the productive activity are those that are detailed in Table 5.

FixedAssets	Price(USD)
Mixer	20898,64
Grain elevator	3134,80
Crawler "Fiat"	0
Scales	4179,73
Fattening pens	10988,94
Nursery Corral	1742,49
TOTAL	40944,6

Table5. FixedAssets.

Investment in intangible assets

These are the investments that the company must make in goods and/or services for the start of its operation such as: start-up, company identity, ratings, etc. Investments in intangible assets are detailed in Table 6.

Intangible Assets	Price USD
Fattening pen assembly	4758,32
Nursery corral assembly	634,80
Incidentals	1228,34
Constitution of the firm	522,47
TOTAL	7143,93

Table 6. Intangible Assets.

Working capital

It is defined as the set of economic resources necessary for the normal operation of the project, for a given capacity and size. For this case, the amount necessary to carry out a productive cycle for both types of fattening is considered.

It is important to mention that a project has different capacities, it is classified in theory and practice. The theoretical capacity of the project is obtained by multiplying the number of kilos of average daily fattening by the number of animals in the pens at 100% capacity, 365 days a year, and thus the amount of kilos in live animal weight is obtained per year that produces the project in an ideal situation.

In this case we start with a capacity of a pre-established production of 150 heads with which it is intended to operate, and in this way contribute to the added value of the product derived from agricultural production.

To determine the theoretical capacity of fattening it is considered that the animal can reach an average increase of 1,4 kg per day, so that the 150 animals in the 365 days of the year would generate a theoretical capacity of 76650 kg average of fattening per year for the fattening diet of up to 300 kg and 340 kg. As for the calculation of practical capacity, the approximate days in which the calves/young bulls entering the establishment do not generate weight gain should be discounted, because they remain in the habituation stage for a period of approximately 21 days plus a short period between replacement of the 4 day cattle.

For this, the number of days needed to fatten the calves from a weight of 180 kg to 300 kg or 340 kg is first expressed, taking a weight gain of 1,4 kg per day. Once the fattening days have been calculated, the days of acclimation and replacement are added to obtain the total days per cycle and thus obtain the number of cycles per year that are carried out. This value will give us the number of cycles that can be completed in a year, represented in Table 7.

Year	Dietcycles300 Kg	Dietcycles340 Kg
2018	3	2
2019	3	3
2020	3	2
2021	4	3
2022	3	3

Table 7. Number of cycles per year.

Table 8 shows the working capital for the complete cycles of the fattening diet of 300 kilograms and 340 kilograms respectively.

Working capital	Diet 300 Kg		Diet 340 Kg	
	Quantity	Amount USD	Quantity	Amount USD
Buy of calves	150	58726,26	150	58726,26
Freight of calves	2	181,82	2	181,82
Buy of corn (tn)	90,42	10964,95	108,91	13206,63
Freight of corn	3	3797,6	4	6098,65
Buy of pasture rolls (tn)	21,55	1684,39	21,19	1969,34
Freight of pasture rolls	2	482,63	3	846,42
Buy of protein concentrate (kg)	3318,11	2661,12	3969	3183,14
Buy of soybean expeller (tn)	17,87	4982,03	21,12	5889,54
Freight of soybean expeller	1	250,13	1	295,59
Veterinary supplies (per cycle)	1	475,24	1	475,24
Electric power consumption (days)	111	231,97	140	6219,44
Human labor (days)	111	5752,98	140	292,58
Fuel consumption (days)	111	3640,80	140	4592
Freight of finished animals	3	102,40	4	121,21
TOTAL		93934,33		102097,96

Table 8. Working capital for 300 kg and 340 kg fattening.

Amortization and depreciation

Amortization refers to the decrease in value that is perceived by the wear and tear of fixed assets, while depreciation means the value that is computed annually to recover the investment of intangible assets. Tables 9 and 10 detail the summary of the depreciation and amortization rates of the assets used.

Equipment/Machinery	Depreciation (Years)	Investment (USD)	Depreciation rates(USD)
Mixer	10	20898,64	2089,86
Grainelevator	10	3134,80	313,48
Scales	10	4179,73	417,97
Fatteningpens	20	10988,94	549,45
Nursery Corral	20	1742,49	87,13
TOTAL		40944,60	3457,89

Table 9. Depreciationsummary.

