FED CATTLE SOURCING METHODS ASSESSMENT FOR URUGUAYAN PACKERS

by

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ABSTRACT

During the last 20 years important changes have taken place in the Uruguayan beef chain. Production of grain finished cattle has become a common practice, supply agreements between packers and groups of farmers have increased and packers have begun to own feedyards. Consequently, the number of cattle pre-committed for procurement by a packer has increased significantly.

Three sourcing methods are commonly used by packers to ensure captive supply of grain finished fed cattle: marketing agreements, custom feeding and owning a feedyard. The objective of this thesis is to determine the method or combination of methods that result in improved Uruguayan packer profitability through enhanced packer plant management and utilization.

To achieve this objective, a quantitative and qualitative analysis using the different sourcing methods was carried out. The analysis looked to identify the drivers that determine why packers resort to one method of procurement rather than other, or a combination of them; and to determine the methods that result in better packer economic results and plant management.

The results show that there is no difference between using marketing agreements and custom feedyards, and that resorting to owned feedyards entails higher costs, using current values for feedyard feed and yardage and 2005-2009 average cattle prices. When different scenarios are assessed, custom feeding emerges as the most cost effective option, followed by marketing agreements. However, when qualitative analysis is included, some doubts

arise regarding the quantitative advantage of custom feedyards over the alternatives, and a combination of marketing agreements and owned feedyards may be the best option.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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CHAPTER I: INTRODUCTION

Traditionally, Uruguayan producers have raised their cattle in grass fed systems and have sold the animals in the spot market directly to packers or through middlemen. As a consequence, transmission of price signals from packers to producers has been poor; quality of beef cattle varies significantly among lots from different producers and even among lots from the same producer. In addition, finished cattle supply depends on grass availability determined mainly by weather conditions.

During the last 10 years, some changes have occurred in the Uruguayan beef chain. Production of grain finished cattle has become a common practice reaching almost 10% of total slaughter; supply agreements between packers and groups of farmers have appeared reaching similar proportions; and packers, who used to own some ranches and produce grass fed cattle, now have their own feedyards. Although, there are no official figures regarding the number of cattle that are pre-committed for procurement by a packer, it is thought that it is increasing and might be near 15% of total slaughter, at least in some plants.

Some important reasons for these changes have been:

- The significant advancement of crops in areas traditionally used for livestock production, reducing the land available to finish beef cattle and increasing grain available to feed animals;
- Packers investment in slaughter capacity;

- Acquisition of local plants by global companies (Marfrig, JBS-Bertin) representing around 30% of Uruguayan slaughter; and
- Reduction of cattle available for slaughter as a consequence of a severe drought and an increase in Uruguayan live cattle exports.

The objective of this thesis is to determine the sourcing method or combination of methods that result in improving Uruguayan packer profitability through enhanced plant management and utilization. A quantitative and qualitative analysis of different sourcing methods for committed procurement of grain finished fed cattle will be carried out to identify the drivers that determine why packers resort to one or to a combination of methods; and to determine which method or combination of methods results in better economic results and plant management.

The focus will be on grain finished steers, the most desired category given that grain finishing systems increase homogeneity among animals and allow packers to design a slaughter schedule through the year, regardless of weather conditions.

Results will be useful for packers to make decisions regarding methods of captive supply, and also for producers to understand where the opportunities are to meet packers' needs.

To achieve the objective, a literature review of captive supply drivers and their implications for packers will be carried out. Then the theory will be developed to understand what the fundamentals are for captive supply. Afterwards, the methodology used will be presented.

Three sourcing methods will be evaluated: marketing agreements, custom feedyards and feedyards owned by packers. A description of these methods, together with the quantitative and qualitative results will be discussed. Finally, conclusions will be explained.

CHAPTER II: LITERATURE REVIEW

The literature review focuses on Captive Supply Drivers and Captive Supply Methods and Implications for Packers mostly for the US beef industry; given that research on Captive Supply for the Uruguayan beef chain is scarce.

2.1 Captive Supply Drivers

Concentration in beef packing has been accompanied by changes in cattle procurement methods, mainly increasing the participation of packers in cattle feeding (Schroeder et al., 1991). Increases in packing plant size has lead packers to look for new ways to keep plants working at optimal capacity or limiting variation in throughput rates, therefore resorting to captive supply, in some cases through contractual arrangement with suppliers (Hunnicutt and Weninger, 1999).

"GIPSA defines committed procurement as livestock that are owned or fed by a packer more than 14 days prior to slaughter, livestock that are procured by a packer through a forward contract or marketing agreement that has been in place for more than 14 days, or livestock that are otherwise committed to a packer more than 14 days prior to slaughter. This definition includes animals procured through forward contracts, marketing agreements, and packer feeding arrangements" (USDA, 2008 - p. 5.).

Based on U.S. Department of Agriculture reports, in 1997 almost 16% of steers and heifers slaughtered were procured through forward contracting and marketing agreements and 3.8% were own by packers. In 2006, forms of committed procurement amount to the 40% of the slaughter for the top four steer and heifer packers. This value consists of 27% using

marketing agreements, 7% using forward contracts and 7% using packer feeding (USDA, 2008).

Anderson and Trapp (1999) suggest that coordination between feeders and packers may improve competitiveness of the beef sector. Non-price coordination methods may help to improve the coordination process, given that prices may not be enough to transmit precise information across the beef chain.

Williamson's vertical coordination theory divides investments in three categories: nonspecific, mixed and idiosyncratic (with very specific uses). For mixed investments, when transactions occur frequently, contracting is the cost minimizing method of coordination. On the other hand, for idiosyncratic investments, direct ownership is the cost minimizing coordination method (Anderson and Trapp, 1999).

Anderson and Trapp (1999) mentioned three possible incentives for vertical coordination offered by different authors: (1) investments in packing plants during the last years have idiosyncratic characteristics; (2) packers desire to operate at full capacity to minimize per unit costs; (3) packers and feeders share incentives to contract, to reduce risk or guarantee they will have a buyer (or supplier) for the cattle.

Schroeder et al. (1991) suggest that some of the reasons for captive supply are: (1) "to increase the ability to control slaughter schedules" (p. 1), (2) "to guarantee a stable source of cattle" (p. 2), (3) "to secure a given quantity of cattle for slaughter" (p. 3), and (4) to reduce costs as a result of a more steady volume of slaughter.

When comparing the processing cost of a plant working at full capacity with one operating at average cost, Anderson and Trapp (1999) identified differences that can be divided into two components: cost of operating below the optimal capacity, and cost of variability around the average level. The first component accounts for more than half of that difference (60 to 84%) with the second responsible for the remaining difference (16 to 40%).

Anderson and Trapp (1999) determined the values of optimal capacity as an average of the 15 largest slaughter days but realized that this method may not be 100% accurate. Even when the slaughter levels represent a certain percentage of the real optimal capacity, it couldn't be determined whether the differences were due to scarce cattle supply during the period studied, overestimated the optimal capacity, or a combination of both.

Variations in cattle and thus carcass quality are issues packers manage. Methods to reduce such variability will contribute to improved industry efficiency.

Hunnicutt and Weninger (1999) suggest that due to the long time period required to produce an animal for slaughter, producers need almost two years to increase their production as a result of a price signal. As a consequence, packers need to use alternatives to make their strategic decisions.

2.2 Captive Supply Methods and Implications for Packers

Schroeder et al. (1991) and Sweatt et al. (1996) mentioned three methods of captive supply: 1) packer-owned cattle, 2) forward contracts, and 3) marketing agreements (including formula pricing and grid pricing).

Referring to the net benefits of coordination, Anderson and Trapp (1999) state that "there are no estimates of whether one set of parties (buyers and sellers) or both gain or lose, and how much one set gains or loses relative to the other" (p. 5).

