BEEF PRODUCERS PREFERENCES FOR JOINING BEEF ALLIANCES: AN ARIZONA AND WESTERN CANADA STUDY

By:

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A thesis submitted to the Faculty of the

DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

In the Graduate College

The University of Arizona

2009

STATEMENT BY AUTHOR

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Dedicated to my Grand-ma and Belated Grand-pa Foust

who have shown me what it is to love agriculture and farm rural America

ACKNOWLEDGEMENTS

I would like to thank the Department of Agricultural and Resource Economics at the University of Arizona for providing me with many opportunities to grow educationally and professionally. In addition, I want to give a general thanks to all the faculty and students whom I have interacted with who have been very helpful and supportive throughout my time at the U of A and for making my program a memorable one.

Special thanks goes to my advisor, Dr. Russ Tronstad, for his edification and guidance. This work would not have been possible without his contributions. I am truly grateful for his assistance and making my thesis more enjoyable. I would also like to thank the members of my thesis committee, Dr. Bob Kattnig and Dr. Satheesth Aradhyula. Their patience, expertise, and insight have led to higher quality output in my thesis. I would also like to offer my gratitude to Dr. Kattnig and the Animal Science Department for providing funding for my Arizona Beef Quality Assurance research and essential contacts within the National Cattlemen's Beef Association. The Arizona Beef Council also contributed financially to this thesis study. I would also like to thank Dr. Bodo Steiner at the University of Alberta, Canada; his prior research and guidance concerning the Canada data was most helpful. Nancy Smith, graduate coordinator at the University of Arizona, also deserves my appreciation. Her counsel and advice have made my graduate studies more enjoyable.

I am also exceedingly grateful to the ranchers of Arizona and Western Canada for their participation in this study.

Finally, I would like to thank my husband, Kody Jorgensen, my parents, Donald and Marilyn Kirkland, and the rest of my family, for the generous and continuing support they gave me throughout my graduate studies.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Three surveys were administered to cow-calf producers in Western Canada, Arizona, and Arizona Rancher Beef Quality Assurance (BQA) members. Two separate binary probit models were used to analyze the data. The first model estimates the willingness of beef producers to join an alliance and the second model estimates which alliance attributes producers willing to join an alliance prefer. Results from model one indicate that producer's age has a negative effect on willingness to join an alliance, producer's education has a positive effect, herd size has a positive effect, and if respondent is a Canadian or an Arizona Rancher BQA producer, it also has a positive effect. Results from model two indicate that producer' data collection has a positive effect on attribute preferences in joining an alliance, alliance sale type has a positive effect, alliance restriction protocols has a positive effect, and herd size has a positive effect.

CHAPTER ONE: INTRODUCTION

1.1 Background

Demand for beef has seen its decline in the last several years in both the United States and Canada. This decline can be linked to several issues, such as increasing competition from the pork and poultry industries and insufficient beef quality/taste measures. Beef also faces challenges from other factors, such as health and food safety concerns associated with red meat, relatively high price, quality consistency, environmental concerns, and changes in life style pertaining to convenience of preparation (Huang et al. 2005, Boetel and Liu 2003, Lamb and Beshear 1998, Katz and Boland 2000, Tatum 2005). However, these challenges cannot be overcome by the individual beef industry segments themselves (Huang et al. 2005, Lawrence and Hayenga 2002, Smith 2001). In order to produce a healthy, consistent, consumer-driven product, all segments of the beef industry must coordinate with each other to facilitate the improvement of beef quality and regain consumer faith (Huang et al. 2005). Ouden et al. (1996) state the specific characteristics of agricultural food chains and changing market circumstances, including the increased interest in the quality of products and production processes, justify renewed attention to vertical cooperation and product differentiation in agriculture. As other non-agricultural industries have also successfully shown, such collaboration would increase the competitiveness of the supply chain through improvement of product flow, financial flow, and information flow among the separate segments (Bowersox et al. 2002).

The cattle industry's response to these problems listed above has been to form alliances, much as the swine and poultry industries have accomplished through vertical integration (Falk 2002). Alliances can help convey clearer signals and incentives to downstream producers, and may result in a faster response to changing consumer demands (Hayenga et. al 2000). Firms

forming alliances most commonly use informal agreements, rely heavily on trust, and share unique assets with their partners (Sporleder 1992). Once a partnership can be made between industry segments through contracts or vertical alliances, information can flow up and down the supply chain, resulting in better market signals. Which ultimately, will result in a more reliable and consistent beef supply. By producing a more consistent beef product, profits are destined to be improved by capturing consumer's willingness to pay for quality attributes they desire.

The beef industry in the United States as well as Canada, needs to focus on the demand factors that have been ignored for several years: producing a healthy, nutritious, and safe beef product that appeals to consumers' evolving tastes and preferences. This focus needs to be coupled with an emphasis on pricing beef that is competitive with other protein sources. The only way the beef industry can achieve this is to be vertically coordinated. Schroeder and Kovanda (2003) state that each participant in the vertical production and marketing chain must have clear market signals to produce beef that consumers want. With proper adequate incentives, producers will make necessary production and marketing changes to meet consumer needs. Without adequate incentives, producers will continue to produce a beef product that is not meeting the consumer's present demands. Previous studies have shown that increasing vertical coordination in the beef industry has emerged primarily due to the escalating needs to ensure that consumer demands are met (Brocklebank and Hobbs 2004).

Ward and Estrada (1999) suggest that participants in vertical alliances maintain independence but also share information to effectively price products and improve the flow of products and information among vertical production-marketing stages. Among methods for vertical coordination in the beef industry, contracts have been found to be important means to improve the coordination in a variety of agricultural industries, however, the use of vertical

coordination mechanisms is less widespread in the beef industry, compared to the poultry and pork sectors (MacDonald et al. 2004). The challenges faced by the beef industry that ultimately, make vertical coordination less prevalent will be discussed in more detail in chapter two.

Over time, the use of marketing and production contracts has become more extensive in North America's agricultural sector, with amplified trends towards vertical coordination in the individual production sectors (Lan 2006). Most beef producers decide to market through contracts because they believe they are not getting paid for the quality of beef they are producing. For example, above average genetics in cowherds not only relate to fertility and performance, but also to carcass qualities and the ability to meet the premium specifications for beef, as set by retailers and consumers (Alberta Feedlot Management Guide 2000).

According to USDA statistics (MacDonald et al. 2004), 34.5 percent of agricultural products were marketed through contracts and 8 percent through vertical integration in the United States. Canada's beef industry has over 30 percent of their volume under vertical integration, production or marketing contracts (Hayenga et al. 2000). According to U.S. Premium Beef Facts, cattle marketed under the U.S. Premium Beef Brand earned $24.61 per head in premiums over the cash market in 2007. The top 25% received more that $62 per head in premiums to cash; the top 50% earned over $46 per head in premiums, while the top 75% of USPB cattle have earned more than $36 per head over selling on the cash market (U.S. Premium Beef Facts 2007).

In summary, the traditional means of beef production and marketing are not consistently meeting the current demands of beef consumers, causing lost profits for producers With increased supply coordination in the beef industry, consumer's demands can be met by increased flow of information from cow-calf producer to the retail level. Increased information sharing

allows alliance participants to respond more effectively to changing consumer demands (Lan 2006). However, it is worth noting that for cow-calf producers as well as the other entities that join alliances, other factors are equally important as meeting consumer demand. One main motivation is increased profits through premiums, especially for "specialty" beef products, as well as a desire to decrease price risk. Falk (2002) finds that producers, retailers and processors want to differentiate their product from commodity beef. Through this beef product differentiation, profits can be obtained.

1.2 Problem Statement

The disparity between consumers' desires for a consistent beef product and the beef products they are reaching on the shelves at the retail level have left many producers concerned to why price signals are not being made clear nor passed down to their stage of production. Without these price signals, it is impossible for beef producers to market their cattle in a way that meets consumers demands and compete effectively with pork and poultry. It has already been discussed in the section above that contracts and beef alliances are a way for beef producers to improve their industry position and marketing of beef in more profitable niche markets. The next concern raised is whether cow-calf producers are willing to join a beef alliance to better capture those profits from market premiums that come from niche beef products.

Due to land extensive production and capital extensive vertical coordination, compared to other stages of the beef supply chain, cow-calf producers operate most efficiently and effectively on a relatively small scale (Bailey 1998, Brocklebank and Hobbs 2004, Schroeder 2003). However, cow-calf ventures operate at the bottom of the beef supply chain and often lack adequate incentives to participate in the process of beef vertical integration. Due to problems of asymmetric information and inapt design of coordination methods, cow-calf producers are the

enterprise that is paying the ultimate cost for inconsistent beef products. This is because cow-calf producers have the opportunity to be increasing profitability of all sectors in the beef industry, but if producers cannot overcome these small challenges, these profits may be foregone. Schroeder and Kovanda (2003) declare that cow-calf producers have tended to be the catalysts for the development of beef alliances. Due to inefficient price signals, producers are often left feeling dissatisfied with an incentive to produce high quality grades in their cattle. Opportunities to better coordinate the production, processing and marketing phases of the industry and target particular consumer segments with branded beef products appear extensive to cow-calf producers.

According to a recent study of the Canadian beef sector, one vital finding is that, on average, cow-calf producers have a preference for a combination of live weight and carcass quality pricing. Even though using this type of pricing method could cause producers to incur some of the risks associated with variability in their cattle quality (Brocklebank and Hobbs 2004). This result suggests that an analysis of incentive and risk-management issues as part of more formal coordination schemes in the beef industry is highly desirable (Lan 2006). For that reason, issues that relate to the incentive implications of pricing schemes (Steiner 2007) and concerns of data sharing between members of beef alliances are also of great interest.

1.3 Hypothesis

Specific hypothesis to be examined and discussed stemming from the objectives of this study include:

(1) Cow-calf producers are differentiated in more coordinated beef supply chains. Their demographics such as beef cowherd size, age, education and income earned from beef are hypothesized to have significant impacts on their decision to join a beef alliance. For

example, it could be further hypothesized that beef cowherd size, education and income earned from beef are positively related to the probability of participating in a beef alliance, whereas age of producers are negatively related to the probability of participating in a beef alliance.

(2) Cow-calf producers have different incentives to adopt a specific organizational alliance structure. Producers' choice behavior decisions are explained not only by minimizing transaction costs (i.e. transaction cost theory), but also by agency theory and property rights theory. As a result, the attributes of alternative marketing agreements are hypothesized to have considerable impacts on their choice behavior.

1.4 Organization of Thesis

This thesis proceeds in the following manner: Chapter 2 provides an overview of the United States, Canadian, and Arizona beef industries and reviews the literature from current existing beef alliances. Constructive and damaging issues concerned with beef alliances are also discussed, as well as how supply chain management is vital to the beef industry; Chapter 3 gives a description of the Canadian and the Arizona beef producer survey including the design and data obtained. This chapter also provides the conceptual framework and models; Chapter 4 describes the empirical modeling to be used in estimation and policy implications; and Chapter 5 summarizes and concludes this study.

CHAPTER TWO: BEEF INDUSTRY OVERVIEW

2.1 Introduction

The purpose of this chapter is to provide an overview of the beef industry structure for the United States, the state of Arizona, and Canada's products, consumption trends and more importantly, its participants are addressed. Several important issues associated with cow-calf producers, feedlots, packers and seedstock producers in the traditional beef industry will be addressed in this section. This chapter also investigates the many alignment problems associated with vertical coordination of the beef industry, with special attention directed towards the motivation of contractual agreements and beef alliances. An overview of existing beef alliance characteristics is also discussed in this chapter.

2.2 United States Cattle Industry Overview

According to USDA National Agricultural Statistics Service (NASS), the United States beef industry is the largest single commodity source of farm cash receipts in the U.S. Due to the nature of the survey types, later discussed in chapter 3, the years 2005 and 2007 are both included to better understand the impacts of the U.S. and Arizona beef industry.

2005:

Farm cash receipts from the sale of cattle and calves in 2005 totaled $49.6 billion or about 20.9% of the total U.S. farm cash receipts. In 2005, the U.S. produced 24.7 billion pounds of beef, which added more than $64 billion dollars to the United States economy (USDA ERS *Farm Income and Costs* 2009, Beef Market 2005). In 2005, the United States exported about 697 million pounds of beef and veal. This was an increase of approximately 34% over 2004, with 460 million pounds of beef and veal being exported (USDA ERS *U.S. Beef and Cattle Industry* 2008). The reason for this immense increase in 2005 was due to the outbreak of BSE in the

United States in December 2003. According to Jin et al. (2004) and Mattson et al. (2005), the major beef importing countries, including Japan, South Korea, and Mexico banned exports of beef and beef products produced in the U.S. during 2004. While domestic demand in the U.S. was not significantly affected by the BSE outbreak, exports declined approximately 85 percent. The United States is for the most part an importer of beef, rather than exporter. In 2005, the U.S. imported 3.6 million pounds of beef and veal, compared to the lowly 697 million pounds it exported. USDA inventory statistics show that in the year 2005 there were 104.2 million head of cattle in the United States as of July 2005. That inventory is divided into beef cows, milk cows, heifers (beef, milk and other), steers, bulls and calves. Of the 2005 inventory, about 32% are beef cows while 19% are beef heifers and steers (USDA NASS *Cattle* July 2005). Table 2.1 below shows the inventory tabulations for the dedicated beef operations in 2005.

Table 2.1 United States Livestock July 1st Inventory by Class, 2004-2007

Class	**2004**	**2005**	**2006**	**2007**
	1,000 Head			
Cattle and Calves	103,600	104,200	105,200	104,800
Cows and Heifers That Have Calved	42,500	42,500	42,600	42,500
Beef Cows	33,500	33,450	33,450	33,350
Milk Cows	9,000	9,050	9,150	9,150
Heifers 500 Pounds and Over	15,950	16,200	16,600	16,600
For Beef Cow Replacement	4,800	5,000	5,000	4,700
For Milk Cow Replacement	3,600	3,700	3,800	3,900
Other Heifers	7,550	7,500	7,800	8,000
Steers 500 Pounds and Over	14,200	14,500	15,000	14,900
Bulls 500 Pounds and Over	2,050	2,100	2,100	2,100
Calves Under 500 Pounds	28,900	28,900	28,900	28,700
Calf Crop	37,625	37,575	37,567	37,400
Cattle on Feed	11,800	12,000	12,500	12,300

Source: USDA National Agricultural Statistics Service *Cattle* 2005, USDA NASS *Cattle* 2007

2007:

Farm cash receipts from the sale of cattle and calves in 2007 totaled $50.7 billion, up 1.1 billion from 2005, and about 17.56% of the total U.S. farm cash receipts, down 3.34% from 2005. The jump in U.S. dairy and poultry cash receipts in 2007 is cause for the percentage decrease of beef cash receipts compared to total farm cash receipts. In 2007, the United States produced 26.4 billion pounds of beef, which added approximately $66 billion dollars to the United States economy (USDA ERS *Farm Income and Costs* 2009, Beef Market 2007). In 2007, the United States exported about 1,431 million pounds of beef and veal. This was an increase of approximately 20% over 2006, with a total of 1,144 million pounds being exported (USDA ERS *U.S. Beef and Cattle Industry* 2008). As mentioned above, the U.S. is largely an importer of beef. In 2007, the U.S. imported approximately 3,164 million pounds of beef and veal, which is down 435 million pounds from 2005, but up 79 million pounds from 2006. USDA inventory statistics show that in the year 2007 there were 104.8 million head of cattle in the United States as of July, 2007. That inventory is divided into beef cows, milk cows, heifers (beef, milk and other), steers, bulls and calves. Of the 2007 inventory, about 32% are beef cows while 19% are beef heifers and steers (USDA NASS *Cattle* July 2007). Table 2.1 shows the inventory tabulations for the dedicated beef operations in 2007 as well.

2.3 Arizona Cattle Industry Overview

2005:

Farm cash receipts from the sale of cattle and calves in 2005 in Arizona totaled $775.9 million, or about 1.57% of the total U.S. farm cash receipts (USDA ERS *Farm Income Cash Receipts* 2009, USDA ERS *Farm Income and Costs* 2009). Beef production in 2005 in Arizona added approximately 825 million dollars to the U.S. economy (USDA ERS *Farm Income Value-*

Added 2009). In 2005, the state of Arizona produced 578.7 million pounds of beef. USDA inventory statistics show that as of July 2005 there were 910,000 head of cattle in the state of Arizona. That inventory is divided into beef cows, milk cows, heifers (beef, milk and other), steers, bulls and calves. Of the 2005 inventory, about 19% are beef cows while 39% are beef heifers and steers (USDA NASS *Arizona Annual Livestock* 2005). Table 2.2 below shows the inventory tabulations for dedicated beef operations in 2005 for the state of Arizona.

Table 2.2 Arizona Livestock January 1st Inventory by Class, 2004-2007

Class	2004	2005	2006	2007
	1,000 Head			
Cattle and Calves	850	910	940	940
Cows and Heifers That Have Calved	330	340	355	350
Beef Cows	175	175	190	175
Milk Cows	155	165	165	175
Heifers 500 Pounds and Over	90	92	93	1/
For Beef Cow Replacement	33	28	30	33
For Milk Cow Replacement	37	42	44	50
Other Heifers	20	22	19	17
Steers 500 Pounds and Over	255	330	340	340
Bulls 500 Pounds and Over	22	23	22	20
Calves Under 500 Pounds	153	125	130	130
Calf Crop	270	275	285	280
Cattle on Feed	293	331	334	334

Source: USDA NASS *Arizona Annual Livestock* 2005, USDA NASS *Arizona Annual Livestock* 2007
1/ Data not available

2007:

Farm cash receipts from the sale of cattle and calves in 2007 in Arizona totaled $700.3 million, or about 1.41% of the total U.S. farm cash receipts (USDA ERS *Farm Income Cash Receipts* 2009, USDA ERS *Farm Income and Costs* 2009). Beef production in 2007 in Arizona

added approximately 741.6 million dollars to the U.S economy (USDA ERS *Farm Income Value-Added* 2009). In 2007, the state of Arizona produced 587.5 million pounds of beef. USDA inventory statistics show that as of July 2007 there were 940,000 head of cattle in the state of Arizona. Inventory is divided into beef cows, milk cows, heifers (beef, milk and other), steers, bulls and calves. For 2007, about 18.6% are beef cows while 40% are beef heifers and steers (USDA NASS *Arizona Annual Livestock* 2007). Table 2.2 shows the inventory tabulations for dedicated beef operations in 2007 as well.

2.4 Canadian Cattle Industry Overview

Much like the United States, Canada's beef industry is the largest single commodity source of farm cash receipts for Canada agriculture (Statistics Canada 2005). In 2005, farm cash receipts from the sale of cattle and calves totaled $6.4 billion or about 17.34% of total farm cash receipts. Canada produced 3.5 billion pounds of beef in 2005 and the beef production added about $25 billion to Canada's economy. Canada exported about 45% of their total beef production in 2005. This was an increase of 10% compared to 2004, and made Canada the third largest beef exporting country in 2005 (CanFax 2006).

Statistics Canada inventory report shows that there were 14.8 million head of cattle in Canada at the end of January 2006 (CanFax 2006). That inventory is divided into beef cows, dairy cows, heifers (dairy, breeding and slaughter), steers, bulls, and claves. Of the inventory, about 43% are cows, while 57% are steers and heifers. Table 2.3 below shows the Statistics Canada January 2006 inventory numbers for beef cow-calf and feeding operations.

Table 2.3 Canadian Beef Inventory by Province, Eastern & Western Canada and Canada January 2006

Location	Cow-calf Operations	Percentage of Total Inventory	Feeder, Stocker/Finish Operations	Percentage of Total Inventory	Feeding Operations	Percentage of Total Inventory
	1,000 Head		1,000 Head		1,000 Head	
Atlantic	93.1	1.02%	43.9	2.34%	25.3	1.60%
Québec	419.1	4.59%	72.8	3.89%	85.5	5.42%
Ontario	761.1	8.33%	222.9	11.90%	312	19.77%
British Columbia	448	4.90%	57.8	3.09%	21.5	1.36%
Manitoba	1154.6	12.63%	196.1	10.47%	61	3.86%
Saskatchewan	2592.9	28.37%	203.8	10.88%	98.5	6.24%
Alberta	3670.7	40.16%	1075.6	57.43%	974.5	61.74%
Eastern Province	1273.3	13.93%	339.6	18.13%	422.8	26.79%
Western Province	7866.2	86.07%	1533.3	81.87%	1155.5	73.21%
Canada	9139.5	100.00%	1872.9	100.00%	1578.3	100.00%

Source: CanFax, Statistics Canada (2006) taken from Lan (2006)

As can be seen from Table 2.3, the beef industry in Canada is largely western based. It presents a distribution that the raising of beef cattle is concentrated in western Canada, away from the main consumption hubs of the country like Ontario and Québec (Lan 2006). Alberta is by far the largest beef production province, followed by Ontario, Saskatchewan, Manitoba, and British Columbia. In 2005, Alberta accounted for nearly 69% of Canadian fed cattle production while Saskatchewan, Manitoba and British Columbia accounted for only 9.4% of the country's fed cattle production.

Over 40% of Canada's beef cows are in Alberta while the three Prairie Provinces (Alberta, Saskatchewan and Manitoba) account for over 80% of the country's beef cowherd. In addition, the three Prairie Provinces account for over three quarters of the country's cattle on feed inventory (Lan 2006). The reticent disparity between the western cowherd and the western cattle on feed share is explained by the fact that Ontario still feeds a significant volume of

western cattle. This geographic distribution is formed principally due to climatic conditions (Steckle 2004). Since 1986, Alberta's cattle industry has experienced steady growth, reaching a peak of almost 2.1 million beef cows and replacement heifer inventories in 1995, before falling off slightly. Since then, Alberta has held steady at about 40% of the total Canadian beef cowherd. Much of this growth in Alberta could be paralleled with the sizeable investments made in the local cattle feeding industry and beef processing facilities (Lan 2006). Evaluating on a per farm basis in Alberta, the average total investment in beef operations had risen by 45.3% over a twelve-year period (ending in 1999), from approximately $602,000 to $874,600 per farm (Alberta Agriculture 2001).

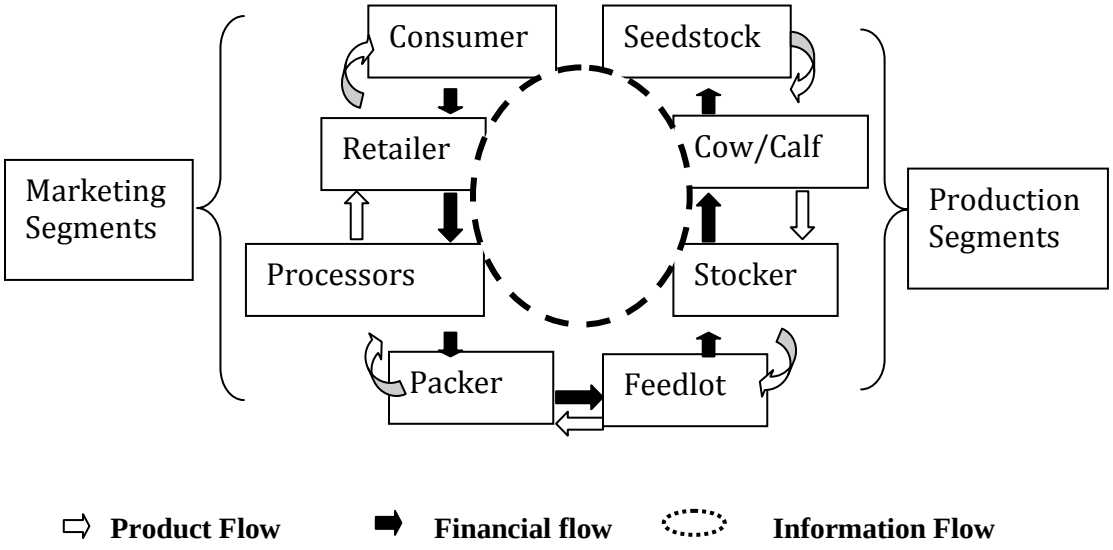
Pertaining to the Canadian packing industry, approximately 72% of the total Canadian cattle slaughter occurred in the West and 63% was in Alberta alone in 2005 (Statistics Canada 2005). Over time, much like the United States, beef processing has become more concentrated in the hands of larger, technologically and financially advanced beef processing companies. Approximately 2.5 million cattle were processed in Alberta during the year 2005. With regard to slaughter breakdown, western Canada accounted for 79% of steer and heifer slaughter with Alberta alone accounting for 76%. Cow slaughter is more evenly distributed between Eastern and Western Canada. Québec slaughters roughly 31% of the cows in the country while Alberta slaughters 46%. The composition of the slaughter between the East and West reflects the geographic distribution of dairy cows versus beef cows (Lan 2006).