Description	Amortization (Años)	Investment(USD)	Amortization rates (USD)
Fattening pen assembly	10	4728,32	472,83
Nursery corral assembly	10	634,80	63,48
Incidentals	10	1228,34	122,83
Constitution of the firm	10	522,47	52,25
TOTAL		7113,93	711,39

Table 10. Amortizationsummary.

5.2. Benefits

Income from sale

The benefits of the establishment have their origin in the sale of cattle. Table 11 and Table 12 show the annual income in dollars for fattening from 180 to 300 kilograms and from 180 to 340 kilograms, respectively.

	Year 1	Year 2	Year 3	Year 4	Year 5
Cycles	3	3	3	4	3
Income for sale (USD)	271687,50	286065,00	300375,00	419580,00	329062,50

Table 11. Income from sales for fattening of 300 Kg.

	Year 1	Year 2	Year 3	Year 4	Year 5
Cycles	2	3	2	3	3
Income for sale (USD)	201195,00	324207,00	224247,00	356643,00	372937,50

Table 12. Income from sales for fattening of 340 Kg.

Waste value

It is the value that the project could have at the end of the planning horizon. There are several estimation methods for this value. These may consider the book value of the venture the commercial value for its possible sale or take into account the future income that it would generate. In this case, the accounting value of the enterprise is considered, that is, the commercial value for its possible sale to estimate its value. According to this method, the value of the project is equal to the sum of the values of the project assets.

Fixed costs

Are those costs that are not influenced by the level of production. Table 13 shows the fixed costs expressed in dollars associated with the operation of the fattening establishment for the fattening diets from 180 to 300 and from 180 to 340 kilograms, since both have the same costs.

	Year 1	Year 2	Year 3	Year 4	Year 5
Telephone and Internet	476,49	490,78	505,51	520,67	536,29
Human labor qualified	4388,71	4520,38	4655,99	4795,67	4939,54
Human labor no qualified	3761,76	3874,61	3990,85	4110,57	4233,89
Human labor of veterinarian	3761,76	3874,61	3990,85	4110,57	4233,89
Administrator	5015,67	5166,14	5321,13	5480,76	5645,10
Accountant	1253,92	1253,92	1253,92	1253,20	1253,92
TOTAL	18658,31	19180,44	19718,25	20271,44	20842,63

Table 13. Fixed costs in dollars of the 300 kg and 340 kg diets.

Variable costs

Are all those costs that increase or decrease as production increases or decreases. Table 14 and Table 15 detail the variable costs of operation of the establishment for the fattening of animals from 180 to 300 kilograms and from 180 to 340 kilograms.

	Year 1	Year 2	Year 3	Year 4	Year 5
Corn	32894,85	33970,92	35046,73	48163,75	37198,62
Protein concentrate	7983,37	8063,00	8142,63	10963,03	8301,90
Rolls	5053,17	5103,70	5154,73	6941,71	5258,34
Calves	176178,79	182524,05	188869,31	260286,09	201559,82
Soybean expeller	14946,09	15219,34	15492,59	21021,11	16039,08
Veterinary supplies	1425,71	1425,71	1425,71	1900,94	1525,71
Electric power	752,35	752,35	752,35	752,35	752,35
Fuel	11972,00	11972,00	11972,00	11972,00	11972,00
Supply freight (calves)	545,45	545,45	545,45	727,27	545,45
Departurecharges(nov/vaq)	307,21	307,21	307,21	409,61	307,21
Corn freight	11392,81	11392,81	11392,81	15190,42	11392,81
Soybean expeller freight	750,38	750,38	750,38	1000,51	750,38
Pasture roll freight	1447,89	1447,89	1447,89	1930,52	1447,89
Income tax	9509,06	10012,28	10513,13	14685,30	11517,19
TOTAL	275159,13	283487,09	291812,93	395944,61	308468,77

Table 14. Variable costs in dollars of the 300 kg diet.