Anderson and Trapp (1999) state that the number of cattle slaughtered each week determines costs for packers, who face a U-shaped short run cost curve. They found that the optimal weekly slaughter size ranges from 800 to 1,200 head depending on the plant size (smallest and biggest respectively). They also found that deviations from the optimal size not only affects costs but also revenues to packers because increases in slaughter volume reduce boxed beef prices.

Using "the day-to-day marketing flexibility that feedlots have" could help stabilize the "short-run flow of cattle into packing plants" (Anderson and Trapp, 1999 - p. 2). However, because in some marketing agreements feeders define the delivery schedule, packers will determine other deliveries depending on marketing agreement cattle deliveries (Schroeder et al., 1997). Thus, information regarding the number of animals ready for slaughter in the short- or mid-term in the feedlots is needed by packers to optimize their cattle procurement.

Studying different coordination strategies on the volume of cattle and boxed beef produced, Anderson and Trapp (1999) found that strategies where a high volume of cattle were slaughtered resulted in a high volume of boxed beef produced, reducing boxed beef prices down, as well as industry profits. Slaughter weight was also identified as a main factor in the volume of box beef produced.

Anderson and Trapp (1999) concluded that “large gains in industry-level profits can be made using relatively simple non-price coordination strategies” (p.25). These non-price coordination strategies are not optimal for packers or for feeders individually.

Price variation increases when cattle are procured through grid pricing, and it can be twice the variation than observed with average prices. High quality cattle receive higher prices; but lower quality cattle are discounted and receive lower prices than when procured through average prices. Average prices don’t recognize the real value of different animals and "higher quality cattle subsidize lower quality cattle" by 30US$/head or more (Ward et al., 1999 – p.1). This has implications for both producers and packers. Producers should know their cattle to be sure they receive the price they expect, and packers should pay lower prices for lower quality cattle that they may have subsidized with average prices.

Variation in prices using grid or formula pricing may be attributed to different factors. Grids and formulas vary among packers in terms of premiums and discounts. Base prices used differ among packers as well. Finally, base price and cattle quality are also variables.

With formula pricing, an external price is needed, so certain level of market information is required. With grid pricing premiums and discounts determined according to quality specifications; a formula might be included to determine the base price or base prices can be determined by negotiation (Ward et al., 1999).

According to Ward et al. (1999), grid pricing allows value-based marketing methods, and clearer signals are sent down the beef chain from consumers to producers.

With fed cattle are owned by packers, packers have total control over cattle supply, so they can use it more easily to maintain a stable slaughter volume. On the contrary, the slaughter schedule of cattle procured through marketing agreements also depends on producers' decisions (Schroeder and Ward, 2006).

Some research has found examined the effect of the volume of captive supplies on cattle market prices. In Kansas and Colorado, it's been determined that there is a decline of $0.02-0.05/cwt for each 1,000 head. However, no statistically significant effects have been found in Texas or Nebraska. On the other hand, a study carried out for GIPSA found that a 1% increase in captive supplies resulted in less than a 0.003% decrease in fed cattle prices. Thus, the impacts of captive supplies on fed cattle prices, although negative, are small (Schroeder et al., 1997).

2.3 Conclusions

Depending on the captive supply method chosen, packers experience differing benefits. In all cases, they have the ability to reduce procurement costs and secure their cattle needs. This allows plants to operate near capacity.

Packers also know the type and quality of cattle they will receive, having more control on quality as they are more involved in the production process (total control with packer owned cattle).

Most literature refers to qualitative benefits, and concentrates on the captive supply effect on cash fed cattle price. However, it has been difficult to find information to quantify the

impact of captive supplies and the combination of different methods of captive supply on the packers' economic results.

A quantitative evaluation of some of the captive supply methods mentioned in the literature is needed to know the economic benefits for packers of choosing each method.

CHAPTER III: THEORY

In the literature review it was observed that methods of captive supply as a means of non-price coordination, to increases profit for packers and, consequently, for the whole beef chain.

Some of the identified benefits of captive supply were:

- To improve competitiveness of the beef sector (Anderson and Trapp, 1999);
- To work at full capacity to minimize per unit costs (Anderson and Trapp, 1999);
- To reduce risk or guarantee a supplier of cattle (Anderson and Trapp, 1999; Schroeder et al., 1991);
- To increase control on slaughter schedules given by securing a given quantity of cattle for slaughter and a more steady volume of slaughter (Schroeder et al., 1991).

The theory behind these arguments is aligned with supply chain theory. The objective of supply chain coordination is to maximize the value generated from the whole chain (Chopra and Meindl, 2007). Given that captive supply methods are in fact procurement methods, the focus of this paper is specifically related to sourcing concepts.

According to Chopra and Meindl (2007) sourcing refers to those activities required to purchase goods and services. The main reasons to outsource are the level of efficiency and the responsiveness the supply chain can achieve. In some cases, third parties can take advantage of economies of scale or have lower costs. Thus, many decisions must be taken within a company regarding sourcing methods. Chopra and Meindl (2007) specifically mention the following components of sourcing decisions:

- In-house or outsource - referring to which goods are produced in-house and which are outsourced.
- Supplier selection - referring to whether to source from a single supplier or from a group of suppliers. The role of each supplier should be defined. This component also includes defining the criteria to select and evaluate suppliers and negotiating contracts to define roles to minimize information asymmetries.
- Procurement - referring to the process the supplier should carry out to respond to customer orders.
- Sourcing-related metrics - includes all metrics that influence supply chain performance.
- Overall trade-off increases the supply chain profits. Sourcing decisions should be driven by their effect on total supply chain profit. The company should outsource when the supplier increases the total supply chain profit. When the supplier cannot increase the supply chain profit or when the risk related to outsourcing is too high, then the company should produce the good in-house.

The most important sourcing-related metrics are (Chopra and Meindl, 2007): a) days payable outstanding: number of days between when the order is delivered and the payment is done; b) average purchase price: all units of a certain good purchased all over the year weighted by the quantity purchased at each price; c) fluctuation in price during a period of time, looking to identify whether there is relationship between quantity and price; d) average amount purchased per order, looking to identify whether there is enough aggregation within an order; e) fraction of deliveries that were on time; f) quality of the

product provided by the supplier; and g) average time between when the order is placed and the product is delivered.

This paper focuses on a quantitative evaluation of sourcing related metrics and overall trade-off, to help a packer decide on the first component of sourcing: whether to outsource or produce in-house.

CHAPTER IV: METHODOLOGY

The methodology chosen for the quantitative evaluation consists of developing a spreadsheet model for mathematical optimization. Net Present Value Analysis (NPV) is used to define the coefficients of the variables of the objective function in the model.

For the qualitative analysis, interviews with packers' representatives will be carried out.

4.1 Spreadsheet Model and Mathematical Optimization

Spreadsheet models are an alternative to decision analysis. According to Ragsdale (2008), a spreadsheet model "is a set of mathematical relationships and logical assumptions implemented in a computer as a representation of some real-world decision problem or phenomenon" (p. 1). Some of the advantages of these models are (Ragsdale, 2008):

- They are simplified versions of the problem;
- They represent a cheaper way to analyze decision problems;
- They usually provide information "in a more timely way" (p. 4);
- They allow the analysis of issues that are not possible to analyze in real world;
- They help better understand the decision problem.

Ragsdale (2008) defines three categories of mathematical models shown in Table 4.1. A prescriptive model is used for this thesis as it helps determine the values of independent variables that result in the best alternative for the dependent variables.

Decision problems analyze how to better allocate resources to maximize profits or minimize costs. Mathematical optimization "is a field of management science that finds the

optimal, or most efficient, way of using limited resources to achieve the objectives of an individual or a business" (Ragsdale, 2008 – p.17). According to Ragsdale (2008) all optimization problems have three components:

- The decisions that must be made;
- The constraints on the alternatives available to the decision maker; and
- The objective to decide which solution is best.