2.5 The Traditional Beef Supply Chain

The United States, as well as Canada's beef industry can be divided into four key stages of production: cow-calf producers, backgrounding operators (stocker), finishing operators (feedlot), and seedstock breeders (Steckle 2004, Huang et al. 2005). However, the role of

packers, processors, retailers and consumers are often included in the stages of beef production. For the purpose of this survey, cow-calf producers, backgrounding operations, finishing operators and seedstock breeders will only be discussed in detail. Figure 2.1 below exhibits a flow chart of the structure of the beef supply chain in terms of product, financial and information flow.

Figure 2.1 Structure of Beef Supply Chain



Source: Huang et al. (2005)

These eight segments in all bind together and form a supply chain that performs the functions of production, distribution and marketing (Huang et al. 2005). As Steckle (2004) and Huang et al. (2005) suggest, the basic functions of the four segments of beef production are as follows, as well as the packer and processor operations:

1. Cow-calf or Ranching Operations: At the first stage in the beef production chain lies the seedstock and cow-calf operations, also known as ranchers or commercial cattlemen. They are responsible for maintaining cowherds and supplying weaned calves for production. Cows are

typically selected based on their mothering ability, beef quality traits, calving ease, as well as other traits. They are then mated in early summer, to be later calved the next spring (Steckle 2004). When the calf reaches about 500 pounds in open pasture (unless born in winter), they are weaned from their mothers and sold to either backgrounding/ feedlot operations, or retained on the farm/ ranch by the producer.

2. Backgrounding/Stocker Operations: Backgrounding is defined as growing, feeding, and managing steers and heifers from weaning until they are ready for a high concentrated finishing ration (Saskatchewan Agriculture and Food 2000). Backgrounding operators graze calves until they are yearlings, generally between 10 and 16 months of age. They then either feed the animals on grain (finishing) and sell them directly to slaughterhouses when they have reached full size, or sell them as yearlings to feedlot operations (USDA ERS *Agricultural Outlook* 2002). Backgrounding is a key industry link between the cow-calf segment (producing weaned calves) and the finishing segment (producing slaughter cattle) (Lan 2006).

3. Feedlot Operations: At the third stage of production lies the feedlot operators, whom purchase cattle or weaned calves from cow-calf or backgrounding operations. Feedlots feed high-energy finishing rations for typically 4 to 6 months. The high concentrated finishing ration mainly consists of forages or grains, whose main purpose is to "fatten" the calves. The operators purchase cattle at a weaning weight of 600 to 800 pounds and they are fed until reaching a weight of approximately 1,200 to 1,400 pounds before they are slaughtered for meat. The next step is to sell the cattle to beef packers for processing. Feedlot operations are usually larger farms or full-time small farms (USDA ERS *Agricultural Outlook* 2002).

4. Seedstock Breeders: Seedstock breeders are at the heart of the beef production chain. Without them, beef quality traits such as birthing weights, calving ease, and several other traits could

never be achieved. Seedstock breeders supply the semen and embryos to be used for artificial insemination and/or the bull breeding animals.

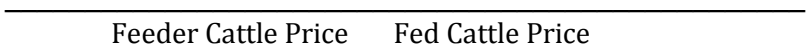
5. and 6. Packers and Processor Operations: The feedlots or ranchers themselves sell the slaughtered cattle to the packing plants. Packers slaughter live animals, generally weighing between 1,000 pounds and 1,400 pounds live weight, depending on the age and breed of the animal. They then breakdown carcasses by general meat cuts and are put into boxes for shipping, also known as "boxed beef". Processors cut, trim and package boxed beef into different beef products (Steckle 2004) to satisfy the retailer's requirement or consumer's demand. More commonly, processors are also cooking or marinating certain cuts of meat in order to add value to the beef products. Distinguished packaging as well, is on the rise to keep up with current marketing trends. Packing plants then sell these beef products either domestically or internationally to retail and foodservice distributors (Lan 2006).

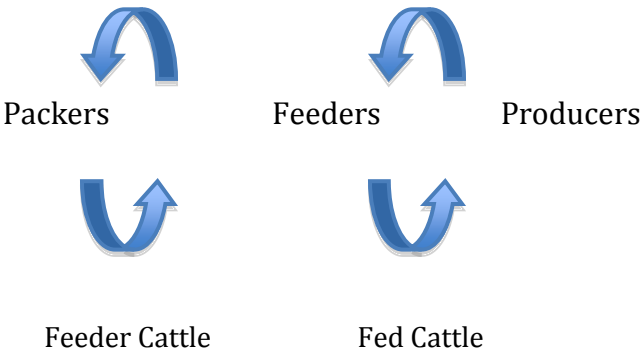
The majority of beef cattle in the United States are produced by small operations and control 74% of the land dedicated to beef cattle production. Three quarters of the nation's beef cattle spend at least some portion of their life on a small farm (USDA ERS *Agricultural Outlook* 2002). These statistics demonstrate the difficulties faced in the beef industry in order to produce a consistent beef supply. Based on the six types of operations listed above that one beef animal may go through in its lifetime, it is effortless to see why beef faces the challenges it does with concerns to consistency and quality. Due to the fact that nearly 75% of cattle spend some time on a small farm, it is easy to see how vertical coordination can be beneficial. If a few of these "small farms" can link together in an alliance arrangement, information can be passed on between the six stages and more consistent quality based beef can be produced.

Beef cattle production is compatible with, and often occurs in conjunction with, other agricultural production such as cash grains. A crop and a beef cattle operation is a logical combination, as cattle can graze on residual acreage not suitable for higher value production and can consume post-harvest vegetation that otherwise has little value. (USDA ERS *Agricultural Outlook* 2002). The survey's descriptive statistics of respondents' other farm activities (Figure 3.8) demonstrate this link between crop production and beef production. Due to Arizona's dry climate and need to irrigate cropland, it is not feasible to graze cattle, as can be seen from the low figures with grain/oilseed operations. However, Canada's climate and dry-farming capabilities allow for many producers to maintain both a beef and crop operation, as can be seen from Figure 3.8 as well.

As discussed and shown in the previous sections, several separate production stages make up the traditional beef production and marketing system. While in this conventional production setting, the only information exchanged between industry participants is the sale price of cattle between the consecutive stages of production (Hudson 2001). Figure 2.6 below illustrates the transaction exchanges between the different production stages that normally take place in a traditional marketing system.

Figure 2.2 Typical Price Transaction Exchanges In The Beef Production System





Source: Hudson (2001)

This traditional marketing system for beef production is equivalently used by both the United States and Canada. Historically, for many agricultural products, the functions of communication and coordination have been performed within an open market system using prices as the director of economic activity. Prices, serving as the set of signals employed, were determined as the result of exchange transactions completed by the representatives of many buyers and sellers (Collins 1959). The traditional pricing system in both cattle industries is by a so-called live weight pricing system, where buyers either bid on a pen of cattle, like at an auction, or by direct one-on-one negotiation (private treaty). In these cases, only two sectors of the production industry participate in the transaction in an auction market, and thus all economic signals are sent through the price paid for cattle (Hudson 2001).

2.6 The Beef Supply Chain's Altering Structure

One of the major structural changes in the beef industry, as well as with many other agricultural industries like the dairy and pork industries, is that they are becoming more concentrated in the hands of larger, technologically and financially advanced processors. Traditionally, cow-calf producers, feedlot operators, and processors seek to maximize their

individual profits. The degree of industry concentration from cow calf operators to the packer segment increases with a large number of small-scale cow-calf producers (Salin 2000).

Beef producers who own less than 100 head of cattle currently face some difficulties in selling their cattle. Producers will continue to face difficulties when selling in the future due to increasing coordination pressure from the pork and poultry industries. According to Bastina et al., one strategy is to have several cattle producers pool their cattle and sell larger lots of cattle jointly. Through an alliance setting, cow-calf producers could pool their cattle based on like characteristics and receive premiums for them.

According to the 2007 Census of Agriculture data, approximately 662,088 beef producers had less than 100 head of cattle and calves in the U.S., this number is down from the 2002 Census of Agriculture data. Approximately 825,043 beef producers had less than 100 head of cattle and calves in 2002 (USDA NASS *Census of Agriculture* 2007). The four major packers in the U.S. are Tyson-IBP (Iowa Beef Packers), Swift & Company (formerly known as ConAgra Beef), Excel and National Beef. These four packers combined slaughter approximately 80% of all U.S. fed heifers and steers (Brocklebank and Hobbs 2004, Huang et al. 2005).

In 2005, Alberta was comprised of 196 cattle feeding operators who controlled 2.44 million head of cattle, compared to 229 operators who controlled 0.93 million head of cattle in 1991. Of the 196 cattle feeding operators in 2005, 35 dominated 58% of cattle production in Alberta (CanFax 2006).

Shifts in consumer demand, advances in technology, information exchange management, and efforts of producers to reduce either their production or transaction costs, has led to increased concentration and consolidation in the U.S. and Canadian beef industry (Brocklebank and Hobbs 2004, Hayenga et. al. 2000, Hobbs 1996, Hobbs 1997). Through Coase's 1937 "The

Nature of the Firm", the reduction of transaction costs has formed an important argument in favor of vertical coordination. Table 2.4 below demonstrates a summary of advantages and disadvantages of vertical integration from Coase (1937).

Table 2.4 Summary of Potential Advantages and Disadvantages of Vertical Integration

Advantages	Disadvantages
Economies	
Reduction of Transaction Costs	High capital investment requirements
Technological Economies	Unbalanced throughput because of differences in efficient scale , diseconomies of scale, and reluctant independent suppliers/buyers
Enhanced Ability to Differentiate	Dulled or attenuated incentives and bureacratic distortions
Economies of Internal Control and Coordination	Differing managerial requirements
Economies of Information	Possibly missing advantageous external opportunities
Economies of Stable Relationships	Reduced flexibility to change partners
Market Power	
Elevate entry barriers and mobility barriers	Higher overall exit barriers
Raise rival costs by foreclosure	Foreclosure of access to supplier or buyer research and/or know-how
Practice price discrimination	
Offset bargaining power and input price distortions	
Defend against foreclosure	

Source: Coase 1937. Taken from Ouden et al. 1996

The advances in technology and changes in economies of size have played a crucial role in generating cost saving techniques for the different sectors of the beef industry. Technology developments in the beef production sector vary in type and scope (Marsh and Brester 2003). For example, in the cow-calf sector, production protocols that specify the breeding genetics, animal health and nutrition, and other management practices would increase calf crop percentages, calf weaning weights, and dressed weights of steers and heifers. In the finishing sector, technology changes such as increased capital intensity and economic information systems will ensure slaughter weights consistent with quality and yield grades desired by beef processors (Marsh and Brewster 2003). Researchers also found that the adoption of new capital equipment, innovative

processing and handling methods, and advancing infrastructure and information systems are the key technology advances in the beef packing sector (Mash and Brester 2003). However, adoption of these technologies and information can require high levels of capital investment, creating obstacles for beef producers and processors to gain market entry. Due to high capital investment costs, smaller low-cost plants have gradually exited from the industry because they are unable to compete with the larger plants that have a lower per-unit cost (Brocklebank and Hobbs 2004).

The concentration in the feeding and processing sectors of the Canadian and United States beef industry is also due to shifts in consumer demand. From 1980 to 1998, U.S. domestic beef demand decreased by more than 48%, forcing the industry to become more keenly focused on meeting consumer's needs. Since 1998, the beef industry has become more consumer-driven and beef demand has increased by approximately 25% (Tatum 2005).

Canadian per capita consumption of beef has declined significantly over the past twenty years, averaging between 84 and 86 pounds per year in the early 1980's and between 64 and 66 pounds per year in the last couple of years (Statistics Canada CANSIM data base). From a peak annual consumption of around 110 pounds per person in 1975, Canadian consumers now purchase slightly more than 44 pounds per capita. The traditional view of determinants of consumers' demand of beef has focused on the relative price and consumer disposable income (Schroeder et al. 2000). Recently, more non-price factors have been affecting consumers' decisions to purchase beef. Non-price factors such as health concerns, food safety concerns, and environmental concerns impact the structure of the supply chain of the beef industry. For example, Miljkovic and Mostad (2005) found that health concerns are indeed an important demand shifter for beef, often spurred by the media. Their results confirm that American's are health concerned and have changed their diets from "healthy" low-fat/low-cholesterol (which

implies low beef consumption) to “healthier” low-carbohydrate diets (which implies high beef consumption).

Safety food concerns have also been a chief factor impacting beef consumption (Schroeder et al. 2000). The beef industry in North America and Europe has experienced a variety of food safety dilemmas in recent years, including Bovine Spongiform Encephalopathy (BSE) and Escherichia Coli (E. Coli). Environmental concerns regarding beef production are also at the forefront of consumers purchasing preferences. According to the Organic Consumers Organization, organic and natural/grass-fed beef have both seen increasing sales in recent years. The organic food industry has been increasing approximately 24% per year. Beef customers view organic and natural beef as safer because of the restrictions these type of cattle encounter. For example, organic beef cattle cannot be fed commercial feed, they must be fed certified organic feed. No growth hormones nor antibiotics are allowed to be injected into the animal either. Consumers view these restrictions as safer because of the decreased possibility the animal may come in contact with BSE or other diseases passed on through processing or medications (Dey).

In addition to organic raised beef, consumer preferences for other beef attributes, such as tenderness and palatability have also changed over time. Schroeder and Mark (1999) explain these changes come from numerous demographic factors, including aging population, and increased female and teenager labor work force participation. With the increase of women’s participation and teenage labor in the work force, household income has increased, which has led to increased demand for more convenient food products and more meals consumed away from home (Kinsey 1983, Schroeder and Mark 1999). Blaylock and Smallwood (1986) found that older people tend to consume more poultry and less beef.

All these non-price factors mentioned above have led to the changing consumption trends of beef products, which indicate that consumers have become more demanding when it comes to food safety, consistency, and palatability of the beef that they consume (Schroeder and Mark 1999). The recent changing consumer demand has resulted in a reorganization of the beef industry's traditional structure due to the failure to transmit consumer demand information effectively to producers in the form of price signals (Schroeder et al. 1998). This problem mainly originates from lack of incentives and information regarding beef quality attributes, and the resulting lack of adequate price signals linked to beef quality. For example, when fed cattle are sold to packers on live weight pricing system without regard for quality, the pricing system does not send economic signals of individual animals back to producers, even though signals from pen data can be sent back to producers.

To help solve these problems, researchers have suggested to promote a more integrated system whereby producers, packers, processors and retailers ensure product safety and quality (Schroeder and Mark 1999). Within this framework, beef producers adopt several practices that are associated with different organizational structures of the industry. These structures include a value-based pricing scheme and a contractual arrangements scheme (Schroeder at al. 1998, Schroeder and Kovanada 2003, Ward 2001, Alberta Feedlot Management Guide 2000).

Value-based Pricing System

The traditional live cattle pricing system for fed cattle marketing has been inadequate at sending appropriate price signals to producers regarding cattle quality attributes (Schroeder et al. 1998). Live-weight average pricing of fed cattle inhibits the information flow regarding cattle quality attributes from the beef consumers to the cattle producers (Schroeder et al. 1998). The current deprived information flow is one reason poor beef quality has transpired, which has

contributed to declining beef demand by nearly 50 percent between 1980 and 1998 (Purcell 1998). With the improved, recently developed pricing systems, more commonly referred to as grid pricing or value-based pricing, producers are able to receive premiums for fed cattle carcasses based on quality and yield grade. According to Schroeder and Gaff (2000), the pricing error for carcasses of varying quality is estimated to average approximately $30/animal for cattle priced on an average live or dressed weight basis compared to those cattle priced on a value-based system. These lost profits indicate a significant value placed on the improvement of information flow and associated management changes.

Contractual Agreements

According to MacDonald et al. (2004), formal contractual agreements that outline the terms and conditions of a certain transaction have become more widely used recently in the beef and cattle industry. The parties involved in a contract can establish coordination through a negotiation of contract specifications and incentives for meeting those specifications before the actual transaction occurs. After the transaction occurs, the parties can exert control by monitoring the contract as it is carried out, to ensure that all parties perform as negotiated. In most contractual agreements, a third party is often used for enforcement to penalize any parties that violate the agreement (Peterson et al. 1998). There are two primary categories of agricultural contracts; marketing based contracts and production based contracts (MacDonald et al. 2004):

With marketing based contracts, the producer provides a quantity of commodities with specified attributes (i.e. physical/genetic or using a specified set of practices). Pricing through marketing contracts, may be set before production, or it may be established from a commodity market, such as futures or local cash markets, with a premium/discount (Lan 2006).

With production-based contracts, there are two main types available to producers: resource providing contracts and production management contracts (Hudson 2000). In general, both contract types legally specify the parties' responsibilities for production inputs and practices, as well as a mechanism of transaction. Under the standard livestock production contracts, also called custom feeding agreements, which take place between cow-calf and feedlot operators, the feedlot's operator provides the labor and equipment while the cow-calf producer provides the feed, veterinary services, and calves. In contrast to resource providing contracts, production management contracts are somewhat a combination of both marketing and resource providing contracts based on the input specifications (Hudson 2000).

Pertaining to the cattle industry, contracts have, on average been more commonly used between packers and feedlots (Brocklebank and Hobbs 2004). According to Lawrence et al. (2001), packers primarily use contracts with feedlots to ensure attaining higher quality cattle and more consistent quality based cattle. Another motivation for the use of contracts by packers is to help reduce operation costs (Lan 2006). By developing closer relationships with producers in other beef production stages, this cost saving may also be utilized by those stages such as feedlots. In a contractual agreement, packers legally specify all requirements for input supply, production protocols and requirements for specific breed or genetics. In turn, the feedlot operations that enter into the contractual agreements can secure quality premiums and obtain a higher price for their cattle. Feedlots that enter into contracts also benefit from having a guaranteed market outlet through pre-specified terms, and in some cases a guaranteed price (i.e. forward contracts) that might increase their revenue stability so as to allow them to focus on the production process instead of marketing and price discovery functions (Brocklebank and Hobbs 2004, Hayenga et al. 2000).

2.7 Alignment Issues in the Beef Production Industry

More recently, vertical coordination has increased due to increased use of value-based pricing systems and contractual agreements, however the beef market continues to remain inefficient in transferring consumer preferences back to producers via the pricing mechanism (Brocklebank and Hobbs 2004). The inefficiencies still exist due to the different goals that each industry segment possesses. Gillespie et al. (2005) indicate that while cattle feeders and packers emphasize feed conversion, cattle and feed prices, quality and yield grades, and rate of gain, cow-calf producers have incentives to focus on calving rates, birth an weaning rates, and calving ease. Although an increasing portion of fed cattle is priced on a value-based system, packers continue to buy more cattle in feedlots through contractual agreements (Lan 2006). At the beef packer-feedlot level, the Canadian producers are somewhat behind the U.S. with regard to managing cattle for the value-based pricing system (Schroeder 2003). In 2002, the U.S. had about 40% of fed cattle sold on cash-negotiated basis (Schroeder 2003). In contrast, Alberta's three largest packers had about 60% of fed cattle that were sold on a cash basis in 2002. With regard to uses of the grid pricing system, Alberta producers only sold 20% of fed cattle on a grid system in 2002, while over 50% of fed cattle in the U.S. were sold on a grid system (Schroeder 2003).

Due to the fact that most contractual arrangements are made between the packing and finishing sectors, the cow-calf producers rarely receive information about the quality of their individual animals from beef packers or from the retail level (Brocklebank and Hobbs 2004). An array of motivations has led to this limited vertical coordination between the feedlot and packing sectors. First, compared with pork and poultry, beef production entails a much longer biological production cycle (i.e. 24 months compared to 6 months for pork and 4 months for poultry), along

with multiple industry stages. Ward (2001) suggests that agricultural business operators are more likely to vertically coordinate in an industry that has a shorter biological process and fewer production stages. Second, the limited capital investments in buildings and equipment (e.g. fencing, corrals, tractors, and implements) in the cow-calf segment do not provide appropriate incentives for contracting (Gillespie et al. 2005). In addition to these issues, economies of scale in the cow-calf segment appear to be restricted, thus limiting the improvement of vertical coordination. A large number of U.S. and Canada cow-calf herds consist of fewer than 30 head per operation (Ward 2001). Given such relatively small economies of scale in the cow-calf segment, and with cattle producers typically operating on a one-year cycle, transaction costs are relatively low (Brocklebank and Hobbs 2004, Gillespie et al. 2005).

The alignment issues mentioned above greatly challenge the coordination process of the beef industry compared to the poultry and pork industries. In section 2.6 it was emphasized that by increasing the information flow in the beef supply chain, these alignment issues may be resolved. However, the underlying organizational beef structure also provides alternative coordination mechanisms for beef producers. As shown in Figure 2.1, an integrated beef system may include seedstockers, cow-calf producers, backgrounding operations, feedlot operations and packers. An alternative structure might include only seedstockers, cow-calf producers, and feedlots. In both organizational structures, at each stage of the segment, producers would benefit from information sharing from upstream and downstream suppliers (Schroeder and Kovanda 2003). For example, seedstock suppliers provide information to the cow-calf operations, including breed, expected progeny differences, calving ease, weaning weights, and related production and carcass quality attributes. Cow-calf producers provide similar information, in addition to preconditioning and vaccination programs, to the feedlots, and likewise the beef

packers whom will benefit from information on cattle performance also need to have information back from the cow-calf operations regarding cattle performance (Schroeder and Kovanda 2003).

As discussed above, the information sharing schemes and the underlying organizational structure, also referred to as vertical beef strategic alliances, can provide a means to ensure a supply of particular quality beef targeted to appropriate consumer segments (Hayenga et al. 2000, Schroeder 2003, Schroeder and Mark 1999, Schroeder et al. 1998, Ward 2001). Strategic alliances that vertically integrate the beef production and marketing chain enable cow-calf producers to retain ownership of their cattle while being kept at feedlots or being processed to maximize interests. Beef alliances are an avenue to increase information sharing among producers, processors, retailers and consumers. Another way in that alliances are unique is they allow for joint participation of the beef production and processing sectors, whereas contracts typically organize transactions between only two participants in the supply chain. Therefore, the involvement of multiple supply chain participants further improves coordination, as economic signals relating to consumer demand are more clearly transferred to the industry participants. Through supply chain coordination, cow-calf operators are able to receive information about consumer demands, whereas in the traditional beef production and marketing setting, they are not.

2.8 Literature Review on Beef Alliances

Although there are various types of alliances in the beef industry, almost every alliance has a similar objective, which is to capture and create additional value and obtain higher returns for participating producers (Anton 2002, Brocklebank and Hobbs 2004, Ward 2001). Therefore, almost all beef alliances overlap to some extents.

There are two main types of vertical strategic alliances, informal and formal. Informal strategic alliances are usually established where partners work towards achieving mutual objectives (Amanor-Boadu and Martin 1992). Under informal agreements, different production sectors in the industry hold a high level of independence while also self-monitoring the effect of their actions on their partners. The partners' relationship is established based on trust rather than any other legally specified forms such as contractual agreements and commitment to initial capital investment (Amanor-Boadu and Martin 1992). In contrast, formal strategic alliances involve more organized and managerial criteria such as control and equity to meet the objective of the different parties in the alliance (Amanor-Boadu and Martin 1992).