	Year 1	Year 2	Year 3	Year 4	Year 5
Corn	26413,26	40915,97	28141,14	43507,78	44809,53
Protein concentrate	6366,28	9644,67	6493,28	9835,18	9930,44
Rolls	3938,68	5967,11	4017,85	6087,04	6147,91
Calves	117452,53	182524,05	125912,87	195214,56	201559,2
Soybean expeller	11779,08	17991,65	12209,78	18637,69	18960,71
Veterinary supplies	950,47	950,47	950,47	950,47	950,47
Electric power	752,35	752,35	752,35	752,35	752,35
Fuel	11972	11972	11972	11972	11972
Supply freight (calves)	363,64	545,45	363,64	545,45	545,45
Departurecharges (youngsteers/heifers)	242,42	363,64	242,42	363,64	363,64
Corn freight	12197,3	18295,96	12197,3	18295,96	18295,96
Soybean expeller freight	591,38	887,07	591,38	887,07	887,07
Pasture roll freight	1692,84	2539,25	1692,84	2539,25	2539,25
Income tax	7184,63	11347,25	7943,25	12482,51	13052,81
TOTAL	201896,86	304696,89	213480,57	322070,95	330766,79

Table 15. Variable costs in dollars of the 340 kg diet.

Cash flow

The construction of the flow of funds is one of the most important stages of the study of a project, because it reflects all the accounts that positively and negatively affect the profitability of the project. Table 16 and Table 17 show the cash flows for the fattening of cattle from 180 to 300 kilograms. and 180 to 340 kilograms, respectively.

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Sales revenue		271687,50	286065,00	300375,00	419580,00	329062,50
Fixed costs		18658,31	19180,44	19718,23	20272,16	20842,71
Variable costs		275159,31	283487,09	291812,93	395944,61	308468,77
Amortization		711,39	711,39	711,39	711,39	711,40
Depreciation		3457,89	3457,89	3457,89	3457,89	3457,89
Profits before taxes		-26299,22	-20771,81	-15325,44	-809,05	-4418,26
Income taxes (35%)		0	0	0	0	0
Profits after taxes		-26299,22	-20771,81	-15325,44	-806,05	-4418,26
Amortization		711,39	711,39	711,39	711,39	711,40
Depreciation		3457,89	3457,89	3457,89	3457,89	3457,89
Investment in fixed assets	-40945					
Investment in intangible assets	-7114					
Working capital	-93934					93934,33
Waste values						27212,12
Cash flow	-141993	-22129,94	-16602,53	-11156,16	3363,23	120897,46

Table 16. Cash flow in dollars of the 300 kg diet.

	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5
Sales revenue		205275,00	324207,00	226950,00	356643,00	372937,50
Fixed costs		18658,31	19180,44	19718,23	20272,16	20842,71
Variable costs		194712,23	293349,63	205537,33	309588,46	317708,61
Amortization		711,39	711,40	711,40	711,39	711,40
Depreciation		3457,89	3457,89	3457,89	3457,89	3457,89
Profits before taxes		-12264,82	7507,66	-2474,84	22613,10	30216,90
Income taxes (35%)		0	2627,68	0	7914,59	10575,92
Profits after taxes		-12264,82	4879,98	-2474,84	14698,52	19640,90
Amortization		711,39	711,40	711,39	711,39	711,40
Depreciation		3457,89	3457,88	3457,89	3457,89	3457,89
Investment in fixed assets	-40945					
Investment in intangible assets	-7114					
Working capital	-102097					102097,96
Waste values						27212,12
Cash flow	-150156	-8095,54	9049,26	1694,44	18867,80	153120,34

Table 17. Cash flow in dollars of the 340 kg diet.

Discount rate

It can be defined as the opportunity cost associated with the best investment of similar risk that is abandoned for allocating these resources to the project under study. If the projects were free of risk, there would be no greater difficulty in determining this rate, but this is not what happens in reality, so some method must be used to incorporate this factor into the equation.

Since the project in question is financed with capital contribution (not requiring external capital), the method to be used to determine the opportunity cost is the CAPM (Capital Asset Pricing Model). This allows obtaining the expected return on an investment for the level of risk considered. The aforementioned method yields a value of the discount rate of 11.89%.

5.3. Evaluation of profitability

Based on the information presented above of the two scenarios, the profitability of each of them is evaluated. This is carried out based on three evaluation criteria, which are described below.