Table 4.1 Categories and characteristics of management science modeling techniques

Category	Model Characteristics		Management Science Techniques
	Form of f(●)	Values of Independent Variables	
Prescriptive Models	known, well-defined	known or under decision maker's control	Linear Programming, Networks, Integer Programming, CPM, Goal Programming, EOQ, Nonlinear Programming
Predictive Models	unknown, ill-defined	known or under decision maker's control	Regression Analysis, Time Series Analysis, Discriminant Analysis
Descriptive Models	known, well-defined	unknown or uncertain	Simulation, Queuing, PERT, Inventory Models

Source: Ragsdale, 2008.

From the many different applications of mathematical optimization, this paper focuses on determining product mix; where each of the different procurement methods represent a product.

The modeling objective helps to make decisions, but, as Ragsdale (2008) indicates, "good decisions do not always result in good outcomes" (p. 11). Many other factors can affect or determine results, but making decisions based on models reduces the odds of making mistakes during a decision process.

4.2 Net Present Value Analysis (NPV)

Net Present Value is a financial tool used out to evaluate whether an investment is profitable. NPV is based on the time value of money and the present value of the investment. Time value of money principle is that "a dollar today is worth more than a dollar tomorrow" (Brealey et al, 2006 – p. 16).

The present value of an investment can be obtained from the expected cash flows of investment and the rate of return of an alternative equally risky investment. The rate of return is also called the opportunity cost of capital, as it represents the return missed by investing in the project rather than in an equally risky alternative (Brealey et al, 2006).

Cash flows of the investment discounted by the rate of return and summed result in the present value. To obtain the NPV, the initial investment should be subtracted from the present value. Projects with positive NPV are profitable and should be invested in.

The NPV is a useful tool to compare different projects within the company. Using NVP analysis ensures the company will invest in those projects with the highest return.

In this paper the NPV analysis is used to evaluate the profitability of investing in a feedlot owned by the packer, rather than using other procurement methods.

4.3 Interviews

Choosing among different sourcing methods includes issues that are difficult to quantify. A qualitative evaluation of those issues is important to understand what those issues are and how they influence the decision making process. Thus, interviews with packer representatives were carried out to determine the reasons packers use captive supply, the optimal proportion of annual slaughter or volume of cattle that are procured in advance through methods of captive supply, the opportunity cost of capital they currently use and the costs they incur when working at reduced capacity.

Interviews with feedyards managers were also completed to gather information on feedyard costs in Uruguay. Managers were asked about feed and yardage costs, and feedyard capacity, economies of scale and available capacity to work as custom feedyard to feed packers cattle.

Interviews were carried out by phone calls and e-mails from August to November 2010.

CHAPTER V: SOURCING METHODS EVALUATION

5.1 Sourcing methods description

Three sourcing methods of cattle for a packer are evaluated: marketing agreements, custom feeding and owning a feedyard.

In all three cases, eight entry periods will be considered, with 2,500 head per period, for a total of 20,000 head produced per year. These periods are determined based on the evaluation of the last five years slaughter of one of the top-10 (in cattle head slaughtered per year) Uruguayan plants. The periods are presented in Table 5.1.

Table 5.1 Confinement periods

	PERIOD 1	PERIOD 2	PERIOD 3	PERIOD 4	PERIOD 5	PERIOD 6	PERIOD 7	PERIOD 8
	Mar-Jun	Apr-Jul	May-Aug	Jun-Sep	Jul-Oct	Aug-Nov	Nov-Feb	Dec-Mar
Date In	**15-Mar**	**15-Apr**	**15-May**	**15-Jun**	**15-Jul**	**15-Aug**	**15-Nov**	**15-Dic**
Date Out	**15-Jun**	**16-Jul**	**15-Aug**	**15-Sep**	**15-Oct**	**15-Nov**	**15-Feb**	**17-Mar**
Days	**92**	**92**	**92**	**92**	**92**	**92**	**92**	**92**

5.1.1 Marketing agreements

These are contractual agreements between packers and producers or group of producers. Producers supply fed steers with well defined quality and production attributes including breed or breed-crosses, age, weight, fat cover and grain fed for a minimum period; fulfilling a schedule previously agreed with the packer.

Packers receive the cattle according to the schedule previously agreed on with the producer and pay according to grid of prices defined in the contract. Grids usually take an INAC[1] index as a base price and define premiums and discounts for combinations of the attributes required.

[1] INAC: National Meat Institute

The grid used in the current analysis is presented in Table 5.2. This grid admits animals up to 6 teeth (age), fat cover 2 or higher (Uruguayan System) and 90 days minimum in the feedyard. Animals not reaching those standards, no matter their weight, go to 3rd category.

Table 5.2 Grid for grain fed steers

Category	Carcass weight	Premium / Discount
1st	> 240 kg	8%
2nd	220 - 240 kg	5%
3rd	< 220 kg	-5%

In the marketing agreement, the packer has little control on the type of cattle procured or the diet the animals receive during the finishing period. The packer only controls the price paid for cattle based on the requirements defined in the grid, but does not know how the cattle fall on the grid.

5.1.2 Custom feedyard

Custom feedyards feed and manage cattle for customers. Fees are charged for feed and management services; usually daily fees for feed and daily fees or a single fee for the whole period for management. Cattle owners decide where and when to sell their animals.

In the custom feedyard, the packer has higher control on the cattle procured they already own the cattle and have decided on the type of cattle sent to the feedyard. However, control on the diet is under the feedyear's control.

Due to the capacity of Uruguayan custom feedyards (from 500 to 3,000 head), cattle are often located in many different units.

5.1.3 Owned feedyard

In an owned feedyard, the packer owns and manages the feedyard and decides, not only what type of cattle will be confined, but also the feed cattle will receive.

To satisfy the confinement periods plan, (Table 5.1) the feedyard should have an 8,000 head capacity.

5.2 Quantitative evaluation

5.2.1 Cattle and feed values

Prices for yearlings and fed cattle included in the analysis are an average of 2005-2007 and 2009 values for the months when yearlings are expected to come into the feedyard and fed cattle are expected to be slaughtered, respectively. The year 2008 was not included because of the dramatic changes in prices (increases and then decreases) observed that year. The source for the yearling prices was the Asociación de Consignatarios de Ganado (Livestock Middlemen Association) and for fed cattle was the Instituto Nacional de Carnes (National Meat Institute).

Feed values are the current values charged by the custom feedyards consulted. These values were also used for the owned feedyard assuming that both options would define roughly the same diet and thus would have about the same costs. In the case of the owned feedyard, given its capacity, some economies of scale could apply, but they were not considered in the analysis.