Anton (2002) provides a categorization of formal beef alliances in terms of their marketing characteristics. One category are cooperatives, which are producer-owned entities (e.g. Premium Beef) and provide an opportunity for additional returns, such as through price premiums. In most cooperative settings, producers must either buy or lease a part of the company through stocks (Anton 2002). A stable and formal management structure is achieved by initial capital investment (Lan 2006). Cooperatives normally pay dividends on the stock and some have additional bonuses paid to producers who market cattle through the program (Anton 2002).

Another category of beef alliances are the brand licensing organizations, such as Certified Angus Beef and Certified Hereford Beef. In this type of setting, the cattle are often required to meet a certain genetic or physical requirement. By entering this kind of program, value is created by marketing a branded product that conveys a certain standard of quality to beef consumers (Anton 2002). The brand licensing organization programs are vastly loose contractual agreements compared to cooperatives, with the only obligation being the certification under the inspection/licensing agency (Anton 2002, Brocklebank and Hobbs 2004).

Specialty product marketing programs are considered one of the brand licensing programs, but have stricter specifications enforced (Anton 2002). In addition to the breed conditions, certain additional production stipulations, such as complex structured veterinary programs, are to be followed. Both quality-based grids and yield-based grids are used in this type of program (Anton 2002). These more technical production protocols potentially result in an increasing investment in asset specificity (Lan 2006).

For cow-calf producers, beef alliances can be the successful alternative organizational structure to producing higher-quality cattle and being rewarded for the higher-quality attributes. However, one of the crucial questions is what types of beef alliances cow-calf producers are willing to participate in, and how do they value the attributes that characterize these alliances. From the above discussion, it would be expected that a successful beef alliance must provide the participants with sufficient financial incentives and employ an efficient information sharing mechanism. The empirical part of this study, discussed in chapter four, will focus on these attributes in an analysis of diverse beef alliances.

Vertically aligned beef chains have emerged because they are more responsive to consumer's requests and desires. They involve coordination of genetics, health, nutrition and management practices to add value, create efficiencies and allow quality and safety to be monitored and managed at each stage of production along the beef chain. They differentiate service, production practices, and product quality in order to deliver products with greater value (Tatum 2005).

According to BEEF magazine's annual list, about 3.3 million cattle were marketed through alliances in 2000 and that number has increased to nearly 4 million head in 2008. This information suggests that approximately 15% or more of fed cattle that are marketed annually

pass through some type of alliance organization. Alliances range from being quite small and local in nature, while others involve large cattle operations and are national in scope (Ward and Raper 2008).

One motivation for alliances is improving beef demand. Competition emerging from the pork and poultry industries has forced the beef sector to contend in terms of quality and consistency. It is thought that alliances could facilitate a move to value-based pricing, where producers would receive prices that matched the condition and characteristics of cattle they brought to the marketplace. Value-based marketing is a management and marketing tool that rewards or penalizes cattle, based on carcass merits. It ultimately provides an opportunity for producers to capture greater economic rewards for using above average genetics (Alberta Feedlot Management Guide 2000). As a result, the overall quality of beef products would increase and the consistency of higher quality beef products would improve (Ward and Raper 2008).

For cow-calf producers, the bottom line from the anticipated improvements in beef demand and increased competitiveness with other proteins is amplified profits. In an alliance framework, improved profitability may occur through premium prices, reduced risks and reduced costs of producing and marketing beef cattle. Research suggests the number one motive for joining an alliance is adding value to cattle, ultimately enabling producers to obtain premium prices (Raper et al. 2005, Ward and Raper 2008). Premium prices might occur due to improved quality components of beef products, such as USDA quality and yield grade, and tenderness. Specific production practices may also contribute to premiums such as, natural, organic, or hormone-free beef. Alliances can contribute to profits for some producers in other ways. Rather than seeking premiums, alliances may be able to reduce cost duplication in areas such as animal

health vaccinations and transportation costs. Rust (1996) estimated these savings to be approximately $59 per head.

Another popular motivation for joining alliances is the assistance producers get in improving cattle quality and quality consistency. This is done by gaining access to carcass data, which producers can use to guide herd improvement and management decisions. Direct access to carcass performance data and information enables producers to respond more quickly and efficiently to demand signals, thereby more rapidly improving cattle quality and ultimately improving supply chain motivation (Ward and Raper 2008).

However, joining an alliance does have its obstacles. Limiting factors may include; cattle genetics, cattle quality, production requirements, size of operation, and animal health restrictions. Raper et al. (2005) conducted a survey where producers where asked what changes they would have to make to join an alliance. Their results are summarized in the Table 2.5 below:

Table 2.5 Producer Responses to Production Changes Required to Participate in Alliances

Ranking	Most Frequent Changes Required	Greatest Challenges	Most Help From Alliance
1	Animal health practices	Sorting methods	Feeding methods
2	Cattle tracking/information systems	Cattle tracking/information systems	Animal health practices
3	Marketing schedule	Marketing schedule	Cattle tracking/information systems
4	Feeding methods	Feeding methods	Type of performance data collected
5	Type of performance data collected	Type of performance data collected	New genetics
6	New genetics	New genetics	Marketing schedule
7	Sorting methods	Animal health practices	Sorting methods

Source: Ward and Raper (2008)

Estrada's (1999) study found that more than one-half of alliances specified some genetic requirements. In the 2008 BEEF list, all but two alliances indicated specific genetic requirements. Genetics may differ from certain percentages of certain breeds (ex. 75% angus) to unseen attributes such as birth weights and calving ease.

Size of operation may be an obstacle for some cow-calf producers as well. According to the 2008 BEEF magazine list, about 1/3 of alliances specified no minimum size or just one head of cattle. Another 1/3 of alliances from the list indicated the minimum size to be one or more semi-truckloads. Smaller producers could face challenges in marketing cattle through an alliance if a minimum number of herd size is required to join the alliance arrangement.

Costs of participating in most alliances are small when considering the out-of-pocket membership fees. Approximately one-half of the alliances in the 2008 BEEF list indicated there are no costs to participating. A few others specified a cost of $5/head or less. Therefore, for many cow-calf producers, membership fees should not be a constraint. Average reported premiums have ranged from about $25/head to $35/head for many alliances. In nearly all cases, average premiums tend to exceed the out-of-pocket costs/membership fees of joining an alliance.

2.9 Literature Review on Vertical Coordination

Vertical coordination refers to all means of aligning, harmonizing and consolidating vertically independently production and distribution activities. This vertical arrangement that reaches from the cow-calf production stage to the consumer stage ranges from spot markets through various types of contracts to complete integration (Frank and Henderson 1992). As discussed in sections above, the organization of individual stages of beef production such as seedstock ,cow-calf, backgrounding, finishing, processing and wholesale/retail, is the vertical array of the beef production chain. According to Collins (1959), if coordination is to be achieved

in a specialized marketing system, three conditions should prevail: First, there should be a communication network to link the performance units in the system, such as retail, processing and farm production. Second, a set of signals should be developed which, when transmitted over the network, accurately characterizes the relevant economic variables. And third, each party must be prepared and able to translate the signal received into an appropriate set of actions.

Evolution of vertical coordination in agriculture has and will continue to be a gradual and complex procedure. In order to explain the organizational structure of vertical alliances, it requires more than just a single theory (Boehlje 1999). Historically, a variety of disciplines have been used to make valuable contributions to explain the vertical coordination mechanism in agriculture (Lan 2006). The most common disciplines include value-chain analysis, transaction cost and principle-agent theories and have traditionally been applied to an institutional economics approach to the discipline of strategic management (Kim and Mahoney 2005). According to Williamson (1985), transaction cost economics (TCE) theory can be an important theoretical framework for analyzing the variety of governance structures employed through vertical coordination. The primary motivation in TCE theory is minimizing transaction costs for adopting alternative organizational structure such as an alliance. Both agency theory and property rights theory concentrate on incentive alignment as a theoretical framework for understanding and researching organizational structures (Eisenhardt 1985, Hart and Moore 1990, Jensen and Meckling 1976). The next few paragraphs discuss in detail the three customary economic theories associated with contracts and alliances.

2.10 Transaction Cost Economics (TCE) Theory

The central idea of TCE is that transactions between the numerous beef production stages are organized in such a way that the costs of carrying them out are minimized. According to

Child and Faulkner (1998), transaction costs refer to the costs that are involved in arranging, managing, and monitoring transactions across markets, including the negotiation cost, search and information costs. TCE predicts that transactions under uncertainty, which frequently persist and require substantial transaction specific investments, are more likely to take place within hierarchical organizations (Williamson 1985).

Transaction cost theory is based upon two main behavioral assumptions: bounded rationality and opportunism. Bounded rationality refers to the fact that people (also known as agents) are intended rational, but are limitedly acting in this manner. According to Williamson (1975), bounded rationality is a result of uncertainty about the intentions and proficiencies of a transaction partner. Due to incomplete or asymmetric information, agents cannot gather and process all the information that they need (Lan 2006). Summing up, the TCE recognizes that many economic activities occur in the environment of incomplete and asymmetric information, which can lead to opportunistic behavior and thus adverse selection and moral hazard. Adverse selection is referred to the situation where information is hidden prior to a transaction. In contrast, a moral hazard problem exists when the agent receives private information after the relationship has been initiated (Macho-Stadler and Pérez-Castrillo 2001). In the beef industry, both adverse selection and moral hazard problems appear to be present at the different production stages. These issues will be discussed in more detail below.

2.11 Characteristics of Transaction Costs

According to Williamson (1985), there are three characteristics influencing the size of the costs accompanying transactions. These include; asset specificity, uncertainty, and frequency of transactions. Asset specificity refers to the investment (capital and/or time) that an agent is required to incur in order to participate in a formal relationship. The implication is that once

agents have invested into specific requirements of a principal-agent relationship, the principal may have an incentive to re-negotiate the contract terms, knowing that the agent's investment is of lower value outside of the relationship. As a result, the principal is said to hold-up the agent (Salanié 2005). Further, when a transaction is conducted more frequently, it is more likely to be internalized, since damages from opportunistic behavior are expected to be higher (Williamson 1979).

2.12 Implications for Research on Beef Alliances

Hobbs (1997) has analyzed transaction cost variables that have a significant effect on cattle-breeders' decision whether to sell deadweight, direct-to-packer or live weight, including live-ring auctions. Based on the transactions cost framework, Hobbs' analysis aims to explore the reasons behind beef producers' decisions for choosing one of the above mentioned pricing channels in the United Kingdom. In another study on the cattle industry, Ayars (2003) developed a theoretical framework to measure transaction costs. The study uses empirical evidence to derive transaction cost estimates for five finishing feedlots in Saskatchewan. The results suggest that larger feedlots have lower transaction costs in buying and selling cattle than smaller feedlots. Brocklebank and Hobbs (2004) conducted a study of beef alliances and branded beef programs, where the attributes of different types of beef supply chain alliances were analyzed under the transaction cost theory framework. A conjoint analysis was used to examine how different product (service) attributes result in the emergence of particular transaction characteristics (asset specific investments, uncertainty and frequency). From the review of literature above, the emergence of alliances within the beef sector could be related to asset specific investment between alliance participants (Hudson 2001). It is expected that the presence of asset specificity impacts the producers' willingness to participate in an alliance program.

The second possible contribution of TCE to the beef alliance research relates to the uncertainty producers face that is intrinsic in transactions. The price uncertainty with which particularly cow-calf producers encounter can affect both quality variability and the number of willing buyers (Brocklebank and Hobbs 2004). However, although price uncertainty is very important in affecting transactions in beef alliances, the extent of uncertainty is difficult to measure within the TCE framework due to data limitations. More importantly, price uncertainty is largely determined by the adoption of the grid pricing system in the current beef industry, which is mainly used between feedlot operations and processors, rather than affecting cow-calf producers directly (Brocklebank and Hobbs 2004). From the TCE framework, it would be forecasted that alliances may operate more effectively when fewer partners are involved. However, Brocklebank and Hobbs' (2004) study suggests that the number of buyers/sellers in the market has no significant impact on cow-calf producers' willingness to participate in the branded program and beef alliance.

2.13 Agency Theory

Agency theory is an alternative theoretical framework for analyzing vertical coordination. It complements the transaction cost approach and provides explanations of inefficiencies stemming from asymmetric information and incentive problems in vertical coordination (Ferguson 2004). Principal-agent theory focuses on the design issues of contractual arrangements between trade parties (Sauvée 1998).

Agency theory focuses on the interrelationships between the principal and the agent. Typically, an agency relationship consists of a risk neutral principal (owner) and a risk-averse agent (user). The basic principal-agent problem can be separated into three different categories: the adverse selection problem, the moral hazard problem and the signaling problem. In the

signaling problem, the agent can send a signal that is observed by the principal after learning the characteristics of the agent (Macho-Stadler and Pérez-Castrillo 2001). Therefore, the agent can adopt actions before signing the contracts to influence the beliefs of principals about the agents' identity. The optimal contract scheme contains appropriate incentives for the agent to behave, or create output, in such a way that maximizes the returns to the principal and total surplus of both parties (Lan 2006). However, the problem can be solved by assuming that the principal selects the reward function that maximizes his expected profits, while the agent chooses his effort to maximize his expected utility, given the structure of his reward function (Brown and Vukina 2001).

2.14 Implications for Research on Beef Alliances

Agency theory has also been used as a complement to the TCE approach in research on vertical coordination. In an empirical analysis on crop production contracts, Lajili, et al. (1997), use elements of both principal-agent theory and transaction cost economics to analyze farmers' preferences for contract terms. Their results indicate that farmers' preferences for rates of cost sharing, price premiums, and financing arrangements are significantly influenced by asset specificity and personal characteristics.

With regard to the empirical research in livestock industries, research on compensation schemes and risk sharing contracts has primarily focused on the pork and poultry industries. Goodhue (2000) uses an agency theoretic framework to analyze grower heterogeneity and production risk among broiler contracts. She shows that by forcing agents to bear additional income risk, processors can increase profits due to the combined moral hazard-adverse selection nature of the informal problem. Wang and Roe's (2002) analysis of a cattle feeding production is based on the observation that post-slaughter quality-based pricing of cattle is increasingly

common. This quality, however, is dependent upon unobservable quality characteristics of the feeder cattle used as inputs and unverifiable effort exerted by feedlot managers. The authors (Wang and Roe 2002) construct incentive compatible quality risk-sharing contracts based upon final grid-quality schedules in feeder cattle markets through stochastic simulation. Their analysis suggests that there is the potential for moral hazard in traditional feeder cattle transactions. With regard to the cow-calf sector, the moral hazard problem exists in a simple spot market transaction because the cow-calf operator has little incentive to exert effort to improve unobservable quality traits. The potential exists for moral hazard on the feedlot side of retained ownership contracts because feedlot operators may not profit from effort spent on sorting or may increase profits by delaying slaughter dates. Further, they suggested that a linear premium/discount sharing contract would circumvent the double-sided moral hazard problem because it provides both parties incentives to make high levels of efforts (Lan 2006).

2.15 Property Rights Theory

Property rights theory is defined as socially sanctioned uses of valuable assets by economic agents and refers to the responsibility and positions of parties in the market (Libecap 2002). This definition implies that there could be a shared ownership, which means that different individuals may hold property rights to various partitioned uses of a certain single resource (Kim and Mahoney 2005).

As Furubotn and Pejovich (1972) indicate, an economic transaction essentially is the exchange of collection of property rights. Therefore the exchange of property rights is the economic principle that drives the various applications of property rights theory. In any kind of institutional arrangement where more than two contracting parties are involved, resource owners must transfer the control over some attributes of a resource to another transacting party. Various

institutional and contractual arrangements attempt to allocate property rights to multiple contracting parties in a way to achieve economic efficiency. As a result, it is assumed that appropriate economic incentives are created for the owners of each collection of property rights (Kim and Mahoney 2005).

2.16 Implications for Research on Beef Alliances

Insight from property rights theory helps us to understand changes in particular observed shifts of ownership of cattle in terms of retained ownership as practiced by cow-calf producers. Kim and Mahoney (2005) assert that the contractual party that retains ownership is the party that has the most to gain from the building of relationship-specific assets. Retained ownership in the beef industry refers to cow-calf producers that can hold title of their calves beyond the customary period (Saskatchewan Agriculture and Food 2001). Under a retained ownership program, the cow-calf producer would retain title of the calves after weaning as they move into backgrounding and/or feedlot programs, also called custom feeding arrangements. Cow-calf producers that retain ownership of their calves through custom feeding agreements do not need to invest in additional facilities, equipment, feed or labor to finish the animals (Saskatchewan Agriculture and Food 2001).

2.17 Summary and Conclusions

This chapter briefly discusses the beef industry in the United States, the state of Arizona and Canada. The traditional beef supply chain was also discussed. The theories associated with vertical coordination and strategic alliances are also discussed in detail. It is argued that transaction cost economics (TCE), agency theory and property rights theory each can help to explain the extent to which incentive and alignment issues exist in different forms of formal beef alliances. Specifically, TCE contributes to this study primarily in explaining the cause of

emergence of beef alliances; agency theory reveals the incentive problem in existing strategic alliance and gives an answer to solve “how” relationships between industry participants can be set up to achieve the objectives set up by an agreement; property rights theory explains the practice of retained ownership of cattle in the beef industry. The following empirical part of this thesis attempts to address some of the incentive problems that were raised in the above sections, by inquiring about transaction costs, producers’ risk attitudes, and their risk management strategies. The next chapter will first discuss the theoretical basis of the survey methods and choice experiments used to make those inquiries.

CHAPTER THREE: SURVEY MODELING, DESIGN AND DATA DESCRIPTION

3.1 Introduction

This chapter focuses on issues relating to choice modeling, research methodology and the data used in this study. Included are the survey design descriptions, application of the econometric models and the data for Canada, Arizona NASS (National Agricultural Statistics Service), and Arizona Rancher BQA (Beef Quality Assurance). Section 3.2 analyzes the theoretical framework for the survey method and the modeling of the beef alliance choice experiment is introduced. Section 3.3 describes the design of the Canada, Arizona NASS, and Arizona Rancher BQA survey's and their data collection methods. In section 3.4, survey procedures for Canada, Arizona NASS, and Arizona Rancher BQA are discussed. In the last section 3.5, sample data are revealed and beef alliance attributes are discussed in detail.

3.2 Theoretical Framework and Choice Modeling of Beef Alliances

3.2.1 Revealed Preference vs. Stated Preference Methods

Revealed preference methods draw statistical inferences on values from actual choices people make within markets. The revealed preference approach often involves the observation of choices made by decision makers and then the comparison of the observed choices to the rejected alternatives (Adamowicz et al. 1994, Hensher et al. 2005). However, revealed preference methods cannot be used to evaluate preferences under conditions which do not yet exist (Louviere et al. 2000). In addition, revealed preference data and techniques cannot provide appropriate statistical properties that we wish for in modeling purposes. According to Hensher et al. (2005), attributes invariance poses modeling drawbacks since an attribute that takes on the same value for all alternatives cannot help explain why an individual respondent has a different

choice on a specific product or service. As a result, some new techniques were developed to directly examine hypothetical choice procedure. One of these techniques is the stated preference method, which is applied to this study.

The stated preference method, also known as stated choice analysis or choice experiment, uses a variety of approaches for asking valuation questions in hypothetical settings, from the straightforward request for maximum willingness to pay to open-ended contingent valuation, to indirect methods using choice, ranking, or ratings (Adamowicz et al. 1998). Stated choice methods generally employ a carefully designed questionnaire in which respondents are given a sequence of questions or choice sets to answer. In each choice set, they are asked to indicate their preferred option from a set of hypothetical alternatives. Each alternative option is described in terms of a number of key attributes that are specified at different levels. The configuration of attribute levels that describe the alternatives follows an experimental design and varies between choice sets. The response data, which usually also include individuals' socio-economic characteristics, enable not only the estimation of the relationships between attribute levels and the choice probabilities, but also the estimation of the extent of the trade-offs between the attributes made by individuals (Lan 2006).

Roe and Randall (2002), with regard to research on agricultural policies, suggest that the use of stated preference instruments could be used to derive trade-offs that farmers are willing to make between current and future farm programs. These tradeoffs and their resulting welfare measures can be derived from the econometrical estimation of discrete choice data. As accentuated above, this study aims to explore alternative marketing and production arrangements between the cow-calf operation and upstream producers, and their potential to improve incentive

and alignment issues. However, these new alternative alliance schemes do not yet exist at present. Therefore, the hypothetical choice-based experiment has to be applied to this study.

3.2.2 Random Utility Theory

Random utility theory frequently underlies objectives related to choice experiments. Hence, models based on random utility can be used to identify the set of feasible alternatives producers may choose among a set of choices (Schulz 2008). Choice experiments can be analyzed by relying on discrete choice models and are derived under the assumption of utility-maximizing behavior of the decision maker (Hensher et al. 2005). The utility derived from a good or service is assumed to be dependent on its characteristics or attributes (Lancaster 1966). In the discrete choice framework, a decision maker is modeled as selecting the discrete alternative with the highest utility among those available at the time the choice is made. Since there are no factors in the decision-making procedure that are unobservable to decision-makers, random utility theory is used to model observed behavior. Within the random utility framework, a utility function can be specified, which expresses hypotheses about the way in which individual respondents combine their part-utilities into an overall evaluation or preference. Following Nakosteen and Zimmer (1980), an agent's utility of two choices can be denoted as U^a and U^b. The observed choice between the two reveals which one provides the greater utility, but not the unobservable utilities. Therefore, the observed indicator equals 1 if $U^a > U^b$ and 0 if $U^a \leq U^b$. There are many approaches that may be utilized to model random utility. Following Greene (2000), a common formulation of the linear random utility model is shown below:

(1) $U^a = x'\beta_a + \varepsilon_a$ and $U^b = x'\beta_b + \varepsilon_b$

Where:

U^a = respondents utility of choosing alternative 'A';

X = indirect utility;

β = a vector of attribute values for alternative 'A', as viewed by respondent; and

ε = random element

Subsequent to Ben-Akiva and Lerman (1985), Kolstad and Braden (1991), Louviere (1994), Adamowicz et al. (1994) and Nakosteen and Zimmer (1980), a general random utility function can be expressed as:

(2) Prob (Y=1 | X) = Prob ($U^a > U^b$)

$$= \text{Prob}\ (x'\beta_a + \varepsilon_a - x'\beta_b + \varepsilon_b > 0 \mid x)$$

$$= \text{Prob}\ (x'(\beta_a - \beta_b) + \varepsilon_a - \varepsilon_b > 0 \mid x)$$

$$= \text{Prob}\ (x'\beta + \varepsilon > 0 \mid x)$$

3.2.3 Probit Analysis Models

The probit analysis idea was originally published in *Science* by Chester Ittner Bliss in 1934. Probit analysis is a specialized regression model of binomial response variables (Vincent). The probit model is based on the cumulative distribution and estimates the probability of the dependent variable lying inside at a 0 – 1 interval (Gong et al. 2007). A common behavioral assumption underlying in economic theory states that "agents" aim to maximize their expected utility. In our application of binary probit models, it is therefore assumed that producers attempt to maximize their utility when faced with a binary choice. An example application in this thesis is the 'yes' or 'no' decision of joining a beef alliance.