Current Net Value VAN

It allows calculating the present value of a certain future cash flow to express its magnitude in current currency (that is, update by a rate). In this way, the project must be accepted if the NPV is greater than or equal to zero. Equation 1 allows us to calculate this value.

$$VAN = \sum_{t=1}^n \frac{Ff_t}{(1+i)^t} - I_0$$

Equation 1. Formula used to obtain the VAN.

Where:

Ff_t: cash flow corresponding to period t.

i: discount rates to apply.

n: planning horizon.

I₀: initial investment.

Internal rate of return TIR

The TIR of a project is defined as the rate that allows net operating flows to be discounted and equal to the initial investment, that is, the discount rate that makes the net present value zero or its. Once the present value of the cash flows generated by the project is exactly equal to the investment made. Equation 2 allows to obtain the value of the TIR through the clearing of the following equality.

$$\sum_{t=1}^n \frac{Ff_t}{(1 + TIR)^t} - I_0 = 0$$

Equation 2. Formula used for the TIR.

The value of the TIR is compared with the value of the discount rate of the company and the evaluation criteria of profitability is as follows:

- If the TIR is greater than or equal to the discount rate (i), the project must be accepted.
- f the TIR is less than the discount rate (i), the project must be rejected.

Period of payback

It determines the number of periods necessary to recover the initial investment, which is compared with the number of acceptable periods according to the company's criteria. This period is obtained by making the accumulated sum of flows. Table 18 and Table 19 show the cumulative background fluxes for the 300 kg and 340 kg diets, respectively.

Periods	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cash flow (USD)	-141992,84	-22129,94	-16602,53	-11156,16	3363,23	120897,47
Accumulatedflows (USD)	-141992,84	-164122,78	-180725,314	-191881,48	-188518,25	-67620,46

Table 18. PR calculation of the 300 kg diet.

Periods	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cash flow (USD)	-150156,48	-8095,54	9049,26	1694,44	18867,80	153120,34
Accumulatedflows (USD)	-150156,46	-158252,02	-149202,76	-147508,32	-128640,53	24479,82

Table 19. PR calculation of the 340 kg diet.

5.4. Results of profitability

Based on the values obtained through the different economic profitability evaluation criteria for the two scenarios, it is concluded that both projects are not economically viable, because both have a VAN less than zero.

In addition, it can be calculated that in the 300 kg diet scenario the TIR is less than zero, this is due to the fact that the fund flows during the project's useful life are not sufficient to recover the capital invested to start the venture, this translates into a period of investment recovery (PR) that exceeds 5 years in which the project was evaluated. Comparing both situations, the one with the best values is the 340 kg diet, since it allows the return of the investment within the useful life of the project.

5.5. Sensitivity analysis

The sensitivity analysis allows us to see how sensitive the studied project is with respect to some particular variable. For this case, the number of heads of cattle produced during the considered repayment period is taken as a variable. The economic-financial study is carried out for the case of 200, 250, 300, 350, 400, 450, 500 and 700 animals and the results of the profitability of the project for each case can be seen in Figure 1.

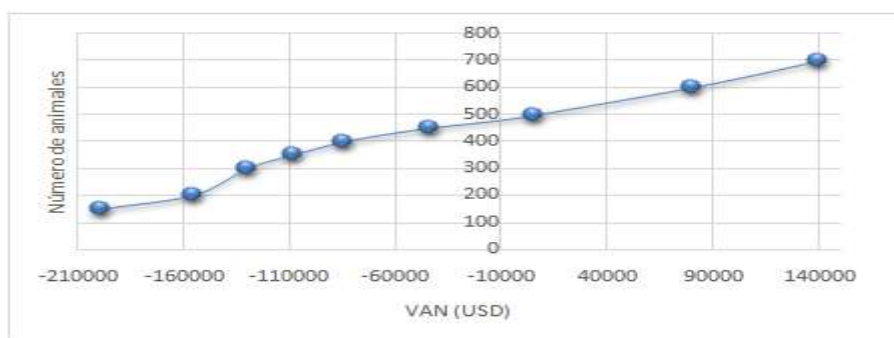


Figure 1. VAN according to the number of animals for the 340 kg diet.