5.2.2 Management fees and feedyard installation costs

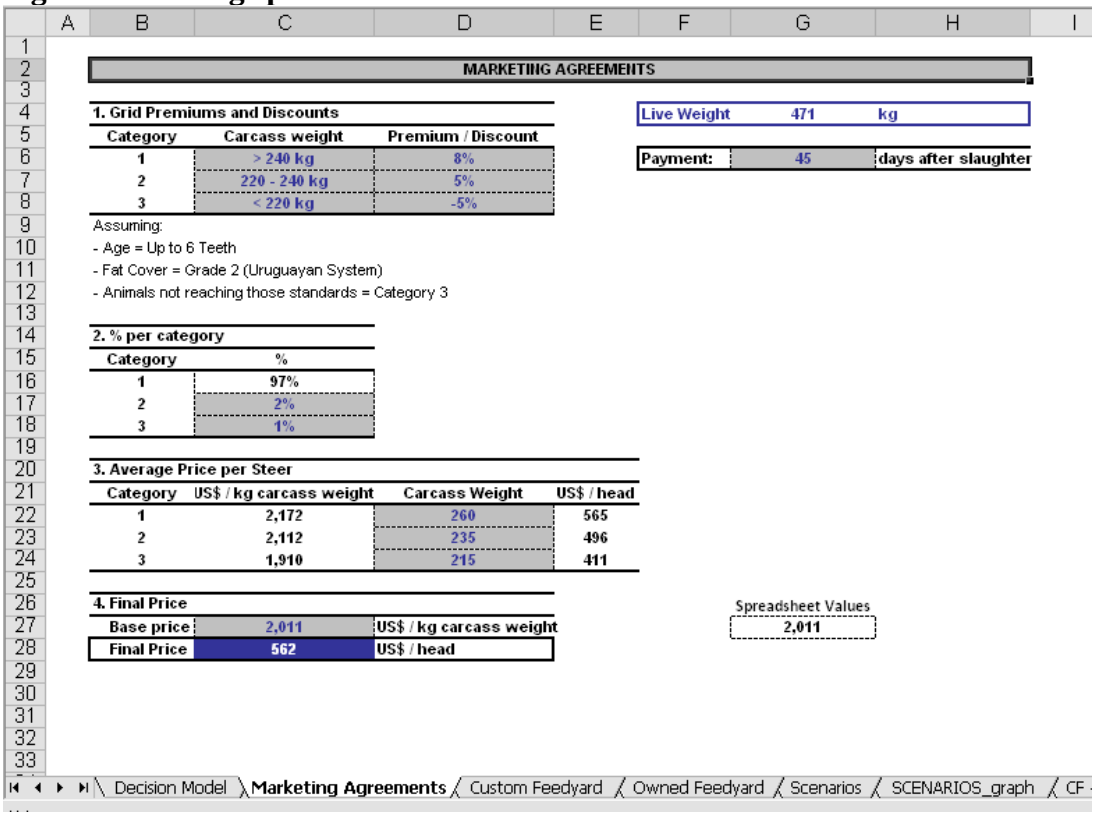
The custom feedyard management fee is an average of the current fees charged by the custom feedyards surveyed.

Investment for the owned feedyard was calculated using current prices for building materials, labor, salaries, machinery, land and all other costs.

5.2.3 Cost of a steer supplied through marketing agreement

The cost for the packer of a steer supplied by producers is US$ 562, based on the grid presented in Table 5.2 that paid 45 days after slaughter. Average weights assumed for animals in each category and base price are presented in Figure 5.1. As mentioned above, the base price is the average for slaughter moments for the last five years.

Figure 5.1 Average price for a contracted steer



MARKETING AGREEMENTS

1. Grid Premiums and Discounts

Category	Carcass weight	Premium / Discount
1	> 240 kg	8%
2	220 - 240 kg	5%
3	< 220 kg	-5%

Assuming:
- Age = Up to 6 Teeth
- Fat Cover = Grade 2 (Uruguayan System)
- Animals not reaching those standards = Category 3

Live Weight 471 kg

Payment: 45 days after slaughter

2. % per category

Category	%
1	97%
2	2%
3	1%

3. Average Price per Steer

Category	US$ / kg carcass weight	Carcass Weight	US$ / head
1	2,172	260	565
2	2,112	235	496
3	1,910	215	411

4. Final Price

Base price	2,011	US$ / kg carcass weight
Final Price	562	US$ / head

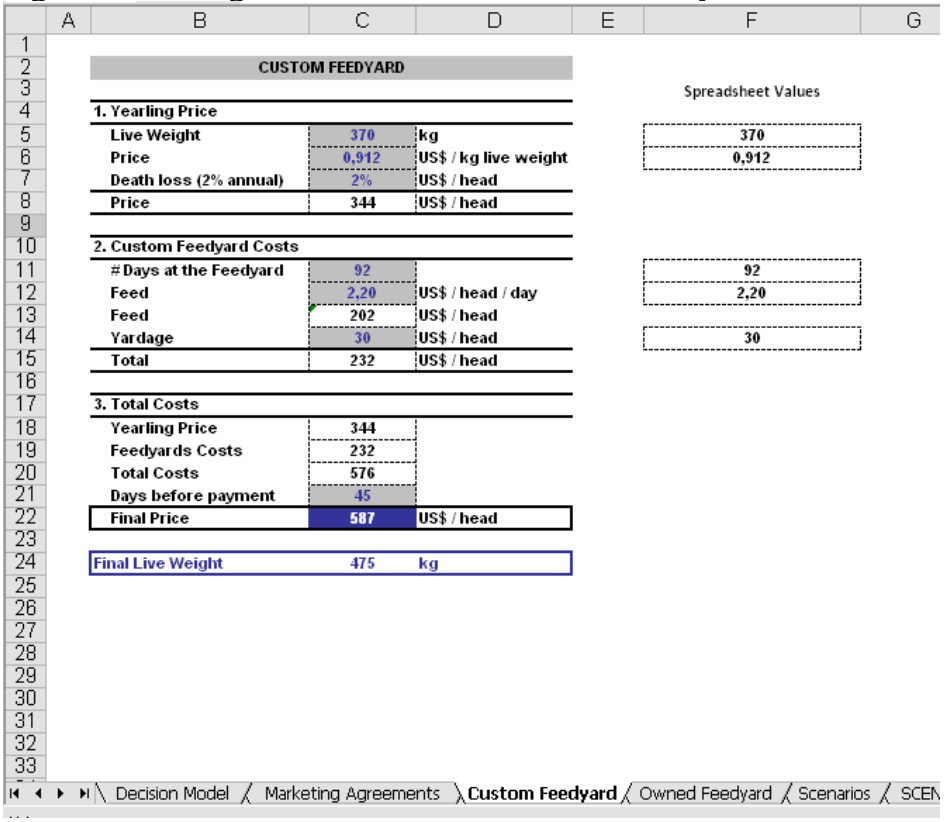
Spreadsheet Values: 2,011

Decision Model | Marketing Agreements | Custom Feedyard | Owned Feedyard | Scenarios | SCENARIOS_graph | CF

5.2.4 Cost of a steer supplied through custom feedyard

The cost to the packer for a steer supplied from the custom feedyard is US$ 587, assuming an interest rate of 6% for having the cattle 92 days at the feedyard. The interest cost on feed costs is calculated for 46 days (half the finishing period) and then another 45 days to receive payment. Values are presented in Figure 5.2.

Figure 5.2 Average cost of a steer in the custom feedyard



		CUSTOM FEEDYARD			
					Spreadsheet Values
	1. Yearling Price				
	Live Weight	370	kg		370
	Price	0,912	US$ / kg live weight		0,912
	Death loss (2% annual)	2%	US$ / head		
	Price	344	US$ / head		
	2. Custom Feedyard Costs				
	# Days at the Feedyard	92			92
	Feed	2,20	US$ / head / day		2,20
	Feed	202	US$ / head		
	Yardage	30	US$ / head		30
	Total	232	US$ / head		
	3. Total Costs				
	Yearling Price	344			
	Feedyards Costs	232			
	Total Costs	576			
	Days before payment	45			
	Final Price	587	US$ / head		
	Final Live Weight	475	kg		

Decision Model | Marketing Agreements | Custom Feedyard | Owned Feedyard | Scenarios | SCEN

5.2.5 Cost of a steer supplied through owned feedyard

The cost for the packer of a steer supplied from the owned feedyard is US$ 592, assuming an opportunity cost of capital of 6%.

The NPV for investing in an 8,000 head capacity feedyard is US$ - 85.608.543, considering no income for the steers. Solving for an NPV of zero, each steer should be valued in US$ 592.