This survey consisted of two binary choice models, the first model illustrating the choice of beef producers willingness to join an alliance, and the second illustrating the choice of beef

producers preferences towards alliances. In a binary response model, interest primarily lies in the response probability (Woolridge 2003). The dependent variable for the first choice model (Model One) is defined as:

$$Y_i = \begin{cases} 1 \text{ if Yes to joining an Alliance} \\ 0 \text{ if No to joining an Alliance} \end{cases}$$

The probabilities associated with this choice are:

(3) Prob (Joining Alliance) = Prob (Y_i =1)

(4) Prob (Not Joining Alliance) = Prob (Y_i = 0)

With regards to the second choice model (Model Two), respondents were asked to choose between two alternative beef alliances. Again, it is assumed that producers will choose the alliance that maximizes their individual utility. Following the random utility theory summarized above, it is assumed that when an individual chooses to join a particular beef alliance, with specific alliance attributes and attribute levels, the individual's choice reflects the benefits and costs of this alliance to the individual. The dependent variable for the first choice model is defined as:

$$Y_i = \begin{cases} 1 \text{ if Alliance A is chosen} \\ 0 \text{ if Alliance B is chosen} \end{cases}$$

The probabilities associated with this choice are:

(5) Prob (Joining Alliance A) = Prob (Y_i =1)

(6) Prob (Not Joining Alliance A) = Prob (Y_i = 0)

A cumulative distribution function must be specified for the disturbance term in order to estimate this model. The most commonly used form is the normal distribution (used in probit models). Following Greene (2003) and Maddala (1988), the specifications of the model can be presented as follows;

(7) $\text{Prob}\,(Y_i = 1) = \text{Prob}\,[u_i > -(\beta_0 + \sum_{t=1}^{t} ß_t x_{it})] = 1 - F\,[-(\beta_0 + \sum_{t=1}^{t} ß_t x_{it})]$

which represents the probability of the event occurring, where F is the cumulative distribution of *u*, the beta's denote the coefficient estimates, and the x's denote the deterministic component of a utility function. For the probability of non-occurrence of the event, the probability is one minus the event probability, hence;

(8) $\text{Prob}\,(Y_i = 0) = F\,[-(\beta_0 + \sum_{t=1}^{t} ß_t x_{it})]$

Assuming that the deterministic component of a utility function X_i can be represented by a linear additive combination of the attributes of an alternative and the unknown parameters as the following functional form:

(9) $X_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta_t X_t$

Using this binary choice framework, specific attributes of beef alliance were analyzed from a choice experiment. The following sections outline how the survey and choice experiment were designed.

3.3 The Survey

3.3.1 Canada Survey Design

A survey was designed to obtain information from Canadian beef producers regarding producer characteristics, production practices, and producers' willingness to join a beef alliance (the original survey is provided in Appendix A). The study covered four Western provinces of Canada, which included, Alberta, British Columbia, Manitoba and Saskatchewan. The National Beef Industry Development Fund financially funded the study and the beef producer database was formed through a membership list accessed by an Alberta beef producer association. The 2001 Agricultural consensus was used to identify how many beef producers should be contacted from each province to guarantee a representative sampling. However, this sampling method could not be used outside of Alberta, due to the inability to contact producers directly outside of Alberta. As a result, it was expected that the survey would result in an over sampling from Alberta.

The comprehensive survey included questions regarding various aspects of beef production, including current production practices; perceptions concerning pricing, premiums, and market value of beef; and a choice experiment that focused on the willingness of beef producers to join a beef alliance. The survey data are used to parameterize the analysis of beef producer characteristics, perceptions, and choices affecting the willingness of beef producers to join an alliance.

Questions regarding years in beef production, cattle breed, herd size, method of how cattle are sold/marketed, information on beef production systems and costs of production, subscription to beef-related and non beef-related magazines, usage of futures and forward contracts, contracts for custom feeding, premiums/discounts associated with specified beef characteristics, net income from beef, other important farm activities, producer and family partners that work off the farm, off-farm taxable net income, producers age, and producers

education were asked to better understand the characteristics of beef producers and their operations.

Questions regarding herd size, method of how cattle are sold/marketed, information on beef production systems and costs of production, usage of futures contracts, contracts for custom feeding, net income from beef, other important farm activities, producer and family partners that work off the farm, off-farm taxable net income, producers age, and producers education were asked to better understand the characteristics of beef producers and their operations.

3.3.2 Arizona NASS Survey Design

A similar survey was designed to equivalently capture the willingness to join a beef alliance for Arizona beef producers (the original survey is provided in Appendix B). The University of Arizona funded the study and the United States Department of Agriculture (USDA) Arizona National Agricultural Statistics Service (NASS) conducted the mailing for the survey. The random selection of cattle producers to receive the survey allowed equal opportunity for selection regardless of demographics or participation in various beef organizations.

The Arizona survey was also comprehensive, analogous to the Canadian survey. The questions asked in the Arizona survey were also asked in the Canadian survey, but the Canadian survey had slightly more questions than the Arizona survey. The Arizona survey included questions regarding various aspects of beef production, including current production practices, producer characteristics, and a choice experiment that focused on the willingness of beef producers to join a beef alliance. The survey data collected was used to parameterize the analysis of beef producer characteristics, perceptions, and choices affecting the willingness of beef producers to join an alliance.

3.3.3 Arizona Rancher BQA Survey Design

In early fall of 2008, the University of Arizona Beef Extension Specialist raised interest in the survey and its results. He proceeded to provide a mailing list of Arizona Rancher Beef Quality Assurance (BQA) individuals that responded to the same questionnaire as Arizona's (the survey is also provided in Appendix B). The BQA program provides training in how to apply vaccines, record keeping, animal health products and its storage, animal handling techniques, and focuses on development of a pre-conditioning program, as well as many other methods concerning management practices and producing healthy, wholesome cattle that meet FDA, USDA, and EPA guidelines and regulations (Arizona Rancher's Beef Quality Assurance 2009). It is beneficial to compare the willingness to join an alliance of the average conventional beef producer to that of a producer that already pays a fee to be in an organization that focuses on producing higher quality cattle.

3.4 The Questionnaire

The questionnaire for Canada, Arizona NASS, and Arizona Rancher BQA contains three parts. Questions in part one focused on the respondent's current beef marketing strategies and production practices. For example, questions concerning if formal contracts are currently used to market cattle and if last years calf crop was marketed as weaned claves, preconditioned calves, retained ownership, or other, help better understand Arizona and Canadian cow-calf producers and their current marketing strategies.

Part two of the survey focused on the choice experiment and producer's willingness to join a beef alliance. This section had only 2 questions, with the first question asking the respondent if they are willing to join a beef alliance under certain circumstances, and the second being the choice experiment. The choice experiment is used to determine the producer's

preferences for the attributes of beef alliances. The choice experiment is discussed in detail below.

The third part of the survey focused on the producer's demographic characteristics. These questions included age, education, off-farm income, beef operation income, beef cow herd size, and other farm activities. It is important to note that since the Arizona NASS and Arizona Rancher BQA surveys differ from the Canada survey, some demographic questions may not be included in part one of the Arizona surveys.

3.5 The Alliance Choice Experiment

A choice experiment was utilized to simulate different varieties of real-life beef alliances. In the computer-based Canadian survey, respondents were first asked if they would consider future participation in a formal agreement between cow-calf producers and other members in a value chain. If the respondent said yes, they were prompted to continue and answer the choice experiment questions.

In this choice experiment, beef producers were presented with a set of four different scenarios. Each scenario involved two different types of alliances to choose from, alliance A or alliance B. Overall, there were eight different versions of the survey for the Canadian and the Arizona Rancher BQA questionnaires measuring the willingness to join an alliance. Which resulted in a total of 32 different types of alliances. However, the Arizona NASS questionnaire consisted of seven versions of the survey when it came to measuring the willingness of joining an alliance. Which resulted in a total of 28 different types of alliances. A reference section describing sale type, type of data sharing, and production protocols was included before the choice experiment scenarios for reference in interpreting the alternative alliance options. The paragraphs below describe these attributes.

Sales Type:

The attribute level of sales type includes different combinations of marketing strategies and compensation schemes. This attribute refers to the way in which the cow-calf producer is willing to market his cattle within the alliance. (i.e. sell animals to alliance, retain ownership, profit sharing among producers).

Type of Data Sharing:

The attribute level of data sharing type includes different combinations of collected information strategies and data sharing schemes. This attribute refers to the different levels at which a producer would want to share data within the alliance (i.e. live performance data, carcass data, individual data).

Production Protocols:

The attribute level of production protocols includes production protocols and quantity commitments. This attribute refers to the use of antibiotics and specific restrictions concerning vaccinations, as well as a minimum number of cattle required by the beef alliance. These types of commitments are considered very important because they ultimately determine the quality and quantity control practices adopted by cow-calf producers. According to Ward (2001), a quantity commitment requirement can be imperative in three ways. First, if an alliance is in a relationship with a processing entity, volume may be important to reduce costs. Second, if an alliance is targeting a specific branded beef product program, volume may allow enhanced control over the supply of the product. Third, producers who are willing to make a quantity commitment in an alliance arrangement will have an increased interest in the success of the alliance.

Participation Fee:

The attribute level of participation fees refers to the different cost per head of participating in the proposed alliance. These costs are in addition to the producer's regular costs of production. This monetary commitment is also important to analyze. Like the quantity commitment, if a producer is willing to pay in order to get information about his cattle marketed, he will also have increased interest in the success of the alliance. In this study, there were four levels of participation fees included.

Between the two choices for alliance preference in each scenario, attributes were randomly varied. The attributes included were: (a) sale type, (b) type of data sharing, (c) production protocols, and (d) alliance participation fee. Options differed in sale type where producer could: (1) sell to alliance, no profit sharing, (2) sell to alliance, bonuses based on animal performance, (3) retain ownership, profit sharing, and (4) retain ownership, no profit sharing. Options differed in type of data sharing where producer could share: (1) live performance, individual data, (2) live performance, pen data, (3) carcass, individual yield and grade data, and (4) carcass, group data. Options differed in production protocols where: (1) No restrictions on vaccination and use of, antibiotics and minimum number of animals required, (2) No restrictions on vaccination and use of, antibiotics and no minimum number of animals required, (3) Restrictions on vaccination and use of, antibiotics and minimum number of animals required, and (4) Restrictions on vaccination and use of, antibiotics and no minimum number of animals required. Options differed in alliance participation fee where producers could pay: (1) $0/head, (2) $5/head, (3) $10/head, and (4) $20/head.

3.6 Survey Procedure

3.6.1 Canada Survey Procedure

In Spring 2006, initially 951 Canadian cattle producers were contacted by telephone. During the telephone screening, the producers were first asked whether they would be willing to participate in an online-survey. The respondents were then told that the same survey could also be completed during an on-site interview, where trained students would use an electronic version of the survey on a laptop computer. No financial incentives were given for participation.

Of the 951 cattle producers contacted, 151 participated in the survey, thus yielding a response rate of 16%. One hundred respondents of the 151 surveys were surveyed on-site, and the remaining 51 completed the same survey on-line. It should be noted that until the spring of 2006, only 110 completed surveys were received. During the summer, a privately organized group of beef producers from north of Westlock (Alberta) raised their interest in participating in the survey, as a result of which another 41 completed surveys were obtained. The survey consisted of 34 questions and it took on average, 15 to 20 minutes to complete. Compared to the 2001 Census of Agriculture, the producers in the Canadian sample have a larger beef cowherd size, a higher education level, and a younger age level (see Table 4.1).

3.6.2 Arizona NASS Survey Procedure

The University of Arizona through NASS of Arizona conducted a similar mail survey in the state of Arizona in May 2005. The Arizona survey differed with the Canadian survey in that the Arizona survey was slightly shorter and was not conducted as an on-line survey. The Arizona survey consisted of 25 questions and took approximately 10 to 15 minutes to complete. A few questions that were included in the Canadian survey, but not in the Arizona survey include; how many years has your business been producing beef cattle; do you specialize in a certain breed; how would you judge the performance of auction markets in terms of competitive pricing,

rewarding qualities, handling; and in the future, do you expect buyers to require your claves to meet specific production protocols.

Initially, 800 surveys were mailed out to cattle producers in the state of Arizona in May 2005. No financial incentives were given for participation. Of the 800 surveys mailed out, 157 were returned, resulting in almost a 20% response rate. However, roughly half of those surveys were lost in an express mail package en route to being entered electronically. Therefore, 85 surveys were not lost. Due to this mishap, the same survey was mailed out to a sampling of producers that did not receive a principal survey or responded to a principal survey. Some producers that did not complete the initial survey could have received a second survey. Thus, the response rate for the second survey was not as high. In November 2005, 600 surveys were mailed out to individuals that did not complete a prior survey and 61 were returned. Which resulted in a 10% response rate. Combining the two Arizona surveys, a total of 146 surveys were useable. From here on, these two mailings will be denoted as the 1st and 2nd sampling for the Arizona survey.

3.6.3 Arizona Rancher BQA Survey Procedure

In November 2008, 457 surveys were initially mailed to all members of the Arizona Rancher Beef Quality Assurance program. A survey comparable to the Arizona version was used for the BQA mailing, which is provided in Appendix B. The Arizona Rancher BQA survey had slightly few more questions that were more consistent with the Canada survey questions. Thirty-four of the 457 surveys mailed were returned undeliverable, resulting in only 423 surveys mailed to producers. A total of 107 surveys were returned and useable, thus yielding a 25% response rate for the Arizona Rancher BQA members. It is also possible that some cattle producers sampled from the first and second Arizona NASS survey could have been sampled again in the

2008 BQA survey, although the overlap is expected to be very small, given the relative size of all the Arizona ranches sampled from (~ 10,000) versus the size of the BQA producers.

3.7 The Sample Data

3.7.1 General Demographic Information

The following graphs illustrate the survey respondents' mean demographic responses for all survey types from Arizona and Canada. Operation type, beef cowherd size, age level, education level and net income from beef are included below. All other mean responses are located in Appendix C.

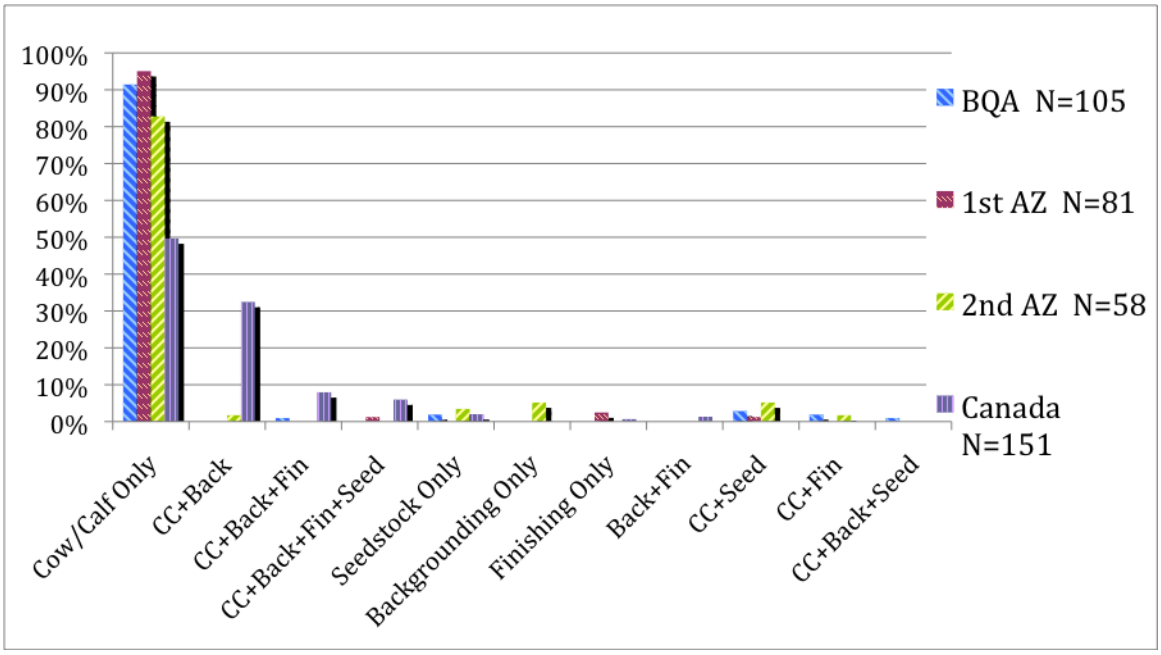
1. Operation Type

The survey respondents represented an array of beef operations from seedstock to backgrounding operations. Some producers also have mixed beef enterprises, such as cow-calf and finishing operations. The Arizona and Canada surveys were different in this question based on the answer choices given. The Canadian respondents were asked to indicate their type of operation as 1) cow-calf operation only; 2) cow-calf + backgrounding; 3) cow-calf + backgrounding + finishing; 4) cow-calf + backgrounding + finishing + seedstock; 5) seedstock producer; 6) backgrounding only; 7) finishing only; 8) backgrounding + finishing. However, the Arizona respondents were asked to indicate their type of operation as 1) cow-calf operation; 2) backgrounding operation; 3) finishing operation; 4) seedstock operation, and asked to check all that apply. Given the discrepancy in the choices given for this specific question, the Arizona data had to be modified in order to fit the same choices as given for the Canadian survey, as well as some new choices that were not asked by the Canadian survey that applied to the Arizona-style survey. For example, three new categories were added to encompass all Arizona responses for

this question. 1) cow-calf + seedstock; 2) cow-calf + finishing; 3) cow-calf + backgrounding + seedstock. Therefore, a total of 9 categories exist for responses to this question.

As shown in Figure 3.1 below, the majority of Canadian respondents (50%) belong to the category of cow-calf operation. Approximately 32 percent of Canadian respondents are cow-calf + backgrounding operations, while the remaining respondents belong to categories of cow-calf + backgrounding + finishing (8%), cow-calf + background + finishing + seedstock (6%), backgrounding + finishing (1.3%), seedstock (2%), and finishing (0.6%). Out of the sample for this study, no respondent belongs exclusively to a backgrounding only operation. The majority of Arizona respondents, from the first (95%) and second (83%) sampling also belong to the category of cow-calf operation. The remaining respondents belong to the categories of cow-calf + backgrounding (0%) and (1.7%) respectively, cow-calf + backgrounding + finishing + seedstock (1.2%) and (0%) respectively, seedstock only (0%) and (3.5%) respectively, backgrounding only (0%) and (5.2%) respectively, finishing only (2.5%) and (0%) respectively, cow-calf + seedstock (1.2%) and (5.1%) respectively, cow-calf + finishing (0%) and (1.7%) respectively. The majority of Arizona Rancher Beef Quality Assurance (BQA) member respondents also indicated that their primary current operation was cow-calf (91%). The remaining respondents belong to the categories of cow-calf + backgrounding + finishing (1%), seedstock only (1.9%), cow-calf + seedstock (2.9%), cow-calf + finishing (1.9%), cow-calf + backgrounding + seedstock (1%).

FIGURE 3.1 RESPONDENTS CURRENT OPERATION



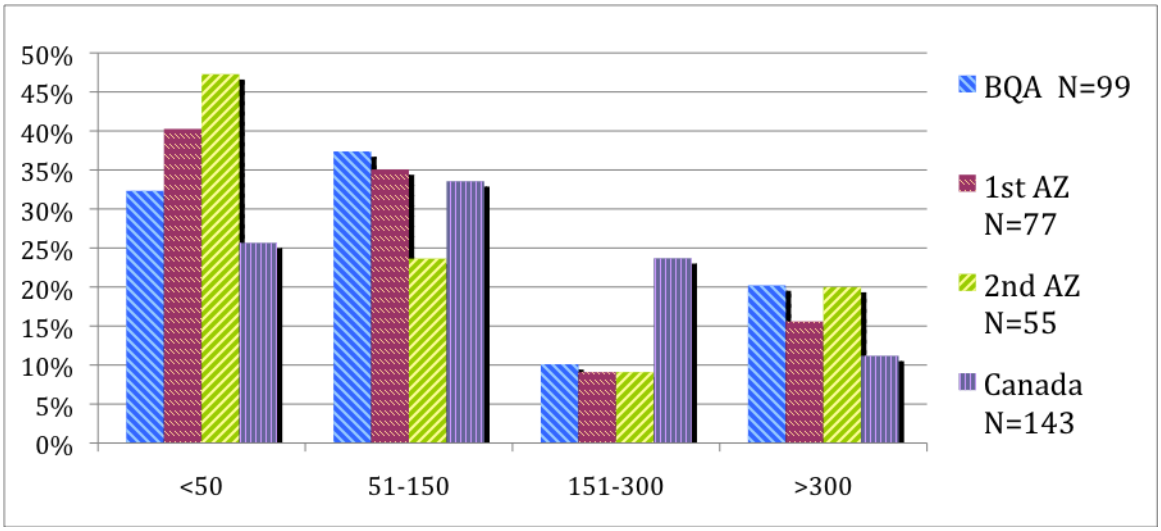
2. Beef Cowherd Size

Herd size for Canadian and Arizona NASS first and second sampling respondents is measured by the number of beef cows the beef producers have at the end of 2005. Herd size for Arizona Rancher BQA respondents is measured by the number of cows at the end of 2007. Respondents were asked to choose from five categories to indicate their cowherd size: 1) none; 2) less than 50 head; 3) 51-150 head; 4) 151-300 head; 5) greater than 300 head.

Figure 3.2 below shows the distribution of beef cowherd size for all survey respondents. About 5.3% of Canadian respondents indicated that they have no beef cows at the end of 2005. Approximately 26% of Canadian respondents have a beef cowherd size of less than 50 head, 34% of respondents have a beef cowherd size between 51-150 head, 24% of respondents have a beef cowherd size between 151-300 head, and only 11% of respondents indicated having a herd size of greater than 300 head. Approximately 10% and 11%, respectively of Arizona NASS first and second sampling respondents indicated that they have no beef cows at the end of 2005.

About 40% and 42% of the first and second Arizona NASS samplings have a beef cowherd size of less than 50 head, which is the largest percentage out of all four data groups, 35% and 24%, respectively responded to having a herd size between 51-150 head, both Arizona NASS samplings only had a 9% response to having a beef cowherd size between 151-300 head, 16% and 20%, respectively indicated that they had a herd size of greater than 300 head. Arizona Rancher BQA respondents followed closely with Canada respondents on herd size less than 50 head (32%) and herd size between 51-150 head (37%). Arizona Rancher BQA's smallest chosen category was herd size between 151-300 head (10%), and 20% indicated in 2007 they had a beef cowherd size of greater than 300. Eight percent of Arizona Rancher BQA respondents indicated they have no beef cows at the end of 2007.

FIGURE 3.2 RESPONDENTS BEEF COWHERD SIZE

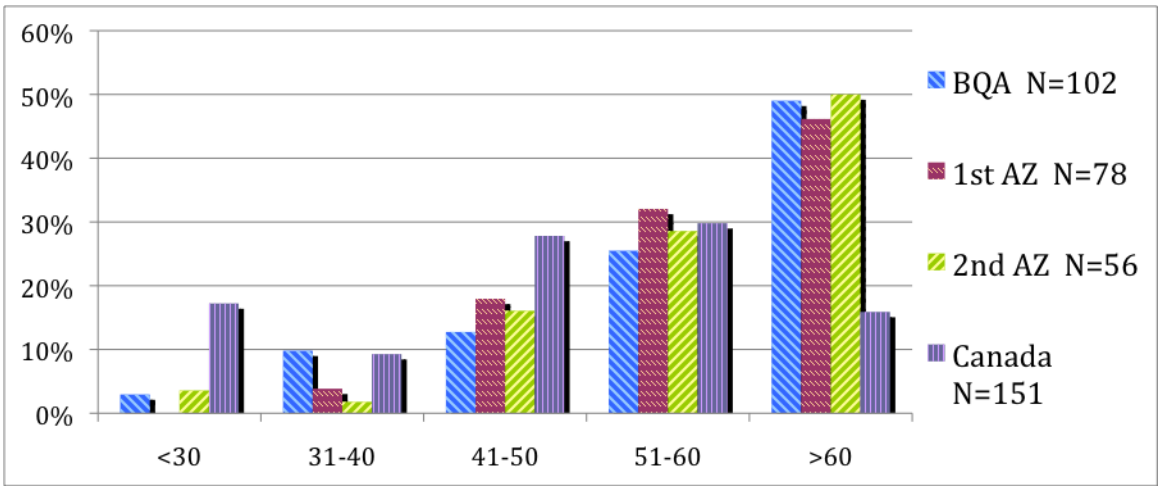


3. Age Level

Respondents were asked to indicate their age from five categories. Figure 3.3 summarizes the age distribution of all survey respondents. At first glance, one notices that Canada producers appear to have a younger mean age, whereas Arizona producers appear to have an older mean

age. Almost 46% of Canada respondents were more than 50 years old (30% were between age 51-60 and 16% were greater than 60 years). Another 28% were between age 41-50, approximately 26% of producers were below age 40 (17% were under 30 years of age and 9% were between 31-40). Approximately 79% of Arizona NASS respondents and 75% of Arizona Rancher BQA respondents were more than 50 years old. Arizona NASS combined samplings had 50% age greater than 60 and 30% between 51-60 years of age. Arizona Rancher BQA had 49% age greater than 60 and 26% between 51-60 years of age. Arizona NASS combined samplings indicated approximately 17% of respondents were age 41-50 and 5% were below the age of 40. Arizona Rancher BQA respondents indicated that 13% were between the age of 41-50 and 13% were below the age of 40. The predominance of cattle producers close to retirement age suggests that the western Canadian cattle industry and even more prevalent, the Arizona cattle industry is facing a significant structural change.