From what was obtained in the previous analysis and from what is observed in Graph 1, the project becomes profitable from the production of 500 animals with a 340 kg diet.

Table 20 shows the cash flow in dollars for the fattening of 500 animals with a 340 kg diet.

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Sales revenue		669979,35	1079609	746742,51	1187621	1241882
Fixed costs		18658,31	19180,44	19718,25	20271,44	20842,63
Variable costs		672316,54	1014640	710890,30	1072496	1101453
Amortization		1813,09	1813,09	1813,09	1813,09	1813,09
Depreciation		4738,10	4738,10	4738,10	4738,10	4738,10
Profits before taxes		-27546,70	39237,03	9582,77	88302,29	113034,64
Income taxes (35%)		0	13732,96	3353,97	30905,80	39562,12
Profits after taxes		-27546,70	25504,07	6228,80	57396,49	73472,52
Amortization		1813,09	1813,09	1813,09	1813,09	1813,09
Depreciation		4738,10	4738,10	4738,10	4738,10	4738,10
Investment in fixed assets	-40945					
Investment in intangible assets	-7114					
Working capital	-102097					328604,80
Waste values						27212,12
Cash flow	-150156	-20995,50	32055,26	12779,99	63947,68	435840,62

Table 20. Cash flow in dollars of the 340 kg diet for 500 animals.

In the case of a scenario where the number of animals produced increases, it can be seen in Table 21 that to achieve a positive VAN, the capacity of the project must increase by at least 230%, that is, work with at least 500 animals.

Method	Diet 340 Kg
VAN	4976,24 USD
TIR	12,5%
PR	Year 5

Table 21. Profitability of the 340 kg diet for 500 animals.

VI. CONCLUSIONS

The market study shows that there is a potential market in the commercialization of cattle, both regionally and nationally. In addition, the available capacity of potential clients and the proximity to them are important parameters to take into account when analyzing the feasibility of this project.

The study of demand for beef (young-steers and heifers) shows an increase in the next few years, so this venture seeks to cover part of it. At the regional level, the main refrigerators that the establishment currently provides have availability in processing capacity.

From the analysis of the offer, it is observed that there is a large concentration of cattle in the region and of cold stores that have the potential to acquire the cattle produced by the enterprise.

The price analysis of standing beef allowed to establish a policy of penetration in the market through lower prices with respect to the competition.

The possible marketing channels reflect that it does not require a large investment for livestock distribution, only enough capital must be available to hire the most appropriate logistics operator, if necessary.

Finally, it can be noted that there is a potential market in the commercialization of cattle fattened in feedlot or pen, although there are producers who still prefer the extensive technique, but it must be taken into account that, due to the advance of agriculture, the The national and regional trend is the implementation of feedlot farming (intensive method).

In the technical study, the physical space in which the enterprise will be carried out was described, showing the characteristics it has for its operation. In addition, the productive capacity of the project was calculated and the necessary facilities for the fattening and care of the cattle were detailed. The environmental standards that the feedlot must comply with and the possible environmental impacts that this may cause, as well as the measures necessary to mitigate them, were described. As for the legal status, we opted for a Limited Liability Company or S.R.L., since it provides the seriousness and operability sought.

As a result of the Economic-Financial evaluation, it is concluded that both the 300 kg diet and the 340 kg diet scenario show negative results in the considered planning horizon, so the project must be rejected as such. it was designed.

When analyzing the 340 kg diet scenario, which yields the best result between the two situations, a negative Net Present Value is obtained but an Internal Rate of Return of 0.031% (value less than the discount rate) and Period of Recovery of the investment of 5 years. In the same way, these values show that the project is not economically feasible.

The sensitivity analysis was carried out for an increase in the number of head of cattle to be produced during the repayment period for the 340 kg diet. As a result, it is obtained that for the venture to be profitable, it must make an increase of at least 230% in the initial capacity of the project, for which reason the possibility of a change in the location of the feedlot, the reorganization of the spaces of the current lot or contract a hotel service for the fattening and care of the animals. Also, a sensitivity analysis could be carried out taking into account other variables such as, for example, an increase in the sale price of steers and heifers or a reduction in the price of the raw material of the animal's diet.

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