The cost of steers finished in the owned feedyard is in Figure 5.3

Figure 5.3 Average cost of a steer in the owned feedyard

	OWN FEEDYARD				
					Spreadsheet Values
	1. Yearling Price				
	Live Weight	370	kg		370
	Price	0,912	US$ / kg live weight		0,912
	Death loss (2% annual)	2%	US$ / head		
	Price	344	US$ / head		
	2. Owned Feedyard Costs				
	# Days at the Feedyard	92			92
	Feed	2,20	US$ / head / day		2,36
	Feed	202	US$ / head		
	Veterinary treatments	3,21	US$ / head		3,21
	Yardage	0,18	US$ / head / day		0,18
	Yardage	17	US$ / head		
	Depreciation	2,52	US$ / head		2,52
	Costs (feed not included)	23	US$ / head		
	Feedyard Costs	225	US$ / head		
	3. Total Costs				
	Yearling Price	344			
	Feedyards Costs	225			
	Total Costs	569			
	Final Price	592	US$ / head		
	Final Live Weight	475	kg		

Marketing Agreements | Custom Feedyard | Owned Feedyard | Scenarios | SCENARIOS_graph | CF - Ir

The average cost of a steer supplied through owned feedyard was estimated through an NPV analysis of the owned feedyard investment. In this analysis, a 10 year amortization period and an opportunity cost of capital of 6% were considered. Table 5.3 illustrates the variables and values taken into account for the NPV analysis.

More information on the feedyard investment is in Appendix 1.

Table 5.3 Owned Feedyard Investment NPV

NPV	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Heads		20000	20000	20000	20000	20000	20000	20000	20000	20000	20000
Investment	(1.008.260)										504.130
Income	0	11.841.436	11.841.436	11.841.436	11.841.436	11.841.436	11.841.436	11.841.436	11.841.436	11.841.436	11.841.436
Costs		(11.331.232)	(11.331.232)	(11.331.232)	(11.331.232)	(11.331.232)	(11.331.232)	(11.331.232)	(11.331.232)	(11.331.232)	(11.331.232)
Feed		(4.048.000)	(4.048.000)	(4.048.000)	(4.048.000)	(4.048.000)	(4.048.000)	(4.048.000)	(4.048.000)	(4.048.000)	(4.048.000)
Veterinary treatments		(64.272)	(64.272)	(64.272)	(64.272)	(64.272)	(64.272)	(64.272)	(64.272)	(64.272)	(64.272)
Yardage		(337.071)	(337.071)	(337.071)	(337.071)	(337.071)	(337.071)	(337.071)	(337.071)	(337.071)	(337.071)
Yearlings		(6.881.889)	(6.881.889)	(6.881.889)	(6.881.889)	(6.881.889)	(6.881.889)	(6.881.889)	(6.881.889)	(6.881.889)	(6.881.889)
Depreciation		(50.413)	(50.413)	(50.413)	(50.413)	(50.413)	(50.413)	(50.413)	(50.413)	(50.413)	(50.413)
Pre-tax Profit		459.791	459.791	459.791	459.791	459.791	459.791	459.791	459.791	459.791	459.791
Tax (2,6%+4,8/head)		(403.877)	(403.877)	(403.877)	(403.877)	(403.877)	(403.877)	(403.877)	(403.877)	(403.877)	(403.877)
After-tax Profit		55.914	55.914	55.914	55.914	55.914	55.914	55.914	55.914	55.914	55.914
After-tax Cashflow		106.327	106.327	106.327	106.327	106.327	106.327	106.327	106.327	106.327	106.327
Working Capital	(126.402)										126.402
Total Cashflow	(1.134.661)	106.327	106.327	106.327	106.327	106.327	106.327	106.327	106.327	106.327	736.858
Opportunity cost	6%										
NPV	0										
Value / Head	592										

5.3 Decision model

The three components of the decision model are discussed below.

The objective function is to minimize the total cost of finishing 20,000 steers. The decision that must be made is to the number of steer procured from each sourcing method. Initially there were three constraints identified: (1) quality differences among cattle coming from different sources; (2) the degree of delivery fulfillment and its effect on plant efficiency; and (3) the minimum amount of proportion of cattle needed coming from a specified source.

After gathering information and interviewing packers' representatives, it was found that some constraints were not easy to quantify, or present no difference among the three methods of procurement.

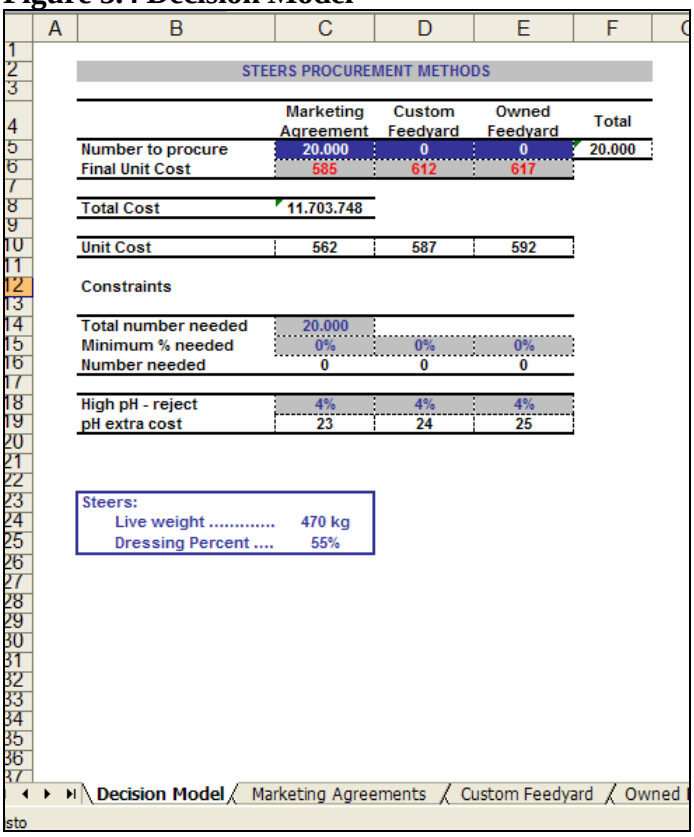
Regarding quality differences, it was found there is no reason to expect differences in carcass attributes among the three different sourcing methods. In terms of beef quality, measured as % of carcasses with adequate pH value, there are no differences in steers coming from different sources. As a consequence, the decision model includes the option to include different pH values for each sourcing method, but the same value of rejected carcasses with high pH was assumed for the three methods in the scenarios evaluated. An increase in rejected carcasses with high pH, results in an equal increase in per head cost. Thus, when differences among steer costs from the three sourcing methods, measured in %, are higher than the % of high pH rejected carcasses, having carcasses with no pH rejection from the owned feedyard (while carcasses from the other sources have some rejection) will not mean that using that sourcing method will result in lowest cost steers.

Regarding the schedule fulfillment, it was found that plants have not quantified the effect on plant efficiency of failing to fulfill the schedule defined in the marketing agreement, so this constraint was not included in the model.

Regarding the minimum proportion of cattle by source, there are no minimum amounts (other than zero or less) from any of the three sourcing methods evaluated. This constraint was included in the model and it can be taken into account when it is needed to solve the objective function.

The model is solved with Solver. A screen print of the model spreadsheet and of the Solver parameters is in Figures 5.4 and 5.5. Cells with grey shade and blue font can be modified.

Figure 5.4 Decision Model



STEERS PROCUREMENT METHODS

	Marketing Agreement	Custom Feedyard	Owned Feedyard	Total
Number to procure	20.000	0	0	20.000
Final Unit Cost	585	612	617	
Total Cost	11.703.748			
Unit Cost	562	587	592	
Constraints				
Total number needed	20.000			
Minimum % needed	0%	0%	0%	
Number needed	0	0	0	
High pH - reject	4%	4%	4%	
pH extra cost	23	24	25	

Steers:
Live weight ..... 470 kg
Dressing Percent 55%

Decision Model | Marketing Agreements | Custom Feedyard | Owned

Figure 5.5 Solver Parameters

In terms of the spreadsheet design:

- The objective function is *Total Cost*, cell C8 (Figure 5.4 and 5.5).
- The decision to be made is *Number to procure*, referred to the number of steers to be procured from each sourcing method, defining variable cells C5, D5 and E5 (Figure 5.4 and 5.5).
- The constraints are:
    - The minimum *Number needed*, cells C16, D16 and E16, are linked to a minimum % sourced from each method, cells C15, D15 and E15 (Figure 5.4 and 5.5).
    - The high pH extra cost, cells C19, D19 and E19, are linked to % of *High pH reject* for each method, cells C18, D18 and E18 (Figure 5.4 and 5.5).
    - For each sourcing method the *Number to procure* should be equal to or higher than *Number needed* (Figure 5.5).
    - *Number needed* should be positive and integer values (Figure 5.5).
    - The sum of *Number to procure*, cell F5 should be equal to the *Total number needed*, cell C14 (Figure 5.4 and 5.5).