FIGURE 3.3 RESPONDENTS AGE LEVEL

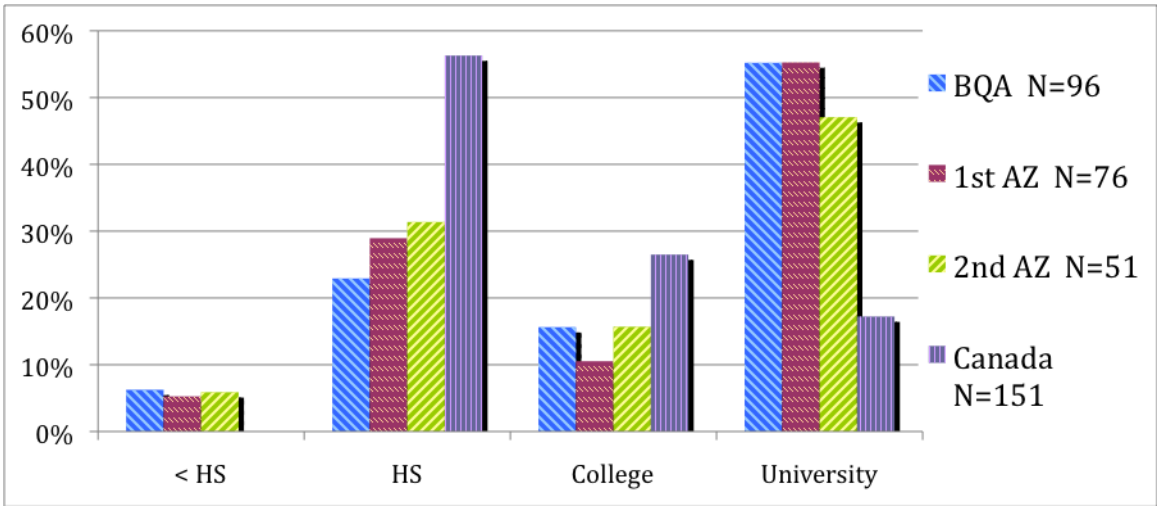


4. Education Level

The Canadian respondents' educational levels are categorized in three ways: 1) high school; 2) college; and 3) university. The Arizona respondents' educational levels are

categorized in four ways: 1) less than high school graduate; 2) high school; 3) technical/vocational degree; and 4) university. Where college is obtaining a two-year degree or a type of trade school. Figure 3.4 summarizes the education level distribution of the four survey respondents. About 56% of Canadian respondents have a high school diploma or equivalent. Approximately 29% and 31%, respectively of Arizona NASS combined samplings respondents indicated they have a high school diploma or equivalent, with 5% and 6%, respectively having no high school diploma. Twenty three percent of Arizona Rancher BQA respondents were recognized as having a high school diploma or equivalent, with 6% having no high school diploma. About 44% of Canadian respondents indicated they have some college or university degree, which is fairly low compared to Arizona NASS and Arizona Rancher BQA respondents. Both Arizona NASS samplings indicated approximately 64% of respondents have some college or university degree. Arizona Rancher BQA respondents have a higher mean of 71% indicating they have a college or university degree.

FIGURE 3.4 RESPONDENTS EDUCATION LEVEL



5. Income (Farm & Off-farm Income)

Respondents' incomes were measured by two sources: 1) net farm income from beef and 2) off-farm income. Figure 3.5 below illustrates that 60% of Canadian respondents earn more than 50% of their taxable farm income from their beef operation. Fifty six percent of Arizona Rancher BQA respondents also indicated that their farm income from beef is greater than 50% of their taxable farm income. However, both Arizona NASS samplings have a lower percentage (about 43%) when it comes to earning more than 50% of their taxable farm income from their beef operation. As can also be seen from the graph, only 27% of Canadian respondents indicated earning less than 25% of taxable farm income from their beef operation. Both Arizona NASS samplings were the highest in the category at almost 46%, and Arizona Rancher BQA respondents indicate 32% earn less than 25% of taxable farm income from their beef operation. In the middle category, all survey respondents were consistent while indicating approximately 10% earn between 25-50% of taxable farm income from their beef operation.

Producers were asked to indicate if they or their beef business partners have off-farm employment, Figure 3.6 shows these descriptive statistics. Off-farm income is categorized four ways: 1) Less than 25% of net taxable income; 2) Between 25-50% of net taxable income; 3) More than 50% of net taxable income; and 4) Not applicable.

FIGURE 3.5 RESPONDENTS NET FARM INCOME FROM BEEF

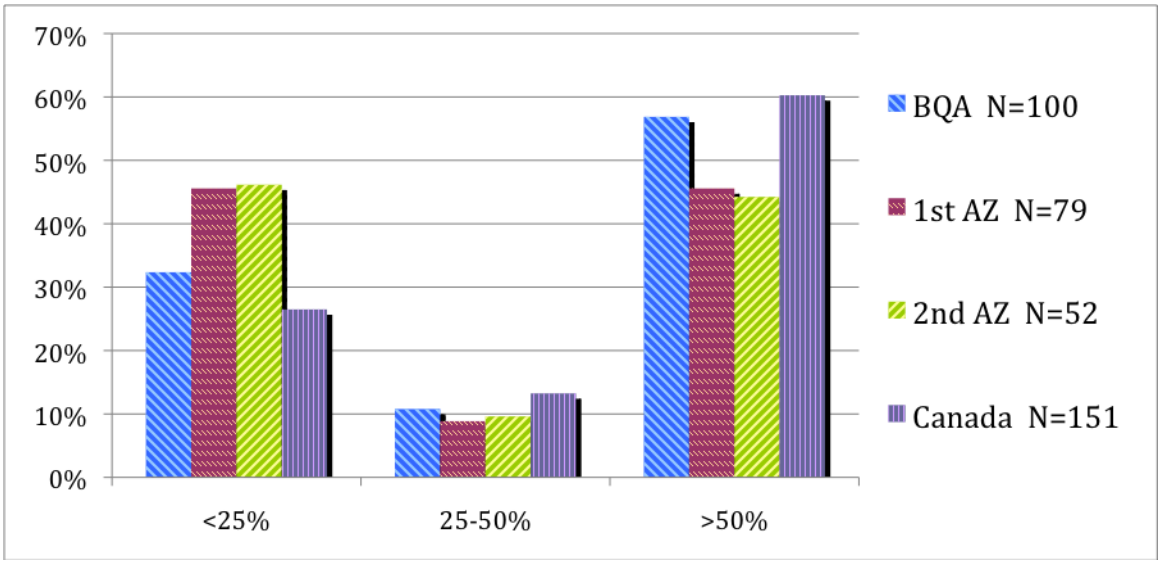
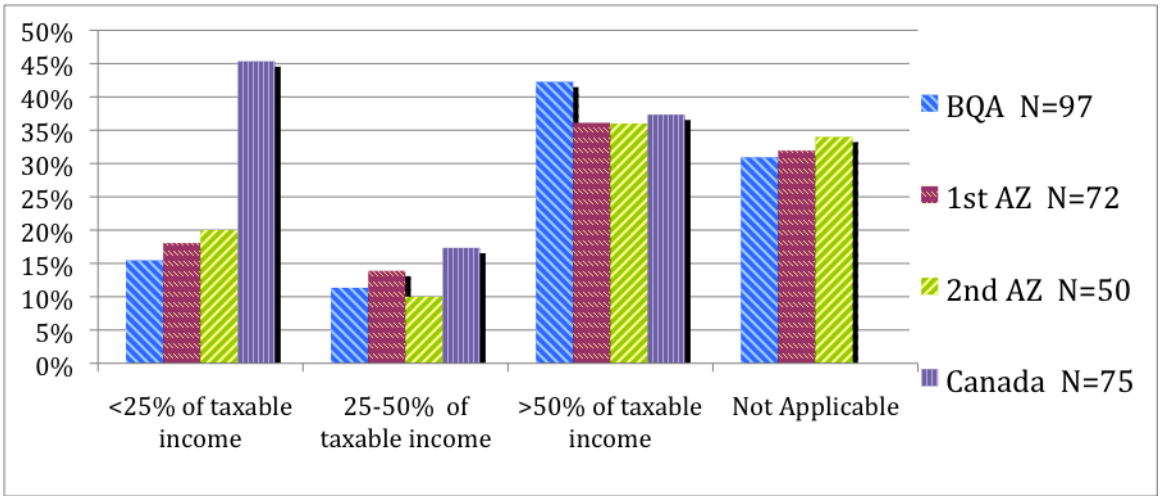


FIGURE 3.6 RESPONDENTS OFF-FARM INCOME

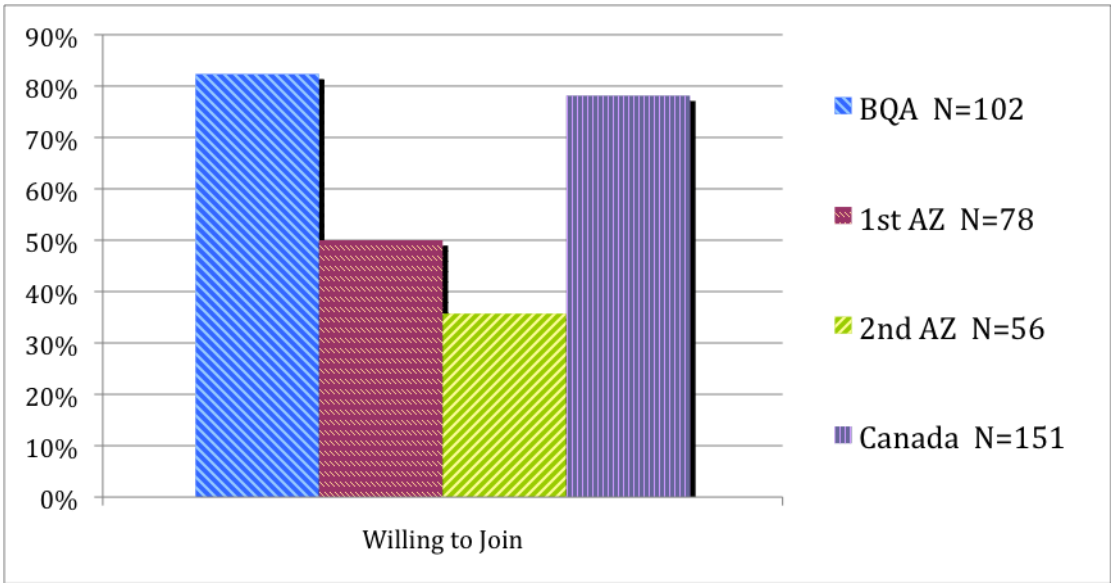


6. Beef Alliance Choice Experiment

When respondents were asked about their willingness to participate, in principal, in a beef alliance, the majority of beef producers answered "yes" (Figure 3.7). Arizona Rancher BQA members had the highest number willing to join, with 82% answering "yes", Canada had the next highest with 79% willing to join, the first Arizona NASS sampling had 50% willing to join

and the second NASS sampling only had 36% respondents who indicated they were willing to join a beef alliance.

FIGURE 3.7 RESPONDENTS WILLINGNESS TO JOIN BEEF ALLIANCE



3.8 Summary and Conclusions

This chapter introduced the survey instrument and presented the descriptive statistics. The descriptive statistics of the data were presented as a basis of further econometrical estimation.

Appendix C shows graphs of the remaining survey's questions and the respondent's means, as well as the eight different versions of the survey questionnaire regarding the alliance characteristic question. For example, Table 3.1 shows the alliance characteristic question for respondents who received version one of the surveys. As can be seen, there are four separate tables with a choice of alliance A or alliance B within each table. The eight survey versions can be used to estimate which type of alliance, based upon its characteristics, is most valued by cow-calf producers. This data will also show if there are differences between Canadian and Arizona

NASS beef producers, as well as Arizona Rancher Beef Quality Assurance members in regards to preferred alliance characteristics.

CHAPTER FOUR: MODEL AND EMPIRICAL RESULTS

4.1 Introduction

This chapter discusses the model development, estimation and results. In section 4.2, the model development is discussed for both Canada and Arizona data. Section 4.3 discusses Model 1, or the willingness of respondents to participate in a beef marketing alliance and section 4.4 analyzes the results of this question. Model 2, or alliance attributes desired by those favorable to an alliance are discussed in section 4.5 and the results are presented in section 4.6. The influence of respondents' demographics and socio-economic characteristics on their choice behavior of beef alliances is explained in section 4.6. The chapter concludes with a section (4.7) regarding key estimation results concerning beef alliance attributes.

4.2 Model Development

Canada:

Figure 4.1 demonstrates the logic behind the choice experiment question. Respondents who answered "yes" to be willing to join an alliance will automatically be exposed to the choice experiment, in which four binary alliance choice questions need to be answered. With regard to respondents who answered "no" to be willing to join an alliance, they are directly routed to the third part of the questionnaire.

Arizona NASS and Arizona Rancher BQA:

As described in Chapter 3, the Arizona NASS and Arizona Rancher BQA mail survey had no way of limiting the choice experiment to respondents who answered "yes" to be willing to join an alliance. However, the respondents were asked to skip the choice experiment and continue on to the third part of the survey if the respondent chose "no". Yet, some respondents

indicated that they were willing to join an alliance by checking “yes”, but did not complete the four binary alliance choice questions.

4.2.1 Choice-specific vs. Individual-specific Variables

The objective of the econometric analysis of this study is to estimate the relationship between the probability of binary alliance choices and the explanatory factors that would impact their probability. These explanatory factors include the four choice-specific variables (sales type, data sharing, production protocols, and participation fee) and the individual-specific variables (e.g. demographic variables). To explain willingness for beef alliance participation (Model 1), the explanatory variables consist of a selection of individual-specific variables. To explain the alliance choice experiment preference (Model 2), explanatory variables consisted of the same selection of individual-specific variables from Model 1 plus seven choice-specific variables of sale type, profit sharing, data sharing, production protocols, and participation fees.

4.3 Model 1: Beef Alliance Participation Binary Model

In accordance with the basic binary probit model that was discussed in chapter 3, the full version of selected variables integrated into Model 1 are presented in Equation 4.1.

Equation 4.1 $$Y_i^* = ß_0 + \sum_{j=1}^{k} ß_j x_{ij} + u_i$$

Where Y_i^* is not observed, also referred to as a latent variable, and the distribution of the error term, u_i, is normally distributed.

Equation 4.2 $$\sum_{j=1}^{k} ß_j x_{ij} = ß_0 + ß_1 x_1 + ß_2 x_2 + ß_3 x_3 \ldots + ß_{17} x_{17}$$

Where:

Variable	Description
Dependent Variable	
	Beef Alliance Participation (1=yes; 0=no)
Independent Variable	
X_1	Cow-calf operation (1=yes; 0=otherwise)
X_2	No other Farm Activities, other than cow-calf operation (1=yes; 0=otherwise)
X_3	Pork, Dairy, Sheep, Diversified Livestock, or Other Activities (1=yes; 0=otherwise)
X_4	Market Calves through Formal Agreement (1=yes; 0=otherwise)
X_5	Collect Production or Processing Data (1=yes; 0=otherwise)
X_6	Oral Contract in Place for Business (1=yes; 0=otherwise)
X_7	Written Contract in Place for Business (1=yes; 0=otherwise)
X_8	Income from Beef Operation Greater than 50% (1=yes; 0=otherwise)
X_9	Age less than 40 years (1=yes; 0=otherwise)
X_{10}	Age between 51 and 60 years (1=yes; 0=otherwise)
X_{11}	Age greater than 60 years (1=yes; 0=otherwise)
X_{12}	Education (2=high school graduate, 3=college [2-yr degree], 4=university [4-yr degree])
X_{13}	Sold as Weaned Calves (1=yes; 0=otherwise)
X_{14}	Sold as Preconditioned Calves (1=yes; 0=otherwise)
X_{15}	Retained Ownership of Calves (1=yes; 0=otherwise)
X_{16}	Cow herd size between 51-150 head (1=yes; 0=otherwise)
X_{17}	Cow herd size greater than 151 head (1=yes; 0=otherwise)

Variables that represent producer's individual characteristics include a dummy of producer's operation type, collect production/processing data, education level, age level, percentage of net income from beef, and beef cow herd size. Variables that represent producer's marketing practices include a dummy of farm enterprises other than beef (pork, dairy, sheep, diversified livestock, other type of operation, or no other type of operation), market calves through formal agreements, if written or oral contracts are in place for the beef business, and if producer sold last years calf crop as weaned calves, preconditioned calves or retained ownership

of calves. A dummy was also included in the Canadian model in order to represent if the respondent completed the survey on-line. A dummy was also included in the model with all four data sets to represent Arizona Rancher BQA and Canada respondents.

4.4 Model 1: Empirical Results

With regards to Model 1, four separate models are estimated. A model with Arizona Rancher BQA respondents only, a model with Arizona NASS respondents only, a model with Canadian respondents only, and a model with all three data sets combined. It is beneficial to estimate the three models separately in order to compare demographic diversities and variations between Arizona Rancher BQA members and ordinary Arizona cattle producers. The results for these four models are presented in Tables 4.5 – 4.9 in Appendix D.

4.4.1 Arizona Rancher BQA Model 1 Results

Arizona Rancher BQA results from Model 1 have six significant variables. These include; oral contract, income from beef operation greater than 50%, age less than 40 years, age between 51 and 60 years, age greater than 60 years, and education level. If a producer has an oral contract in place for his business, the producer is 26% more likely to join a beef alliance. Beef income greater than 50% also has a positive effect on willingness to join an alliance, whereas the three age variables have a negative effect on willingness to join a beef alliance. Education has a positive effect, which means as a producer's education level increases by one category (i.e. high school to 2-year degree to 4-year degree), so does his willingness to join a beef alliance. These results are shown in Table 4.5.

4.4.2 Arizona NASS Model 1 Results

Arizona NASS results from Model 1 have three significant variables. These include; age between 51 and 60 years, age greater than 60 years, and education level. The two significant age

variables also have a negative effect on willingness to join an alliance, comparable to the Arizona BQA results. As a producer's education level increases by one category, willingness to join a beef alliance increases by 11%. These results are shown in Table 4.6.

4.4.3 Canada Model 1 Results

Canadian results from Model 1 have seven significant variables. These include; cow-calf operation, no other farm activities, written contract in place for business, education level, sold calf crop as weaned calves, sold calf crop as preconditioned calves, and herd size greater than 151 head. Cow-calf operation, no other farm activities, and written contracts all had a negative effect on producer's willingness to join an alliance. Whereas, education, weaned calves, preconditioned calves, and cow herd size > 151 have a positive effect on producer's willingness to join an alliance. These results are shown in Table 4.7.

As mentioned earlier, another model was estimated for the Canadian data set. This model includes the same independent variables as Model 1, but also includes a dummy variable for on-site survey. This dummy captures the respondents who filled out the survey on-site as compared to respondents who filled out the survey on-line via computer. As the results indicate from Table 4.8, the on-site variable is significant at the 1% level and has a negative effect. This means that if a producer filled out the survey via on-site, the producer is 38% less likely to join an alliance. All other variables are in-line with the discussion above.

4.4.4 All Data Sets Combined Model 1 Results

Results from all three data sets combined from Model 1 are presented in Table 4.9. The significant variables include; cow-calf operation, no other farm activities, written contract in place for business, age between 51 and 60 years, age greater than 60 years, education level, herd size between 51 and 150 head, herd size greater than 151 head, Arizona Rancher BQA

respondent, and Canada respondent. The cow-calf operation, no other farm activities, and the two age variables have a negative effect on producer's willingness to join. Whereas, education, the two herd size variables and the Arizona Rancher BQA and Canada respondents have a positive effect on producer's willingness to join. With the addition of the Arizona Rancher BQA and Canada variable, it can be seen that Arizona Rancher BQA respondents and Canada respondents alike have a positive effect on joining as compared to Arizona NASS respondents.

4.5 Model 2: Alliance Choice Model

If producers are willing to join an alliance, another binary probit model is used to analyze how choice-specific attributes differ between respondents when presented with two alternative choice sets of beef alliance (alliance A versus alliance B).

As shown previously in chapter 3, the purpose of having eight different versions of the alliance choice question is to help determine which alliance characteristics a respondent prefers. In order to model this type of preference, a ranking order is used. The ranking order goes from characteristics most prevalent in an alliance setting, to characteristics least prevalent in an alliance setting. The 16 possible alliance characteristics are shown in Table 4.1 below, with the ranking order to the right.

Table 4.1 Possible Survey Alliance Characteristics

Sale Type		**Profit Sharing**	
Retain Ownership	Least Like an Alliance Arrangement ↓	No Profit Sharing	Least Like an Alliance Arrangement ↓
Sell to Alliance	More Like an Alliance Arrangement	Profit Sharing	More Like an Alliance Arrangement
Carcass Data Sharing		**Individual Data Sharing**	
Live Performance, Pen Data	Least Data Sharing ↓	Pen/Group Data	Least Data Sharing ↓
Carcass Data	More Data Sharing	Individual Yield & Grade Data	More Data Sharing
Restriction Protocols		**Animal Required Protocols**	
No Restrictions	Least Restricted Protocols ↓	No Minimum # Animals Required	Least Restricted Protocols ↓
Restrictions	More Restricted Protocols	Restrictions	More Restricted Protocols
Participation Fee			
$0	Least Expensive Fee		
$5 ↓			
$10			
$20	More Expensive Fee		

With regards to Sale Type, ranking occurs from the type of sale most like an alliance arrangement to least like an alliance arrangement. Selling cattle to an alliance and profit sharing among producers denotes an arrangement most like an alliance, whereas retained ownership of cattle and no profit sharing represents the more common of cow-calf production sales type, and the arrangement least like an alliance. With regards to Data Sharing Type, ranking occurs from the most type of data shared to least type of data shared. Carcass data and individual yield and grade data denotes the type of data sharing with more information compared to the least type of data sharing; live performance (physical attributes only) and pen data (consolidated information on a group of cattle). With regards to Production Protocols, ranking occurs from the most

restricted cattle production protocols to least restricted cattle production protocols. An arrangement with restrictions on antibiotics, vaccinations, and a minimum number of animals required is denoted as consisting of the more restricted protocols. The "no restrictions and no minimum number of animals required" characteristic is ranked as being the least restricted type of protocols. With regards to alliance participation fee, ranking occurs from the most expensive fee ($20) to the least expensive fee ($0).

In order to isolate and identify preferences for alliance attributes, the four categories from Table 4.1 are broken down into seven categories. These seven variables are; sale type, profit sharing type, carcass data sharing type, individual data sharing type, restriction protocol type, animal number required type, alliance participation fee.

With the alliance characteristics ranked in order from most like an alliance arrangement to least like an alliance arrangement, a 1 can be given to the variable most like an alliance and a 0 can be given to the variable that is least like an alliance. For example, regarding sale type, if alliance A requires selling cattle to the alliance, then sale type 'A' would take the value of 1. If alliance B requires retaining ownership of cattle, then sale type 'B' would take a value of 0. Another variable is then created, a difference variable. This difference variable equals alliance 'A' minus alliance 'B'. In our example above, the difference variable for sale type would equal 1 (alliance 'A' – alliance 'B' ➔ 1 – 0 = 1). The table 4.2 below demonstrates how the difference variable for each of the seven characteristics will be calculated in order to estimate Model 2 above.