5.4 Scenarios

To assess the robustness of results under diverse circumstances, changes were made in seven variables with different scenarios defined. The base assumptions for the initial calculation is defined as Scenario 0. The modified variables are described below.

Yearling Price

- Scenario 0: Average of values for all entering months for years 2005 to 2007 and 2009 (Source: Asociación de Consignatarios de Ganado – Livestock Middlemen Association).
- The average value for May for years 2005 to 2007 and 2009, given it is the month with the lowest average price.
- The average value for November for years 2005 to 2007 and 2009, given it is the month with the highest average price.

Fed Steer Price

- Scenario 0: Average of values for all slaughter months for years 2005 to 2007 and 2009 to 2010 (Source: Instituto Nacional de Carnes – National Meat Institute).
- The average value for March for years 2005 to 2007 and 2009 to 2010, given it is the month with the highest average price.
- The average value for June for years 2005 to 2007 and 2009 to 2010, given it is the month with the lowest average price.

Feed

- Scenario 0: Average of current values charged by the custom feedyards consulted.
- A 15% increase on current values.
- A 15% decrease on current values.

OF Yardage

- Scenario 0: Yardage costs for the owned feedyard considering current values.

- A 15% increase on current values.
- A 15% decrease on current values.

Depreciation

- Scenario 0: Depreciation of the investment for the owned feedyard that was calculated using current prices for building materials, labor, salaries, machinery, land and all other cost included.
- A 15% increase on current values.
- A 15% decrease on current values.

CF Yardage

- Scenario 0: average of the current fees charge by the custom feedyards consulted.
- A 15% increase on current values.
- A 15% decrease on current values.

MA Max Premium

- Scenario 0: the maximum premium available in current marketing agreements (8%).
- Maximum premium paid by packers a couple years ago (10%).

A summary of the combination of variables and the values for those variables in each scenario is presented in Table 5.4 and Table 5.5, respectively.

Table 5.4 Summary of variables for alternative scenarios

Scenarios Description							
#	Yearlings Price	Fed Steer Price	Feed	OF Yardage	OF Depreciation	CF Yardage	MA Max Premium
0	Average 2005 - 2007 & 2009	Average 2005 - 2007 & 2009 - 2010	Prices 2010	Prices 2010	Prices 2010	Prices 2010	Current agreement (8%)
1	Average May 2005 - 2007 & 2009	Average Mar 2005 - 2007 & 2009 - 2010	Prices 2010	Prices 2010	Prices 2010	Prices 2010	Current agreement (8%)
2	Average Nov 2005 - 2007 & 2009	Average Jun 2005 - 2007 & 2009 - 2010	Prices 2010	Prices 2010	Prices 2010	Prices 2010	Current agreement (8%)
3	Average 2005 - 2007 & 2009	Average 2005 - 2007 & 2009 - 2010	Prices 2010 + 15%	Prices 2010 + 15%	Prices 2010 + 15%	Prices 2010 + 15%	Current agreement (8%)
4	Average 2005 - 2007 & 2009	Average 2005 - 2007 & 2009 - 2010	Prices 2010 - 15%	Prices 2010 - 15%	Prices 2010 - 15%	Prices 2010 - 15%	Current agreement (8%)
5	Average 2005 - 2007 & 2009	Average 2005 - 2007 & 2009 - 2010	Prices 2010	Prices 2010	Prices 2010	Prices 2010	10%
6	Average May 2005 - 2007 & 2009	Average Mar 2005 - 2007 & 2009 - 2010	Prices 2010	Prices 2010	Prices 2010	Prices 2010	10%
7	Average Nov 2005 - 2007 & 2009	Average Jun 2005 - 2007 & 2009 - 2010	Prices 2010	Prices 2010	Prices 2010	Prices 2010	10%
8	Average 2005 - 2007 & 2009	Average 2005 - 2007 & 2009 - 2010	Prices 2010 + 15%	Prices 2010 + 15%	Prices 2010 + 15%	Prices 2010 + 15%	10%
9	Average 2005 - 2007 & 2009	Average 2005 - 2007 & 2009 - 2010	Prices 2010 - 15%	Prices 2010 - 15%	Prices 2010 - 15%	Prices 2010 - 15%	10%

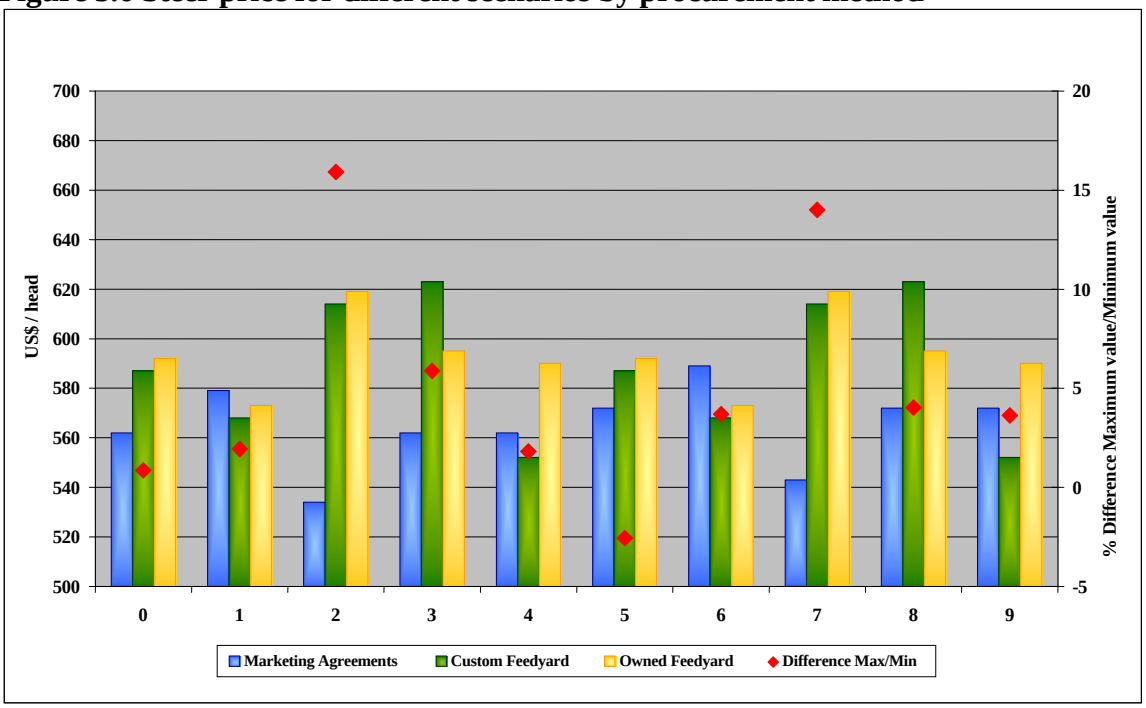
Steer costs for each sourcing method and for each scenario are presented in Figure 5.6.

Table 5.5 Alternative assumptions for different scenarios

Scenarios Values							
Scenario	Yearlings Price	Fed Steer Price	Feed	OF Yardage	OF Depreciation	CF Yardage	MA Max Premium
#	US$ / kg live weight	US$ / kg live weight	US$ / head / day	US$ / head / day	US$ / head	US$ / head	%
0	0,912	2,011	2,20	0,18	2,52	30	8%
1	0,863	2,072	2,20	0,18	2,52	30	8%
2	0,981	1,911	2,20	0,18	2,52	30	8%
3	0,912	2,011	2,53	0,21	2,90	34	8%
4	0,912	2,011	1,87	0,16	2,14	25	8%
5	0,912	2,011	2,20	0,18	2,52	30	10%
6	0,863	2,072	2,20	0,18	2,52	30	10%
7	0,981	1,911	2,20	0,18	2,52	30	10%
8	0,912	2,011	2,53	0,21	2,90	34	10%
9	0,912	2,011	1,87	0,16	2,14	25	10%

Depending on the scenario, the lowest steer price corresponds to marketing agreements or custom feedyards; and highest steer price usually correspond to owned feedyards.

Figure 5.6 Steer price for different scenarios by procurement method



Marketing agreements result in the lowest cost alternative in 6 of the 10 scenarios, but those values represent the price paid using the grid and does not represent production differences. The custom feeyard is the lowest cost alternative for the remaining 4 scenarios. However, in many scenarios (0, 1, 2, 5, 6 & 7) the difference in cost compared to the owned feedyard cost is only US$5 per head. This difference represents 1% of per head total cost and 2% of per head feed cost.

5.5 Qualitative evaluation

The packer representatives interviewed confirmed that Uruguayan packers agree with US packer's reasons to for captive supplies. The main reasons are concentration in the beef packing industry observed the last five years and increases in packing plant size and the need to work at optimal capacity.

Packer representatives also identified other issues that are difficult to quantify, but significantly influence the decision making process regarding sourcing methods.

The first refers to delivery schedule creation and fulfillment. Based on past experience with marketing agreements, there are few doubts that producers are capable of fulfilling delivery schedules. The difficulty to do so could occur due to exceptional problems that affect cattle performance in the feedyard, but in those cases, changes in the schedule can be anticipated and measures can be taken to minimize any potential effect. However, those same problems in cattle performance in the feedyard can also arise both in the custom and the owned feedyard.

Secondly, a captive supply equivalent to 15% of annual slaughter, concentrated in certain periods of the year, prevents packers from having to reduce slaughter or having to close the plants during some weeks. It was not possible to obtain information on costs of working below capacity, but two aspects are worth mention regarding those costs. First, when case packers develop marketing agreements for the same volume of cattle that they would have in the owned feedyard, delivered at the same moments, no difference should be attributed to the different sourcing methods. Secondly, given certain price scenarios, as is the case of scenario 2, the cost of producing a fed steer in custom and owned feedyards is much higher than the price offered through marketing agreements. In such cases, it can be assumed that producers will also face high costs and, thus, will not confine cattle during those periods and packers should look for alternatives. In the event that packers own cattle when returns to feeding are negative, packers would need to counteract losses from confining steers with

packer profits. Consequently they would probably need to define a minimum number of steers supplied from custom or owned feedyards.

Third, having captive supply allows packers to face procurement in the spot market from a different position. When packers have part of the weekly slaughter already scheduled, they need to buy a smaller volume of cattle in the spot market and consequently can offer lower prices. As mentioned in the literature review, the effect of captive supply on market prices has not been determined, and the Uruguayan market is not an exception according to packer and feedyard representatives interviewed. However, the packers' representatives indicated that they are in a better position when they have part of the weekly slaughter already committed and do not need to pay the highest prices for the week. If this could be quantified, the reduction on prices paid in the spot market should be included in captive supply procurement methods to favor these methods. Again, there would be no difference among sourcing methods regarding this issue.

As it was initially discussed, most of these variables have a quantitative component, but in most cases packers have not quantified them or quantification requires commitment and information sharing beyond what packers will provide (as it is the case of evaluating the impact of captive supply on market prices).

CHAPTER VI: CONCLUSIONS

Packers owning a feedyard is always one of the highest cost alternatives as a cattle sourcing method, while confining yearlings in a custom feedyard is in some cases a more cost effective alternative. Some aspects should be considered here. First, known values were used for custom feedyard yardage. In contrast, hypothetical or estimated costs for the owned feedyard were necessary. As a result, some changes could appear between values presented here for the owned feedyard and actual feedyards run by the packer. Secondly, given the scale of the owned feedyard, it is expected that some economies of scale exist and per head cost are lower than custom feedyard costs. Considering the differences in steer costs between these two alternatives, for some of the scenarios evaluated, owned feedyard steers could reach equal or lower values than custom feedyard steers if feed cost would be reduced by 2%. Third, the opportunity cost of capital might be different for the custom feedyard and for the owned feedyard, but there is not available information on the cost of capital for the custom feedyard. Fourth, according to the way the custom feedyard option was evaluated, the quality of the cattle produced in the custom feedyard us bit affected. Summing up, the advantage of using a custom feedyard over owning a feedyard can be questioned and it might be expected that costs are similar in both methods. Therefore packers may prefer running their owned feedyard and having higher control on the quality of the cattle they slaughter, not in terms of the breed or breed crosses, but in terms of cattle performance in the feedyard.

In many of the evaluated situations, marketing agreements represent the lowest costs alternative. It is hard to imagine that differences in technology applied in the feedyard

among the three alternatives that could result in lower costs for the producer than the custom or owned feedyard. Explanations for this could be, that producers in some cases run smaller feedyards that require smaller investment and present smaller opportunity costs of capital. Running a 400 head feedyard can be done with more labor, which is not the case for an 8,000 head feedyard. Second, values for marketing agreements represent the price producers receive according to the grid included in the agreement, but does not necessarily reflect the costs producers face in each period. As a consequence, producers may not place cattle in all periods needed by the packer and will not supply cattle in periods when the expected economic results are negative, so in this case, packers may need to source cattle from other methods, mostly through ownership.

Given the increasing volume of cattle confined in feedyards owned by packers in Uruguay, it is clear that there are important decision variables that may not be included in this study. This thesis challenges Uruguayan researchers to start working on these topics to understand a phenomenon that is happening so fast in the country. In the meantime, a combination of owned feedyard and marketing agreements are probably the best alternative. It allows packers to have control of some cattle, but share the risk of feedyards results with producers. Keeping marketing agreements with producers will be a way to keep relations packer-producer relationships on good terms, in a moment where the increasing participation of packers in production processes generates uneasiness sentiments toward packers among producers.

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APPENDIX I – OWENED FEEDYARD INVESTMENT

Pens Design

CAPACITY		
Total Capacity	8.000	heads
Pen Capacity	150	heads
Nbr Pens	54	-
Pens / Sector	6	-
Nbr Sectors	9	-
Heads / Sector	900	heads
DIMENSIONS		
Feeding Troughs (real)	0,37	
Front (real) / Pen	55	m
Front / Sector	330	m
Side (real)	100	m
Pen Surface (real)	5500	m2
Total Surface (real)	29,7	ha
Surface / Head (real)	37	m/head
Nbr Sides	7	-
Surface / Head (minimum)	35	m2/head
Surface / Pen (minimum)	5250	m2
Feeding Troughs (minimum)	0,35	m/head
Font (minimum)	52,5	m

Machinery

	Model	Units	US$/unit	Total
Tractor	115 HP	2	45.000	90.000
Mixer		2	35.000	70.000
Land leveler	used	1	35.000	35.000
Shovel	Mainero 3.5M3	1	9.000	9.000
Pick-up	Toyota Hilux	1	25.000	25.000
Total				229.000

Facilities Investment

MATERIALS	Posts I (1 each 10 m)	Posts II (1 each 1 m	Wire	Posts I	Posts II	Wire (m)
Front	0,1	1	5	34	330	1.650
Side	0,1	1	5	70	700	3.500
Bottom	0,1	1	2	34	330	660
Total / Sector				138	1.360	5.810
Total Feedyard				1.242	12.240	52.290