Table 4.2 Difference Variable for Model Two

Variable	Differences
Sale Type Difference	Sale Type 'A' – Sale Type 'B'
Profit Sharing Difference	Profit Sharing 'A' – Profit Sharing 'B'
Carcass Data Sharing Difference	Carcass Data 'A' – Carcass Data 'B'
Individual Data Sharing Difference	Individual Data 'A' – Individual Data 'B'
Restriction Protocol Difference	Restrictions 'A' – Restrictions 'B'
Animal Required Difference	Animal # Required 'A' – Animal Required 'B'
Alliance Participation Fee Difference	Fee 'A' – Fee 'B'

Therefore, if the attribute exists that is most like an alliance, it takes the value of one. This difference variable can be used in order to estimate a model of alliance characteristic preferences when faced with various alliance arrangements. Implications from the difference variable can be summarized as follows; a producer is x% more likely to participate in an alliance if selling cattle to the alliance exists compared to retaining ownership, a producer is x% more likely to participate in an alliance if profit sharing exists compared to no profit sharing, a producer is x% more likely to participate in an alliance if carcass data sharing exists compared to live data sharing, a producer is x% more likely to participate in an alliance if individual data is collected rather than pen/group data, a producer is x% more likely to participate in an alliance if restrictions are enforced rather than no restrictions enforced, a producer is x% more likely to participate in an alliance if a minimum number of animals are required compared to no minimum number of animals required, a producer is x% more likely to participate in an alliance if the fee price is higher compared to a lower/no fee price.

As noted before in chapter 3, each survey consists of four tables, each with a binary choice of choosing alliance 'A' or alliance 'B'. In order to efficiently compare alliance 'A' to alliance 'B', the four tables each needed to represent its own observation. Therefore, instead of respondent 'x' representing one observation, respondent 'x' would represent four observations. Within the four observations, the independent variables would remain the same, but the

responses would change to adequately address which alliance was chosen within each table. Therefore, in each data set for model 2, all number of observations were multiplied by 4. Table 4.3 below shows an example of this. Notice for respondent 'z', the age and education variable remain the same for all four observations, only the sale type variable changes in order to match survey version eight's alliance attributes. The dependent variable represents if the respondent chose alliance 'A' over alliance 'B'.

Table 4.3 Example of Model 2 Data Coding

Respondent	Dependent Variable (Alliance 'A' = 1)	Alliance 'A'	Alliance 'B'	Sell Difference	Alliance 'A'	Alliance 'B'	Profit Difference
X	1	Sell to Alliance	Sell to Alliance	1 - 1 = 0	Profit Sharing	No Profit Sharing	1 - 0 = 1
X	1	Sell to Alliance	Ownership Retain	1 - 0 = 1	Profit Sharing	Profit Sharing	1 - 1 = 0
X	1	Ownership Retain	Ownership	0 - 0 = 0	No Profit Sharing	Profit Sharing	0 - 1 = -1
X	1	Ownership	Sell to Alliance	0 - 1 = -1	No Profit Sharing	No Profit Sharing	0 - 0 = 0

The basic model for the alliance choice experiment is defined as follows:

Equation 4.3 Prob (Y_i = join alliance 'A') = $Y_i^* = ß_0 + \sum_{j=1}^{k} ß_j x_{ij} + u_i$

Where Y_i^* is not observed, also referred to as a latent variable, and the distribution of the error term, u_i, is normally distributed.

Equation 4.4 $\sum_{t=1}^{t} ß_t x_t = ß_0 + ß_1 x_1 + ß_2 x_2 + ß_3 x_3 \ldots + ß_{24} x_{24}$

Where:

Variable	Description
Dependent Variable	
	Chose Alliance 'A' (1=yes; 0=no)
Independent Variable	
X_1	Cow-calf operation (1=yes; 0=otherwise)
X_2	No other Farm Activities (1=yes; 0=otherwise)
X_3	Pork, Dairy, Sheep, Diversified Livestock, or Other Activities (1=yes; 0=otherwise)
X_4	Market Calves through Formal Agreement (1=yes; 0=otherwise)
X_5	Collect Production or Processing Data (1=yes; 0=otherwise)
X_6	Oral Contract in Place for Business (1=yes; 0=otherwise)
X_7	Written Contract in Place for Business (1=yes; 0=otherwise)
X_8	Income from Beef Operation Greater than 50% (1=yes; 0=otherwise)
X_9	Age less than 40 years (1=yes; 0=otherwise)
X_{10}	Age between 51 and 60 years (1=yes; 0=otherwise)
X_{11}	Age greater than 60 years (1=yes; 0=otherwise)
X_{12}	Education (2=high school graduate, 3=college [2-yr degree], 4=university [4-yr degree])
X_{13}	Sold as Weaned Calves (1=yes; 0=otherwise)
X_{14}	Sold as Preconditioned Calves (1=yes; 0=otherwise)
X_{15}	Retained Ownership of Calves (1=yes; 0=otherwise)
X_{16}	Cow herd size between 51-150 head (1=yes; 0=otherwise)
X_{17}	Cow herd size greater than 151 head (1=yes; 0=otherwise)
X_{18}	Sale Type Difference (1=sell to alliance; 0=retained ownership)
X_{19}	Profit Sharing Difference (1=profit sharing/bonuses; 0=no profit sharing)
X_{20}	Carcass Data Sharing Difference (1=carcass data; 0=live data)
X_{21}	Individual Data Sharing Difference (1=individual data; 0=group data)
X_{22}	Restriction Protocol Difference (1=restrictions; 0= no restrictions)
X_{23}	Animal Required Difference (1=minimum number required; 0= no minimum number required)
X_{24}	Alliance Participation Fee Difference (20=$20, 10=$10, 5=$5, 0=$0)

4.6 Model 2: Empirical Results

Similar to Model 1, the four data sets were also used in Model 2 to estimate alliance choice characteristics. The results from Model 2 can be seen in Tables 4.10 – 4.14 in Appendix D.

4.6.1 Arizona Rancher BQA Model 2 Results

The Arizona Rancher BQA results from Model 2 are shown in Table 4.10. Significant variables include; no other farm activities, all other farm activities (pork, dairy, sheep, diversified livestock, or other activities), written contracts in place for business, age between 51 and 60 years, age greater than 60 years, retained ownership of last years calf crop, sale type difference, profit sharing difference, restriction protocol difference, and alliance participation fee difference. Concerning sale type difference, these results indicate that if selling cattle to the alliance exists in the alliance arrangement, a producer is 8% more likely to join the alliance as compared to an alliance arrangement where retaining ownership of the cattle is enforced. Likewise, if profit sharing/bonuses based on performance are included in the alliance arrangement, a producer is 6% more likely to join the alliance as compared to an alliance arrangement where no profit sharing is enforced. Restriction protocol difference has a positive effect, which means producers are more likely to join an alliance with restrictions present, than an alliance with no restrictions present. However, producers indicate that with a higher participation fee enforced, they are less likely to join the alliance, as compared to a lower cost participation fee.

4.6.2 Arizona NASS Model 2 Results

The Arizona NASS results from Model 2 has nine significant variables. These include; collect production/processing data, beef income greater than 50%, age between 51 and 60 years, cow herd size greater than 151 head, sale type difference, profit sharing difference, carcass data sharing difference, individual data sharing difference, and participation fee difference. Sale type

difference, profit sharing difference, and individual data sharing difference all have a positive sign. Whereas, Carcass data sharing difference and alliance participation fee difference have a negative sign. Which indicates that producers are 11% less likely to join an alliance arrangement if carcass data sharing is enforced as compared to live performance data, and producers are less likely to join an alliance with a higher fee as compared to a lower fee. These results are shown in Table 4.11.

4.6.3 Canada Model 2 Results

Canadian results from Model 2 reveal nine significant variables. Variables similar to Arizona Rancher BQA and Arizona NASS in significance are collect production/processing data, cow herd size greater than 151 head, profit sharing difference, individual data sharing difference, and participation fee difference. Profit sharing difference and individual data sharing difference both a have a negative sign, whereas participation fee has a positive sign. Compared to Arizona Rancher BQA and Arizona NASS results, Canadian respondents are more likely to join an alliance with a higher participation fee. Likewise, compared to Arizona BQA and Arizona respondents, Canadian respondents are less likely to join an alliance where profit sharing is enforced and less likely to join an alliance if individual data is available, compared to group data. These results are shown in Table 4.12.

As mentioned earlier, another model was estimated for the Canadian data set. This model includes the same independent variables as Model 2, but also includes a dummy variable for on-site survey. This dummy captures the respondents who filled out the survey on-site as compared to respondents who filled out the survey on-line via computer. As the results indicate from Table 4.13, the on-site variable is significant at the 10% level and has a negative effect. This means that if a producer filled out the survey via on-site, the producer is 10% less likely to join alliance ‘A’

versus alliance ‘B’. All other significant variables match that as described in the paragraph above.

4.6.4 All Data Sets Combined Model 2 Results

Results of all three data sets combined for Model 2 have nine significant variables. These include; cow-calf operation, no other farm activities, all other farm activities (pork, dairy, sheep, diversified livestock, or other activities), collect production/processing data, herd size between 51 and 150 head, Arizona Rancher BQA respondent, Canada respondent, sale type difference, and restriction protocol difference. The Arizona Rancher BQA respondents and Canadian respondents alike have a positive sign, which indicates they both prefer alliance type ‘A’ over alliance type ‘B’. Sale type difference and restriction protocol difference both have a positive sign which means, producers are 7% more likely to join an alliance where cattle are sold to the alliance, and producers are 5% more likely to join an alliance where restrictions are enforced on vaccinations and antibiotics. These results are shown in Table 4.14.

4.7 Testing

The table below summarizes several joint tests that were conducted in order to determine if data sets from model one could be joined together to represent the same sample.

Table 4.4a Model One Joint Testing

Hypothesis	Full Model (LL_{full})	Restricted Model (LL_{rest})	Degrees of Freedom (Test)	Test Statistic $-2*(LL_{full} - LL_{rest})$	$\chi^2_{.05}$	Results
H_0: Arizona NASS sample = Arizona BQA sample	-81.06	-98.41	17	34.73	27.6	Reject
H_0: Arizona Combined = Canada	-149.36	-162.80	17	26.89	27.6	Not Reject
H_0: BQA = Canada	-74.15	-91.14	17	33.97	27.6	Reject
H_0: BQA = Arizona = Canada	-131.48	-162.80	34	62.64	43.8	Reject

Table 4.4b: Model Two Joint Testing

Hypothesis	Full Model (LL_{full})	Restricted Model (LL_{rest})	Degrees of Freedom (Test)	Test Statistic $-2*(LL_{full} - LL_{rest})$	$\chi^2_{.05}$	Results
H_0: Arizona NASS sample = Arizona BQA sample	-344.67	-280.86	17	127.63	27.6	Reject
H_0: Arizona Combined = Canada	-511.02	-431.58	17	158.87	27.6	Reject
H_0: BQA = Canada	-435.44	-276.24	17	318.40	27.6	Reject
H_0: BQA = Arizona = Canada	-615.66	-711.05	34	190.79	43.8	Reject

As can be seen, the joint test confirms that the Arizona NASS sample and the Arizona Rancher BQA sample are statistically different from each other. The joint test also concluded that the Arizona Rancher BQA and Canada samplings are statistically different, which one would expect with the demographic and geographic differences. The last joint test shows that by combining the three data sets, the samples are indeed different from each other. However, as mentioned above, the three data sets were combined and used to estimate model one and model two, but also included a dummy variable to account for Arizona Rancher BQA respondents and Canadian respondents.

4.8 Summary

This chapter provided a description of the models used to analyze 1) producer's willingness to join a beef alliance, and 2) producer's preferences concerning beef alliance attributes. The selection of the independent variables for each model was discussed. Binary probit models used for both models were analyzed. In the beef alliance participation model (Model one) with all three data sets, producer's age, education, written contract, and herd size have a significant impact on the producer's decision to join an alliance. If the producer was from Canada or the Arizona Rancher BQA sample, it also impacted his decision to join an alliance. If the producer was from Canada and filled the survey out on-line, it also impacted his decision to join an alliance.

The alliance choice experiment allows further insight into beef producer's preferences for alliance attributes. From model two with all three data sets, sale type and restrictions affected the behavior of respondents significantly. However, from the three data sets modeled separately, a combination of all alliance attributes, except 'minimum number of animals required' were significant.

CHAPTER FIVE: CONCLUSION

5.1 Summary of Results

The main purpose of this study was to evaluate cow-calf producers' willingness to join an alliance, as well as to analyze which alliance attributes producers have a preference towards. A computer-based survey was conducted among Western Canadian cow-calf producers in the spring of 2006. A similar mail survey was conducted among Arizona cow-calf producers in the fall of 2005. After interest from the University of Arizona Beef Extension Specialist, a mail survey was conducted among Arizona Rancher Beef Quality Assurance members in the fall of 2008, whom are proactive members of the Arizona cattle industry. The survey questionnaire was designed to obtain demographic information, as well as information on the producer's current production and marketing practices of their cattle as part of participation in a beef alliance. Two binary probit models were estimated, one as a typical binary probit model, and one as a conditional probit model. The influence of respondents' demographic characteristics, current production and marketing practices on producer's preferences for joining alliances and preferences for alternative beef alliance attributes were evaluated.

Our results suggest that cow-calf producers in Arizona and Canada alike see benefits in participating in a beef alliance. The producers appear to identify and understand the underlying benefits from increasing information flow within the beef sector chain and the end results of joining beef alliances. Considering the three data groups, the following variables significantly affected producers' beef alliance participation (model 1): cow-calf operation, no other type of farm activities, written contracts in place for business, age between 51 and 60 years, age greater than 60 years, education level, cow herd size between 51 and 150 head, cow herd size greater

than 151 head, Arizona Rancher BQA respondent, and Canada respondent, versus Arizona NASS respondents. Farms that were limited to cow-calf operations only were found to be unlikely to participate in a beef alliance. Older producers are less likely to participate in a beef alliance, whereas, producers with more education are more likely to participate in a beef alliance. The larger producers (51 head or greater) are found to be more likely to participate in an alliance. Other production and marketing and demographic characteristics that do not significantly influence a respondent's choice behavior include: Market cattle through formal agreement, currently collect production/processing data, oral contracts in place for business, income from beef greater than 50%, age less than 41 years, sold last years calf crop as weaned calves, sold last years calf crop as preconditioned calves, and retained ownership of last years calf crop. When estimating model one for Canada data only, survey method (on-site vs. on-line) was also a significant variable.

Most of these empirical results from the beef alliance participation model (model 1) were consistent with former hypothesis concerning the expected sign, as well as results from other studies. For example, Gillespie et al. (2004) determined that younger, more educated beef producers with larger herd sizes are more likely to participate in alternative marketing arrangements, such as strategic beef alliances in the cattle industry. According to Brocklebank and Hobbs (2004), beef cow herd size, age, and education of producer's impact their choice behavior in adopting alternative marketing and production practices.

Our results also suggest that Canadian and Arizona cow-calf producers' alike have preferences when faced with different attributes of beef alliances. Considering the entire three data sets, the following variables significantly affected producers' participation in Alliance 'A' (model 2): cow-calf operation only, none other type of farm activities, other types of farm

activities (such as: pork, dairy, sheep, horses, diversified livestock), currently collect production/processing data, herd size between 51 and 150 head, Arizona Rancher BQA respondent, Canada respondent, sale type, and production protocols concerning restrictions. Likewise from model one, farms that were limited to cow-calf operations only were found to be unlikely to participate in a beef alliance. However, concerning the sale type variable, producers are 7% more likely to join an alliance arrangement when it is required to sell cattle to the alliance as compared to retaining ownership of the cattle. The restriction type variable indicates that producers are 5% more likely to join an alliance arrangement where restrictions on vaccinations and antibiotics are enforced. However, when the three data sets are estimated separately, only one variable does not prove to be significant with regards to the alliance choice experiment, which is minimum number of animals required. The variables that did not show significance in model 2 with all three data sets, but are still worthy to mention due to expected sign are: profit sharing type, with a positive sign, producer's indicate that they are more likely to join an alliance arrangement when bonuses/profit sharing are imposed. However, both carcass and individual sharing have negative signs. This indicates that producers would prefer an alliance with live performance and pen/group data. It was expected that these two variables would carry a positive sign, indicating producers would prefer an alliance setting where carcass and individual animal information would be available. As expected, minimum number of animals required carries a negative sign, which indicates that producers are less likely to join an alliance if a certain number of animals are required. The participation fee variable also carries its expected negative sign. This indicates that as the alliance participation fee increases, producers are less likely to join.

5.2 Limitations and Further Research

One of the limitations of this study is due to the fairly small sample sizes. The final sample from Canada used in this study was 150 valid samples, which is a response rate of 16%. The final sample from Arizona NASS used in this study was 99 valid samples, which is a response rate of only 14%. However, it is noteworthy that this response rate is extremely low due to the loss of surveys from the mail incident. The final sample from Arizona Rancher BQA used in this study was 82 valid samples, which is a response rate of 18%. Hensher et al. (2005) and Lee et al. (2000), as well as many other numerous well-established discrete choice literature, state that small sample sizes can lead to large variances in choice models resulting in insignificant coefficient estimates and a low model fit.

Due to the small sample sizes, it was necessary to reduce the number of variables that would be incorporated into the final models. Therefore, the final models come at a cost of losing some variables that were originally intended to be included. Some variables not included in the models are: if premiums/discounts are obtained from breed of cattle, possible increase/decrease in net income from beef, and possible increase/decrease in market value of beef.

Additionally, those respondents who indicated unwillingness to participating in an alliance were not included in estimation of alliance choice attributes (model 2). Therefore, the sample size that could be used for an analysis of beef alliance attribute preferences was lower than it could have been if all respondents had been asked to answer the alliance choice experiment. However, the respondents who indicated unwillingness to join an alliance were asked to skip over the alliance choice experiment. This would lead to estimation results from respondents who had intentions of joining an alliance rather than intentions of not joining.

The inability to effectively contact cow-calf producers outside of Alberta resulted in an over-sampling of Alberta beef producers. This was largely due to the fact that the regional

associations were bound by their bylaws not to provide access to their membership lists. A regional diverse sample would have been highly desirable since it would be expected that different demographic and transaction characteristics might result in different attitudes towards alternative marketing arrangements (Lan 2006). For example, producers from Saskatchewan typically focus on cow-calf operations but sell their cattle outside of the province (Kularatna 2000).

Another limitation to this study is the possible existence of hypothetical bias (Bishop and Heberlein 1979). Hypothetical bias arises when a situation lacks realism or when respondents find the survey instrument too complex or lengthy (Lan 2006). In the Canada survey, it was observed that the survey method (on-site vs. on-line) had a significant impact on the estimates. Even though the survey filled out on-line and on-site was identical in design and presentation, it is possible that systematic bias could have occurred, because trained students helped producers fill out the survey on-site. Bias could have occurred as well in the Canada survey due to the fact that producers had to answer one question in order to move on to the next. Due to time constraints, some producers filling out the survey on-line, may have biased answers in order to complete the survey. As can be noted from the Arizona NASS and Arizona BQA surveys, most producers did not fill out the survey in its entirety. Therefore, it can be assumed that some Canadian producers may have "skipped" through the questions in order to complete the survey.

Revealed preference data would help to overcome some of the above listed limitations. Adamowicz et al. (1994) and Louviere et al. (2000) affirm that revealed preference data provides actual information about respondent's choice behavior. However, in this study, no revealed preference data was available. Mainly because of denied access to private information such as actual contract terms in Canada.

5.3 Conclusion

This thesis has provided an analysis of survey responses from Arizona and Canadian respondents that were aimed at answering issues related to cow-calf producers' willingness to join strategic beef alliances and a variety of different alliance attributes. Alliance choice attributes regarding sale type, data sharing, production protocols, alliance participation fee, and other contract specifications were explored as possible motivators for alliance participation and supply chain coordination. This study has also evaluated the influence of demographic and producer characteristics on individual's behavior to participate in beef alliances. The data for this study were collected from Western Canada, mainly Alberta, in 2006, from the state of Arizona in 2005, and from Arizona Cattle Growers Association Rancher Beef Quality Assurance members in 2008. Two binary probit models were estimated using the three separate data sets above and a combined data set of all three. In the first model, the beef alliance participation model, producer's age, education, cow herd size, operation type, other farm activities, written contracts, Arizona Rancher BQA respondent, and Canada respondent were found to have a significant impact on producer's decision to join. The second model, the beef alliance choice experiment model, provides insight into producer's preferences for attributes of assorted beef alliances. The estimation results indicate that the sales type and production protocols significantly affect the choice behavior of producers. The two Canada only binary models also suggest that survey methods (on-line vs. on-site) have a significant effect on the participation of beef alliances and their attributes.

In conclusion, it appears that Canadian and Arizona beef producers have a strong willingness and desire to join a type of beef alliance. However, due to current producer characteristics (as seen from survey question means in chapter 3), beef producer's still face

production and processing obstacles before fully committing to an alliance. This study also confirms that diversity does exist between Arizona respondents and Arizona Rancher BQA respondents, which was expected. This information goes to show that beef producers who are already in an organization that promotes healthy and wholesome cattle with modern vaccination and genetic techniques, are more likely to participate in an alliance and chose alliance attributes that are consistent with many alliance techniques and procedures.

By understanding these results and their implications, projections and improvements can be made in order to tailor alliances for different producer characteristics. These survey results indicate that on average, most beef producers are interested in participating in an alliance arrangement. By analyzing the findings from model two, the alliance characteristics preferred by beef producers, current beef alliance characteristics can be compared to these findings and updates or new alliances can be formed to satisfy producer's desires in an alliance.

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Appendix A: Canada Survey Instrument

Dear Industry participant,

The National Beef Industry Development Fund (NBIDF) is supporting our research project "Formal beef alliances and alignment challenges: issues in contracting, pricing and quality". This interview is an important part of the project. Our research efforts have two main objectives. First, to design better contracts between the cow-calf sector and other sectors in the beef industry supply chain. Second, to evaluate the feasibility of using market based tools to manage price risk in the cattle industry.

You are part of a carefully selected sample that has been asked to assist with this interview, and we appreciate your assistance. As with all interviews we conduct your responses are confidential. Thank you for your participation and support!

PART I

1. Please indicate which of the following best describes your current operation (please choose one option only)?

   - cow-calf operation only
   - cow-calf + backgrounding
   - cow-calf + backgrounding + finishing
   - cow-calf + backgrounding + finishing + seedstock
   - seedstock producer
   - backgrounding only
   - finishing only
   - backgrounding + finishing

2. How many years has your business been producing beef cattle?

   ___ years

3. What did you do with your calf crop born in 2004? Please allocate percentages across the following options:

   - Sold as weaned calves ..... ____ %
   - Sold as preconditioned calves ..... ____ %
   - Retained ownership ..... ____ %
   - Replacement heifers ..... ____ %
   - Other: please describe; please use zero if not applicable. ____ %

   = 100 %

4. Do you specialize in a particular breed?
   A. Yes, _____
   B. No
5. Please specify your December 2005 herd inventory in terms of the following size categories (please check the following boxes):

	Number of head:				
	None	Less than 50 head	51-150 head	151-300 head	300 and more
Cows					
Replacement heifers					
Stockers/ Yearlings					
Bulls					

6. How did you market your weaned calves in 2005? If multiple options apply, please rank the options in declining order (1 being the most frequently (or largest by head) used marketing option):
   - Sold through auctions ..... ___
   - Retained ownership .... ___
   - Sold directly to backgrounder ..... ___
   - Sold directly to feeder ..... ___
   - Other:
7. If you used auction markets in 2005 **to sell your weaned calf crop**, what percentage of your calf crop was sold by the following public auctions:

   - Regional auction markets .... ___
   - Pre-sort auction ..... ___

   = **100%**
8. If you used auction markets in 2005 **to sell your feeders/backgrounders**, what percentage of your cattle was sold by the following public auctions:

   - Regional auction markets .... ___
   - Pre-sort auction ..... ___

   = **100%**
9. If you have used auction markets in the past, how would you judge the performance of those markets (in terms of competitive prices, rewarding qualities, handling), (a) for regular auctions and (b) for pre-sort auctions? Please place one mark in each column.

   (a) Performance of regular auction markets:

	… in terms of achieving a competitive price	… in terms of rewarding the qualities of my cattle	… in terms of professional livestock handling
They perform extremely well			
Very well			
Quite well			
Not very well			
Extremely poor			
Have not used regular auction			

(b) Performance of pre-sort auctions:

	… in terms of achieving a competitive price	… in terms of rewarding the qualities of my cattle	… in terms of professional livestock handling
They perform extremely well			
Very well			
Quite well			
Not very well			
Extremely poor			
Have not used a presort auction			

10. If you have retained ownership in the past, what type of financing of feeding and yardage was involved?
    - ➢ No financing of living expenses provided by backgrounder/feedlot __
    - ➢ I deposited __ % of the backgrounding costs with the backgrounder/feedlot upfront
    - ➢ Feed, yardage and other costs are settled at the end of the feeding period __
    - ➢ Feed, yardage and other costs are settled monthly __
    - ➢ Other (please specify):
11. In 2005, have you marketed cattle through an existing relationship agreement between producers and other members in a value chain (e.g. livestock cooperative/alliance)?
    - No __
    - Yes, __ less than 10%. ___ more than 25%, ___ more than 50% ___ 100%
12. Do you retain ownership of some of your calves **to background**?
    - No: __ then please skip to question 13.

- Yes: __then please consider the following questions:

If you sold at the backgrounding stage, could you please indicate whether the following specifications hold in dealing with your buyer. If these specifications are not exactly matching those that apply to you, please choose what is closest to what you use in practice.

a) An average price based on regional auction markets is used in determining the final price

1. yes __
2. no __

b) Price premiums and discounts for not meeting specified characteristics are in place.

No __: please skip to question 13

Yes __

These premiums/discounts are associated with:

1. your breed __ yes
   __ no
2. a regional average price that is directly factored into your payment scheme
   __ yes
   __ no
3. other quality-related specifications (please specify): _____

13. Do you retain ownership of some of your cattle **until slaughter**?

- No: __ then please skip to question 14!
- Yes: __ then please consider the following questions:

In considering the payment method and the associated price level for your finished cattle sold in private sales, could you please indicate whether the following specifications hold in dealing with your buyer. If these specifications are not exactly matching those that apply to you, please choose what is closest to what you use in practice.

c) A regional average price is used in determining the final price

1. yes __
2. no __

d) Discount scales apply for carcasses over _____ lbs.

e) Price premiums and discounts for not meeting specified characteristics are in place.

No __, then please go to question 14.

Yes __

These premiums/discounts are associated with

1. quality grade __ yes__ no
2. yield grade __ yes__ no
3. regional average price__ yes__ no
4. other specifications related to carcass weight: _____

f) The premiums and discounts associated with your above choices are as following:

__ -20% __ -15% __ -10% __ -5% __ +5% __ +10% __ +20%

PART II

Please let us know whether, in principle, you would consider future participation in a formal agreement between cow-calf producers and other members in a value chain. You have the opportunity to be part of a beef alliance that is developing niche markets. There is the potential for generating extra margins for your business if the alliance is able to produce animals of suitable qualities based on genetics and specific production protocols. Your animals are close to or ready to qualify for participating in this alliance.

() Yes, I am willing to participate in an alliance under certain circumstances
() No, I am not willing to participate in an alliance under any circumstances

Next you will be asked to choose between different types of alliances (with different specifications). You will vote four times between two alternative options. Please choose only one option on each screen. Assume that the options on each page are the only ones available. Each time, please vote independently from the other votes - please do not compare options on different screens.

1. Sale type refers to the ways in which you are willing to market your animals with the alliance (e.g. sell animals to alliance, retain ownership)
2. Type of data sharing refers to the different levels at which you would want to share data with the alliance.
3. Production protocols refers to the type of production protocols you would agree to related to vaccines, weaning and other production practices.

Example of Choice Experiment

Attributes	Alliance A	Alliance B
Sale Type	Sell to alliance, bonuses based on animal performance	Sell to alliance, No profit sharing
Information Sharing Scheme	live performance, individual data	live performance, individual data
Production Protocol	Restrictions on vaccination and use of antibiotics & No min. number of animals Required	Restrictions on vaccination and use of antibiotics & min. number of animals Required
Membership Fee	$0	$5
I would choose	□	□

PART III

1. In the future, feedlots (backgrounders) may opt to require specific production protocols from cow-calf producers. Therefore, written contracts may include more explicit cost sharing arrangements between feedlots and cow-calf producers/feedlots and backgrounders.

   Do you currently bear the costs for production protocols **fully** or **partially** in your operation? Please check all options that apply:

   - No, I don't bear any costs related to production protocols __ (then please proceed to question 2)

   Yes, I **fully** bear costs related to:

   - Herd health (vaccination/ vet visits) __
   - Genetics__
   - Unanticipated increases/decreases in feed costs __
   - Unanticipated death rates __

   Yes, I **partially** bear costs related to:

   - Herd health (vaccination/ vet visits) __
   - Genetics__
   - Unanticipated increases/decreases in feed costs __
   - Unanticipated death rates __

2. Please consider how market prices for cows have moved during the past few years. When replacement cow prices are very low, in your experience, how many years does it take for market prices for cows to return to the long run average price?

   - Never ..... __
   - Prices change too much to determine a length of time __
   - 1 year __
   - 2 years __
   - 3 years __
   - 4 years __
   - Other (number of years): __

3. What type of information do you collect for your beef enterprise? Please check all the categories that apply to your business.

   Market data from the beef industry

   a. auction prices ..... __
   b. information on contracts from other producers ..... __
   c. other: _____

   Beef production data:

   d. birth weights ___
   e. genetics ___

PART III

1. In the future, feedlots (backgrounders) may opt to require specific production protocols from cow-calf producers. Therefore, written contracts may include more explicit cost sharing arrangements between feedlots and cow-calf producers/feedlots and backgrounders.

   Do you currently bear the costs for production protocols **fully** or **partially** in your operation? Please check all options that apply:

   - No, I don't bear any costs related to production protocols __ (then please proceed to question 2)

   Yes, I **fully** bear costs related to:

   - Herd health (vaccination/ vet visits) __
   - Genetics__
   - Unanticipated increases/decreases in feed costs __
   - Unanticipated death rates __

   Yes, I **partially** bear costs related to:

   - Herd health (vaccination/ vet visits) __
   - Genetics__
   - Unanticipated increases/decreases in feed costs __
   - Unanticipated death rates __

2. Please consider how market prices for cows have moved during the past few years. When replacement cow prices are very low, in your experience, how many years does it take for market prices for cows to return to the long run average price?

   - Never ..... __
   - Prices change too much to determine a length of time __
   - 1 year __
   - 2 years __
   - 3 years __
   - 4 years __
   - Other (number of years): __

3. What type of information do you collect for your beef enterprise? Please check all the categories that apply to your business.

   Market data from the beef industry

   a. auction prices ..... __
   b. information on contracts from other producers ..... __
   c. other: _____

   Beef production data:

   d. birth weights ___
   e. genetics ___

f. animal health __
g. open cows (dry cows) __
h. birth rate __
i. $ spent per wintered cow
j. Pounds of calf weaned per cow wintered
k. Other: _____

Beef processing data:

l. carcass grading data on feeder cattle ___
m. genetic tracking (parenting) __
n. other: _____

4. How do you use the information that you collect for your enterprise? Please check all options that apply:

- I use it internally, without outside advice ___
- If you use outside (consulting/extension) advice, please rank the following options in the order of importance to your business (1 being most important, 4 least important):

	Rank
I use outside advice in my feeding program	
I use outside advice in my breeding program	
I use outside advice for my business management	
I use outside advice in my health management	

5. **How many**, and **which** cattle *and* business-related magazines/regular publications do you subscribe to (both related to your beef as well as your other businesses)?

I regularly subscribe to ___ publications.

Names of publications: _____

6. How do you manage risk outside of your beef business (crops, etc.)?
   - I'm using forward cash contracts yes __ no __
   - Yes, I'm hedging commodity futures yes __ no __
   - I have insurance for: _____
   - Other: .....
7. If marketing your weaned calves with written contracts, do you
   - use forward cash contracts ..... yes __ no __
   - use other pre-pricing contractual arrangements ..... yes __ no __
     - if yes, please specify: _____

8. If you custom feed your calves (either from your own operation or purchased), do you have written or oral contracts in place for most of your business?
   - Oral contracts __ (then please proceed to question 9)
   - Written contracts __

   8. a. Consider your written contracts for custom feeding,
   - they apply to the calves placed with the custom feeder for a single production cycle: Yes __ no __
   - they carry over to following years,
     and the contract terms are re-negotiated annually __
     and the contract terms remain fixed for multiple production cycles __

   8.b. Have you had your own cattle custom fed in the past?

   NO __ please proceed to question 8.c.

If YES, please consider your written contracts for custom feeding. What features were (are) contained in those contracts? Please select all those options that apply:

1. Maximum cost of gain __
2. Safeguards against lower prices __
3. Known minimum price __
4. Safeguard against price variability __
5. Grid-based pricing __
6. Deferred compensation until after processing __
7. Electronic information exchange on animal performance __
8. Type of feed __
9. Markup for feed __
10. Yardage fee (overhead, maintenance) __
11. Death loss
12. Manual exchange of information on animal performance (printout) __
13. Financing as part of retained ownership through cattle feeder association __
14. Financing is arranged through the feedlot as part of retained ownership __
15. Margin sharing according to ownership proportion __
16. Margin sharing according to cost allocation __
17. Other (please specify):

Out of these 17 contract features, what are the **three most important ones** to you, and how would you rank these in terms of their ability to positively affect your business success (1 being most important, 5 least important)?:

- Rank 1: Number __
- Rank 2: Number __
- Rank 3: Number __

Consider those **three** contract features above (and the corresponding numbers), which ones are open for negotiation with your backgrounder/feedlot, **before** or **after** you signed the contract? Please check all options that apply:

	Contract terms that are open for negotiation **before** signing the contract	Contract terms that are open for negotiation **after** signing the contract
Number ___		
Number __		
Number __		

8.c. If in the future, you were to custom feed your calves, what would be important features that you would want to be included in those contracts?

Please select all those options that apply:

18. Maximum cost of gain __
19. Safeguards against lower prices __
20. Known minimum price __
21. Safeguard against price variability __
22. Grid-based pricing __
23. Deferred compensation until after processing __
24. Electronic information exchange on animal performance __
25. Type of feed __
26. Markup for feed __
27. Yardage fee (overhead, maintenance) __
28. Death loss
29. Manual exchange of information on animal performance (printout) __
30. Financing as part of retained ownership through cattle feeder association __
31. Financing is arranged through the feedlot as part of retained ownership __
32. Margin sharing according to ownership proportion __
33. Margin sharing according to cost allocation __
34. Other (please specify):

Out of these 17 contract features, what are the **three most important ones** to you, and how would you rank these in terms of their ability to positively affect your business success (1 being most important, 5 least important)?:

- Rank 1: Number __
- Rank 2: Number __
- Rank 3: Number __

Please indicate to what extent you agree that the reference price (base price?) should be tied to the following criteria:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree

The reference price should be tied to boxed beef cutout value					
The reference price should be					

8.d. If in the future, you were to retain ownership of your calves and place them with a custom feeder, what would be important features that you would want to be included in those contracts?

Please select all those options that apply:

35. Maximum cost of gain __
36. Safeguards against lower prices __
37. Known minimum price __
38. Safeguard against price variability __
39. Grid-based pricing __
40. Deferred compensation until after processing __
41. Electronic information exchange on animal performance __
42. Type of feed __
43. Markup for feed __
44. Yardage fee (overhead, maintenance) __
45. Death loss
46. Manual exchange of information on animal performance (printout) __
47. Financing as part of retained ownership through cattle feeder association __
48. Financing is arranged through the feedlot as part of retained ownership __
49. Margin sharing according to ownership proportion __
50. Margin sharing according to cost allocation __
51. Other (please specify):

Out of these 17 contract features, what are the **three most important ones** to you, and how would you rank these in terms of their ability to positively affect your business success (1 being most important, 5 least important)?:

- Rank 1: Number __
- Rank 2: Number __
- Rank 3: Number __

9. If you retain ownership, what means of monitoring the performance of your animals at the feedlot/backgrounder level do you use? Please rank these monitoring schemes in order of significance to your business success (1 for most important, 3 for least important):
   - Rank __: I contact the feedlot (backgrounder) to view my animals (average frequency in weeks: ___)
   - Rank __: I ask for to see the printed records of my animals periodically
   - Rank __: I have 24hrs real-time access to electronic data of my cattle

10. How do the buyers of your cattle (backgrounders/feedlots) verify your own quality efforts as related to your cattle, before it leaves the farmgate?
    - There is no verification going on,
        - because my buyer simply trusts me
        - because my buyers doesn't care about auditing me
    - The buyer requests documentation (on health practices etc.)
        - No __
        - Yes, he requests:
            - Verbal documentation __
            - Written documentation __
            - On-farm inspection

11. What percentage of your net income from farming comes from your beef enterprise?
    - Less than 25% of my net income from farming comes from beef
    - Less than 50% of my net income from farming comes from beef
    - More than 50% of my net income from farming comes from beef

12. Please consider the following statements regarding two performance measures for your beef operation, net income and value of cow herd wintered. Considering my expectation (average) for these measures in 2007,

    - I think it is extremely unlikely that my net income in 2007 will be __ % **above** my **average net income**
    - I think it is extremely unlikely that my net income in 2007 will be __ % **below** my **average net income**

    - I think it is extremely unlikely that the value of my cows wintered in 2007 will be __ % **above** the **average value** of cows wintered.
    - I think it is extremely unlikely that the value of my cows wintered in 2007 will be __ % **below** the **average value** of cows wintered.

13. Considering all your farm activities outside of your cow-calf operation, could you please rank them in order of financial contribution to your overall farm income (1 being the most important activity):
    - Grain & oilseeds ___
    - Pork ___
    - Dairy ___
    - Sheep ___
    - Horses ___
    - Diversified livestock __
    - Other: .....

14. Are you or your family partner employed off the farm?

1. Myself: __ yes __ no
2. Partner: __ yes __ no

15. If you or your family partner work off the farm, do you work full or part-time?

1. Myself: __ full-time __ part-time
2. Partner: __ full-time __ part-time

16. If you or your partner work off the farm, your total off-farm income is:
    - Less than 25% of your farm income
    - Less than 50% of your farm income
    - More than 50% of your farm income

17. Please indicate your age

    - Under 30 __
    - 31-40 __
    - 41-50 __
    - 51-60 __
    - 61 and older __

18. Please indicate your level of education

    - High school __
    - College __
    - University __

Thank you for completing this survey! If you have further comments on the survey, or specific questions, please enter them in the following box:

Appendix B: Arizona NASS Arizona Rancher BQA Survey Instrument

November 24, 2008

<first last>
<address #1>
<address #2>
<City, AZ zip code>

Dear <First Last>,

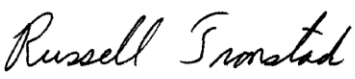
The Arizona Beef Quality Assurance (BQA) program is designed to assure the production of a safe, wholesome product produced in a humane manner that is environmentally sustainable. Marketing alliances have been formed in other regions that utilize established production protocols to improve the marketability of their cattle. Please find enclosed a questionnaire to help assess the feasibility of a marketing alliance for Arizona's beef cattle. We are sending this to present and former BQA certified ranches. Production and marketing alliances can help bolster prices through rewarding better production efficiencies at the feed lot and more consumer desirable beef attributes. Alliances can also provide information back to producers on how their calves performed in the feedlot (daily gains and pen feed efficiency) and the carcass yield and grade attained for individual animals or pens of animals. Through this questionnaire, we hope to find common interests among producers in Arizona for improving the competitive position of our beef industry.

Questions asked regarding your marketing and management choices are strictly voluntary and it is not expected that being a part of this study will harm you in any way. Your input is completely anonymous as we have no way of linking your responses to a given questionnaire. Please use the enclosed envelope with postage to return your questionnaire.

We greatly appreciate your support in completing this questionnaire and we look forward to identifying how Arizona's beef industry can be most supported in this area given your responses. Please note the questionnaire is shorter than is appears since some questions are skipped depending on your answers.

Sincerely,

Robert Kattnig
Associate Livestock Specialist
The University of Arizona



Russell Tronstad
Specialist and Professor
The University of Arizona

THE UNIVERSITY OF ARIZONA
TUCSON ARIZONA

Arizona Cattle Growers' Association

August 20, 2007

<first last>
<address #1>
<address #2>
<City, AZ zip code>

Dear <First Last>,

Although calf prices have been relatively strong in recent years, it is also important for our industry to be proactively exploring different avenues for increasing the competitive position of beef. Production and marketing alliances are a tool to help bolster prices through rewarding better production efficiencies at the feed lot and more consumer desirable beef attributes. Alliances can also provide information back to producers on how their calves performed in the feedlot (daily gains and pen feed efficiency) and the carcass yield and grade attained for individual animals or pens of animals.

Enclosed is a survey we ask for you to complete so that producer preferences regarding alliances can be properly identified. The primary purpose of this survey is to identify alliance preferences between cow-calf producers, yearling operations, feedlots, and processors so that improved genetics, more efficient production protocols, and desirable product attributes can be achieved by Arizona's beef industry. Questions asked regarding your marketing and management choices are strictly voluntary and it is not expected that being a part of this study will harm you in any way. You can be assured that your answers are confidential and will not be released to anyone. The survey is being conducted by the Arizona Field Office of USDA/NASS and data they supply to university researchers will in no way have your name or other identifiers attached to your responses. Your name will never be associated with the final data analysis and results will only be published in aggregate form.

We greatly appreciate your support in completing this questionnaire and we look forward to identifying how Arizona's beef industry can be most supported in this area given your responses. Please note the survey instrument is shorter than is appears since some questions are skipped depending on your answers.

Sincerely,

Russell Tronstad

Russell Tronstad
Specialist and Professor
University of Arizona

C. B. 'Doc' Lane
Arizona Cattle Growers' Association

Appendix B: Arizona NASS Arizona Rancher BQA Survey Instrument

1. Please indicate which of the following best describes your current operation? (**Please check all that apply**).

- ☐ Cow-calf operation
- ☐ Backgrounding operation
- ☐ Finishing operation
- ☐ Seedstock producer

2. What other important farm activities do you have? (**Please check all that apply**)

- ☐ Grain and oilseeds
- ☐ Pork
- ☐ Dairy
- ☐ Sheep
- ☐ Horses
- ☐ Diversified livestock
- ☐ None of the above options
- ☐ Other, please specify:_____

3. What did you do with your calf crop born in 2004? Please allocate percentages across the following options **(total should add up to 100%, Please use zero if not applicable):**

Sold as weaned calves _____%
Sold as preconditioned calves _____%
Other, _____%
please describe: _____
Retained ownership _____%
Replacement heifers _____%

4. Please specify your December 2005 herd inventory in terms of the following size categories:

	none	< 50	51 - 150	151 - 300	> 300
Cows	○	○	○	○	○
Replacement heifers	○	○	○	○	○
Stockers/Yearlings	○	○	○	○	○

5. How did you market your weaned calves in 2005? If multiple options apply, please rank the options in declining order, with 1 being the option where you sold the most head.

Sold through auctions _____
Retained ownership _____
Other, _____
please describe: _____
Sold directly to backgrounder _____
Sold directly to feeder _____

6. Considering your calves and backgrounders that you marketed in 2005, did you:

No	Yes	
○	○	Market **25% to 50%** of your animals through formal (contractual) agreements?
○	○	Market **more than 50%** of your animals through formal (contractual) agreements?

7. Do you use futures contracts in your business?

- ○ No
- ○ Yes

8. In the past, have you retained ownership of some of your calves **to background**?

- ○ No **(Please proceed to Question 10)**
- ○ Yes, they have typically been fed on my farm
- ○ Yes, they have typically been fed in a custom establishment

9. If you sold at the **backgrounding stage**, could you please indicate if premiums/discounts hold in dealing with your buyer for the following characteristics:

No	Yes	
○	○	Your breed
○	○	A regional average price that is directly factored into your payment scheme
○	○	Other quality-related specifications: (please specify)_____

10. In the past, have you retained ownership of some of your cattle **until slaughter**?

- ○ No **(Please proceed to Page 2, Question 12)**
- ○ Yes

11. In considering the sale of your **finished cattle** sold in private sales, could you please indicate if premiums/discounts hold in dealing with your buyer for the following characteristics:

No	Yes	
○	○	Quality grade
○	○	Yield grade
○	○	Regional average price
○	○	Discount scales apply for carcasses over ____ lbs
○	○	Other specifications related to carcass weight, please specify:_____

12. What types of information do you collect for your beef operation? **Please check all that apply**.

Costs of production:

- ☐ none
- ☐ feed costs
- ☐ grazing costs
- ☐ operating costs
- ☐ cash costs
- ☐ fixed costs
- ☐ per pound cost of gain
- ☐ other:_____

Beef production data:

- ☐ none
- ☐ birth weights
- ☐ genetics
- ☐ animal health
- ☐ weaning weights (and/or average daily gain)
- ☐ birth rate
- ☐ pounds of calf weaned per cow wintered
- ☐ other:_____

Beef processing data:

- ☐ none
- ☐ carcass grading data on feeder cattle
- ☐ other: _____
- ☐ dressing percentage of live weight

13. Suppose you have the opportunity to be part of a beef alliance that is developing niche markets. There is the potential for generating extra margins for your business if the alliance is able to produce animals of suitable qualities. Supposing your animals are close to or ready to qualify for participating in this alliance, would you be willing to participate in such an alliance?

- ○ Yes, I am willing to participate in an alliance under certain circumstances
- ○ No, I am not willing to participate in an alliance under any circumstances **(Please proceed to Page 5, Question 14)**

On the following two pages you will be asked to choose between different types of alliances (with different specifications). You will see four tables. In each table you will be asked to choose between two different alliances.

- Please choose only **one option** in each table.
- Assume that the **options in each table** are the **only** ones available.
- **Please do not compare** the options across tables.

Through the four tables, the following definitions will be used:

Sale type refers to the ways in which you are willing to market your animals with the alliance (e.g. sell animals to alliance, retain ownership)

Type of data sharing refers to the different levels at which you would want to share data with the alliance.

Production protocols refers to the type of production protocols you would agree to related to vaccines, weaning and other production practices.

Alliance Participation Fee refers to the per head cost of participating in the proposed alliance (these costs are in addition to your regular costs of production)

Table 1: Please choose between the following two types of alliances (choose only one option)

	Alliance A	Alliance B
Sale Type	Sell to alliance, NO profit sharing	Sell to alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Live performance, pen data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & min. number of animals required	Restrictions on vaccination and use of, antibiotics & min. number of animals required
Alliance Participation Fee	$5 /head	$5 /head

	Alliance A	Alliance B
I would choose	◯	◯

Table 2: Please choose between the following two types of alliances (choose only one option)

	Alliance A	Alliance B
Sale Type	Sell to alliance, NO profit sharing	Sell to alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Carcass, group data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & min. number of animals required	Restrictions on vaccination and use of, antibiotics & min. number of animals required
Alliance Participation Fee	$5 /head	$20 /head

	Alliance A	Alliance B
I would choose	◯	◯

Table 3: Please choose between the following two types of alliances (choose only one option)

	Alliance A	Alliance B
Sale Type	Sell to alliance, NO profit sharing	Sell to alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Carcass, individual yield & grade data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & min. number of animals required	NO restrictions on vaccination and use of, antibiotics & NO min. number of animals required
Alliance Participation Fee	$5 /head	$10 /head

	Alliance A	Alliance B
I would choose	○	○

Table 4: Please choose between the following two types of alliances (choose only one option)

	Alliance A	Alliance B
Sale Type	Sell to alliance, bonuses based on animal performance	Sell to alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, pen data	Carcass, group data
Production Protocols	Restrictions on vaccination and use of, antibiotics & min. number of animals required	Restrictions on vaccination and use of, antibiotics & min. number of animals required
Alliance Participation Fee	$5 /head	$20 /head

	Alliance A	Alliance B
I would choose	○	○

14. Please consider how market prices for bred cows have moved during the past few years.

When replacement cow prices are very low, in your experience, how many years does it take for market prices for bred cows to return to the long run average price?