INSTALLATION COSTS

Item	Description	Units		US$/unit	Total
Fence					
Wire	17/15	53	coil (1,000 m)	113	5.989
Posts I	Red Eucaliptus	1.242	unit	9	10.805
Posts II	Red Eucaliptus	12.240	unit	1	13.464
Fence gate	3 m	162	unit	153	24.786
Water					
Well	Perforación	1	unit	5.000	5.000
Water Pump		1	unit	6.000	6.000
Water Tank	300.000 lt	1	unit	30.000	30.000
Drinking Trough	-	27	unit	500	13.500
Cement Base - Drinking Troughs	11 m2	297	m2	21	6.237
Water Supply	installed	6.480	m	3	16.200
Feeding Trough					
Concrete Soil - Feeding Troughs	3 m * 8 cm	672	m3	100	67.200
Feeding Troughs	-	2.800	m	60	168.000
Handling					
Scale	80000 kg	1	unit	15.000	15.000
Tube		10	m	374	3.740
Chute		1	unit	5.000	5.000
Hospital Pen		2	unit	4.000	8.000
Storehouse	-	1	unit	45.000	45.000
Office	-	50	m2	500	25.000
Labor		15%		-	70.338
TOTAL					539.260

Investment, Residual Value and Depreciation

	Purchase Price	Useful Life	Residual Value		Depreciation	
	US$	years	%	US$	US$/year	US$/head
Land	45.000	10	100%	45.000	0	0,0
Facilities	539.260	10	50%	269.630	26.963	1,3
Soil movements and trails	150.000	10	50%	75.000	7.500	0,4
Machinery	229.000	10	50%	114.500	11.450	0,6
Incidental Expenses	45.000	10		0	4.500	0,2
Total	1.008.260			504.130	50.413	2,5

Total investment/head	50	US$/head

			ha	US$/ha
Land	45.000	US$	15	3.000

Yardage

		US$/year	US$/month	US$/head	US$/head/day
Fixed costs					
	Salaries	197.071	16.423	9,9	0,11
	Office	12.000	1.000	0,6	0,01
	Maintenance	47.000	3.917	2,4	0,03
	Energy Consumption	5.000	417	0,3	0,00
	Fuel	17.000	1.417	0,9	0,01
	Repairs	55.000	4.583	2,8	0,03
	Incidental Expenses	4.000	333	0,2	0,00
Total Fixed Costs		337.071	28.089	16,9	0,18

SALARIES

Position	Quantity	Base Salary	Social Benefits	US$/month	Total US$/month	Total US$/year
Management						
General Manager	1	5.000	0	5.990	5.990	83.860
Administration						
Accountant	1	1.000	0	1.198	1.198	16.772
Secretary	1	750	0	899	899	12.579
Feeding and Cattle Handling						
Foreman	1	1.200	0	1.438	1.438	20.126
Operators	3	600	0	719	2.156	30.190
Nutricionist	1	500	0	599	599	8.386
Maintenance						
Operators	1	900	0	1.078	1.078	15.095
Watchman	1	600	0	719	719	10.063
Total	10				14.077	197.071

Operations Plan

	PERIOD 1 Mar-Jun	PERIOD 2 Apr-Jul	PERIOD 3 May-Aug	PERIOD 4 Jun-Sep	PERIOD 5 Jul-Oct	PERIOD 6 Aug-Nov	PERIOD 7 Nov-Feb	PERIOD 8 Dec-Mar	AVERAGE / TOTAL
Date In	15-Mar	15-Abr	15-May	15-Jun	15-Jul	15-Ago	15-Nov	15-Dic	
Date Out	15-Jun	16-Jul	15-Ago	15-Sep	15-Oct	15-Nov	15-Feb	17-Mar	-
Days	92	92	92	92	92	92	92	92	92
Heads/period	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	20.000
Yearlings Live Weight, kg	370	370	370	370	370	370	370	370	370
Yearlings Price, US$/kg	0,949	0,922	0,906	0,934	1,004	1,083	0,963	0,930	0,961
Total US$	351	341	335	346	372	401	356	344	356
ADG, kg	1,359	1,359	1,359	1,359	1,359	1,359	1,359	1,359	1,359
Total DG, kg	125	125	125	125	125	125	125	125	125
Slaughter Weight	475	475	475	475	475	475	475	475	475

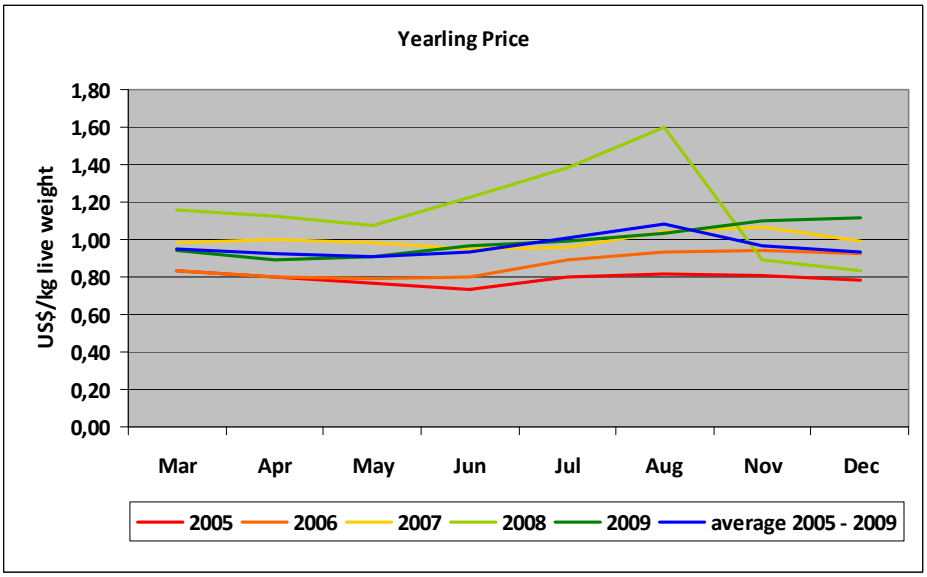
Yearling Prices - Table

YEARLING PRICE (+360 kg)

USD/kg PV	Mar	Apr	May	Jun	Jul	Aug	Nov	Dec
2005	0,83	0,80	0,77	0,73	0,80	0,81	0,81	0,79
2006	0,83	0,80	0,79	0,80	0,90	0,94	0,94	0,93
2007	0,98	1,00	0,98	0,95	0,96	1,04	1,07	0,99
2008	1,16	1,12	1,08	1,22	1,38	1,60	0,89	0,83
2009	0,95	0,90	0,91	0,97	0,99	1,03	1,10	1,11
2010	1,33	1,33	1,36	1,39	1,47			
average 2005 - 2009	0,95	0,92	0,91	0,93	1,00	1,08	0,96	0,93
average	**0,961**							

SOURCE: ASOCIACIÓN DE CONSIGNATARIOS DE GANADO (www.acg.com.uy)

Yearling Prices – Graph



Carcass Prices – Table

CARCASS PRICE								
USD/kg PC	Jun	Jul	Aug	Sep	Oct	Nov	Feb	Mar
2005	1,70	1,74	1,73	1,74	1,72	1,71		
2006	1,83	1,97	1,99	1,94	1,95	1,92	1,72	1,73
2007	2,04	2,15	2,21	2,30	2,27	2,17	1,90	1,97
2008	2,85	3,26	3,59	3,38	2,71	2,00	2,31	2,45
2009	2,08	2,15	2,19	2,16	2,19	2,18	1,99	2,07
2010	2,76	3,18	3,25	3,07	3,11		2,44	2,52
average	2,10	2,25	2,34	2,30	2,17	2,00	2,07	2,15
average	**2,173**							

SOURCE: INAC (payment 45 days, free of freight)

Carcass Prices – Graph