- ○ 1 year
- ○ 2 years
- ○ Never
- ○ 3 years
- ○ 4 years
- ○ Other (number of years):_____
- ○ Prices change too much to determine a length of time

15. If you custom feed your calves (either from your own operation or purchased), do you have written or oral contracts in place for most of your business?

- ○ I do not custom feed **(Proceed to question 17)**
- ○ Oral contracts
- ○ Written contracts

16. Consider your most commonly used contracts for custom feeding,

- ○ contracts apply to the calves placed with the custom feeder for a single production cycle
- ○ contracts carry over to following years, and the contract terms are re-negotiated annually
- ○ contracts carry over to following years, and the contract terms remain fixed for multiple production cycles
- ○ Other, please specify: _____

17. Please consider the following statements regarding two performance measures for your beef operation, net income and value of cow herd wintered. Considering your **average farm income from cattle** over the past 5 years:

a. What is the maximum **increase** in your **net income** that you think is possible in 2007? _____%

What is the maximum **decrease** in your **net income** that you think is possible in 2007? _____%

b. What is the maximum **increase** in **market value of your cows sold** that you think is possible in 2007? _____%

What is the maximum **decrease** in **market value of your cows sold** that you think is possible in 2007? _____%

18. What percentage of your net income from farming comes from beef?

- ○ Less than 25%
- ○ Between 25% and 50%
- ○ More than 50%

19. If you or your partner work off the farm, your total off-farm taxable net income is:

- ○ Less than 25% of your net taxable income
- ○ Between 25% and 50% of your net taxable income
- ○ More than 50% of your net taxable income
- ○ Not applicable

20. Please indicate your age:

- ○ Under 30
- ○ 31-41
- ○ 41-50
- ○ 51-60
- ○ 61 and older

21. Please indicate your level of education:

- ○ Less than high school graduate
- ○ High school graduate
- ○ Technical/Vocational Degree
- ○ Bachelors Degree (or further)

Thank you for your time and participation!
Please share any other comments with us below

_____
_____
_____

Appendix C: Chapter 3 Tables and Figures

FIGURE 3.8 RESPONDENTS OTHER FARM ACTIVITIES

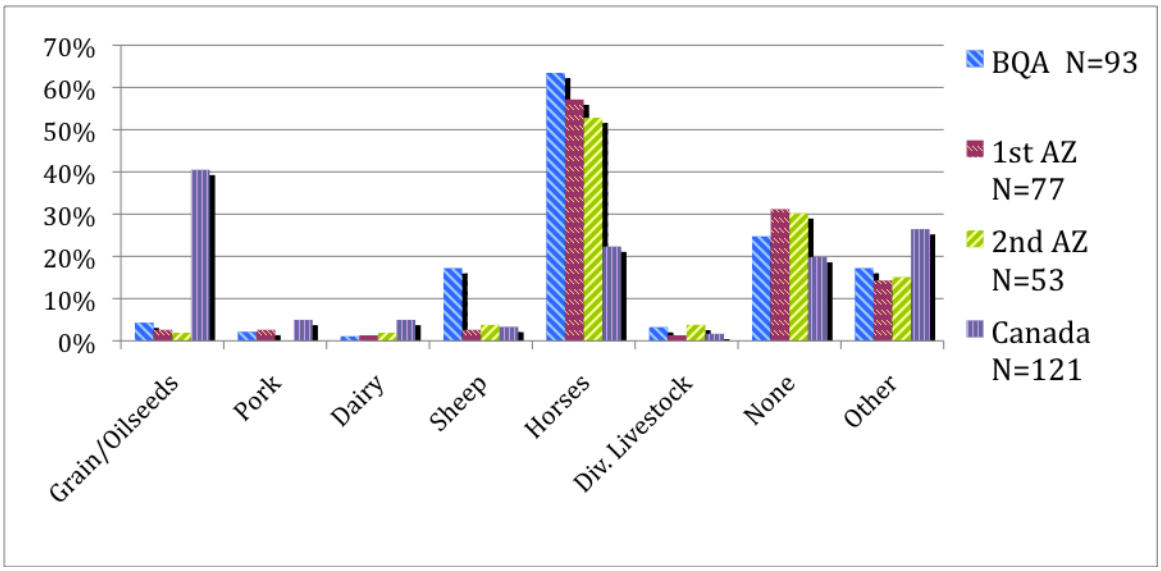


FIGURE 3.9 RESPONDENTS CALF CROP BORN

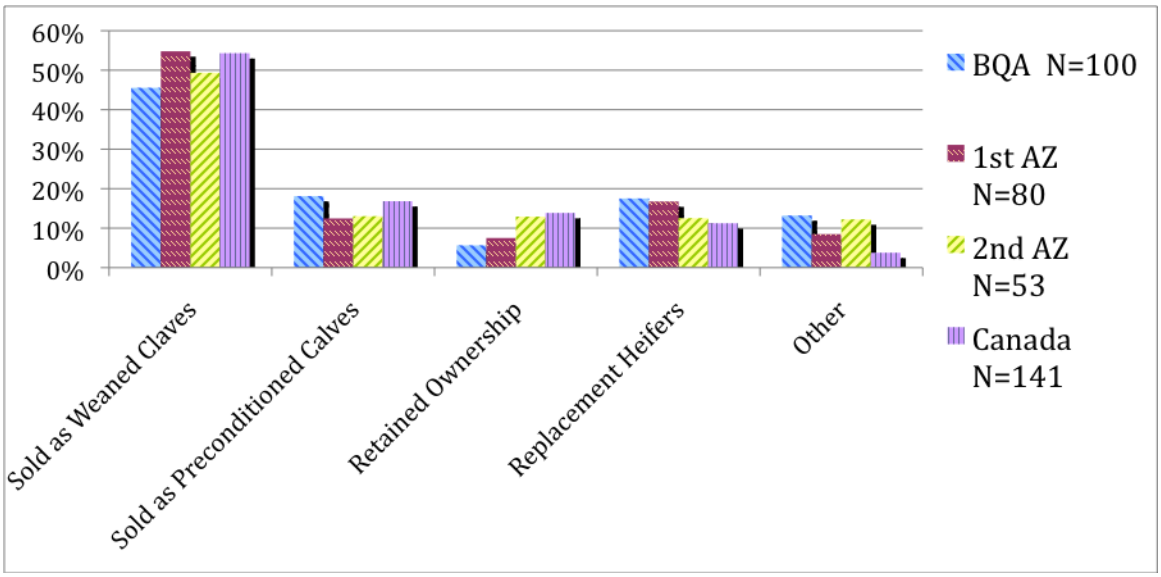


FIGURE 3.10 RESPONDENTS METHOD OF MARKETING WEANED CALVES

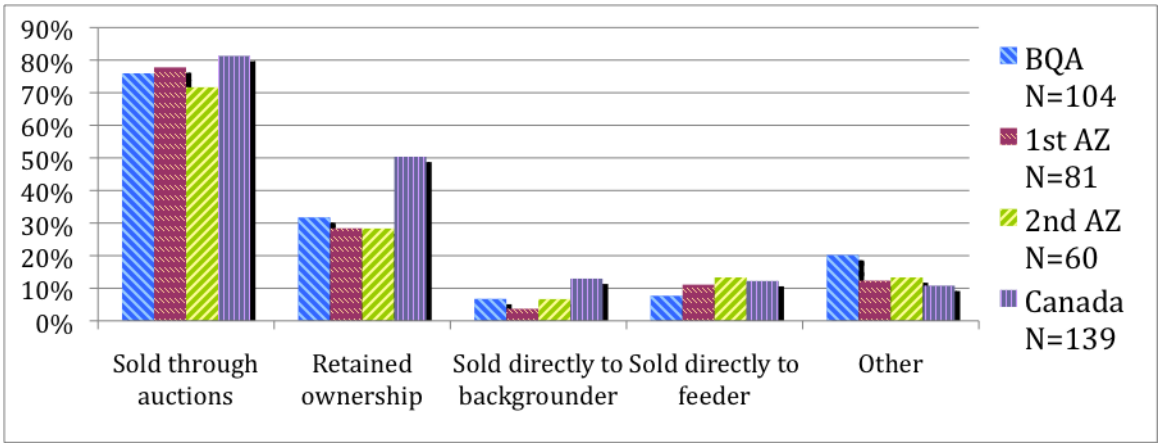


FIGURE 3.11 RESPONDENTS MARKET MORE THAN 50% OF CATTLE THROUGH FORMAL AGREEMENTS

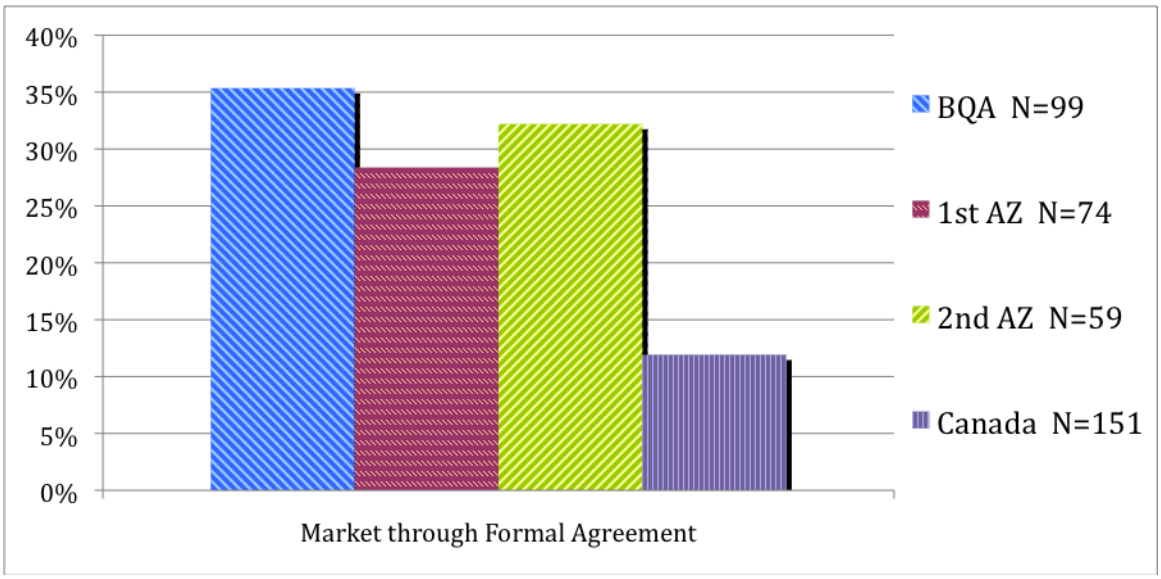


FIGURE 3.12 RESPONDENTS USE FUTURES CONTRACTS IN BUSINESS

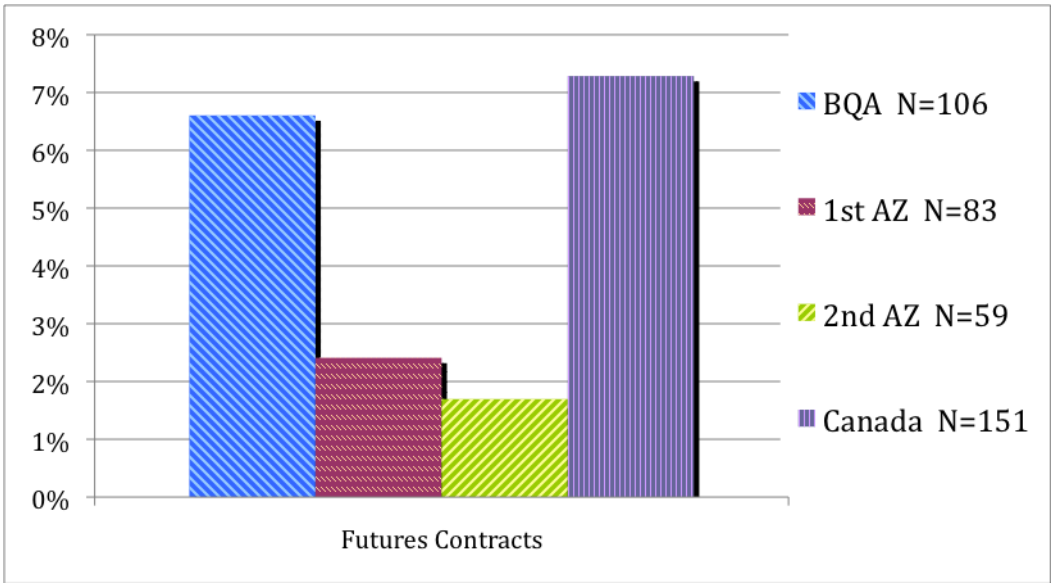


FIGURE 3.13 RESPONDENTS RETAINED OWNERSHIP OF CALVES TO BACKGROUND

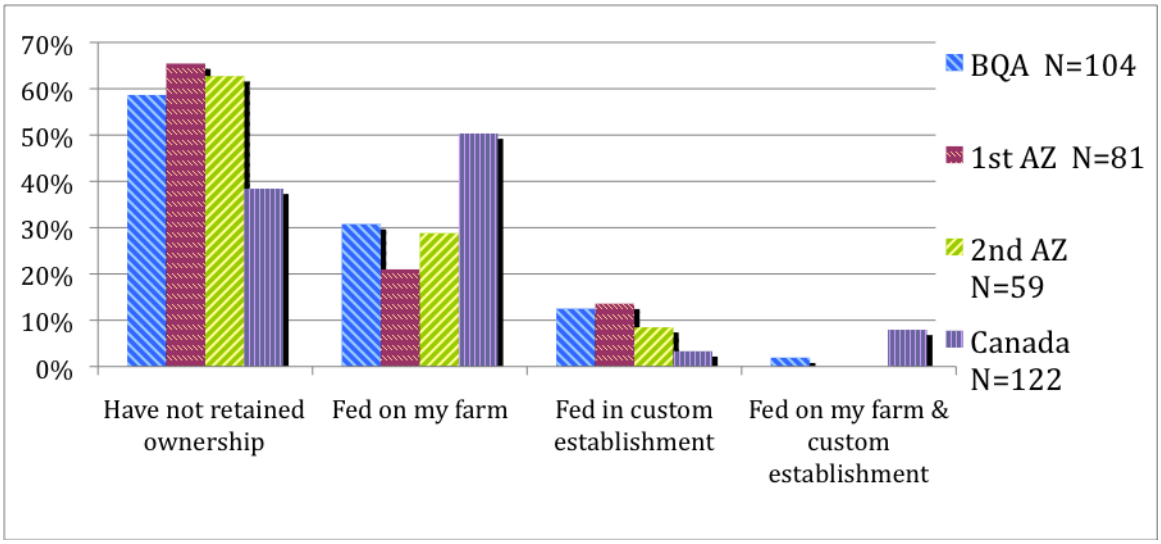


FIGURE 3.14 RESPONDENTS PREMIUMS/DISCOUNTS MADE IF SOLD AT BACKGROUNDING STAGE BASED ON FOLLOWING CHARACTERISTICS

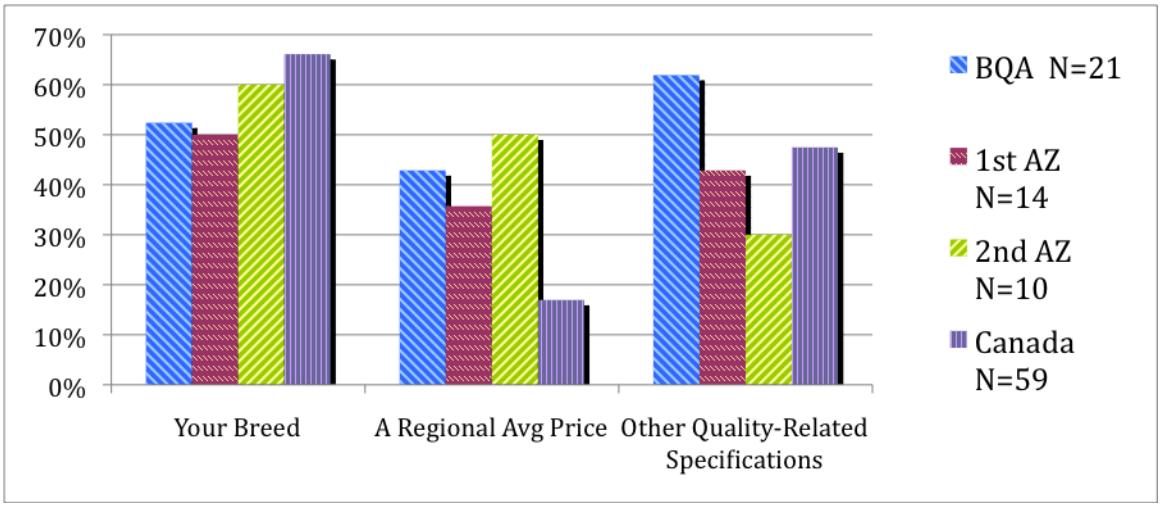


FIGURE 3.15 RESPONDENTS WHO HAVE RETAINED OWNERSHIP OF SOME CATTLE UNTIL SLAUGHTER IN THE PAST

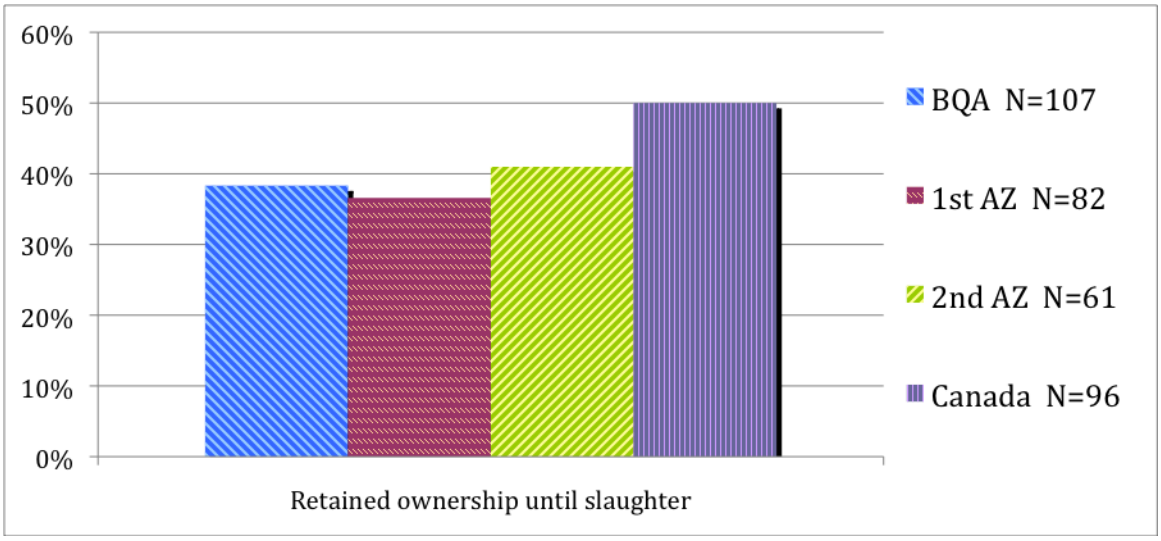


FIGURE 3.16 RESPONDENTS PREMIUMS/DISCOUNTS MADE IF SOLD AT FINISHING STAGE BASED ON FOLLOWING CHARACTERISTICS

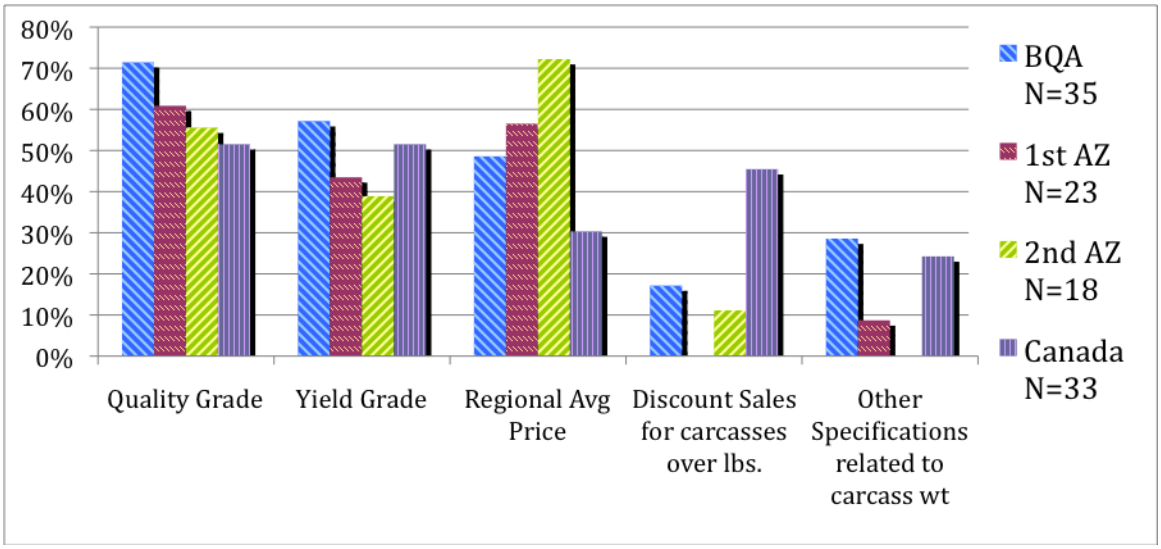


FIGURE 3.17 RESPONDENTS COST OF PRODUCTION INFORMATION COLLECTED FOR BEEF OPERATION

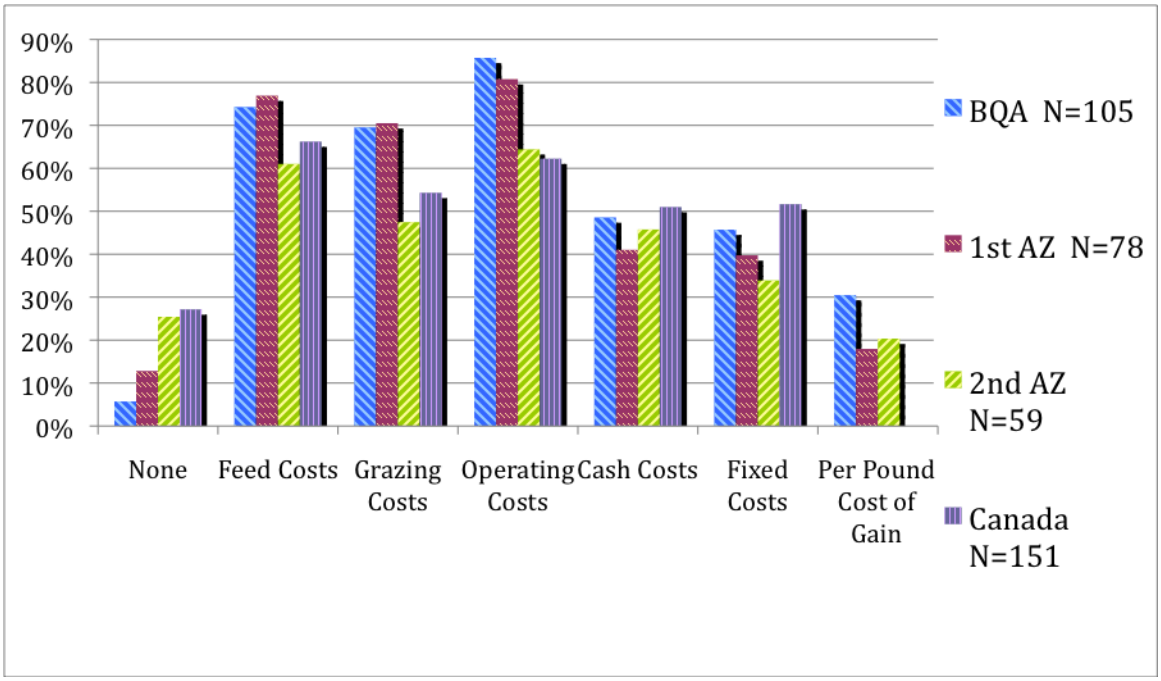


FIGURE 3.18 RESPONDENTS BEEF PRODUCTION DATA INFORMATION COLLECTED FOR BEEF OPERATION

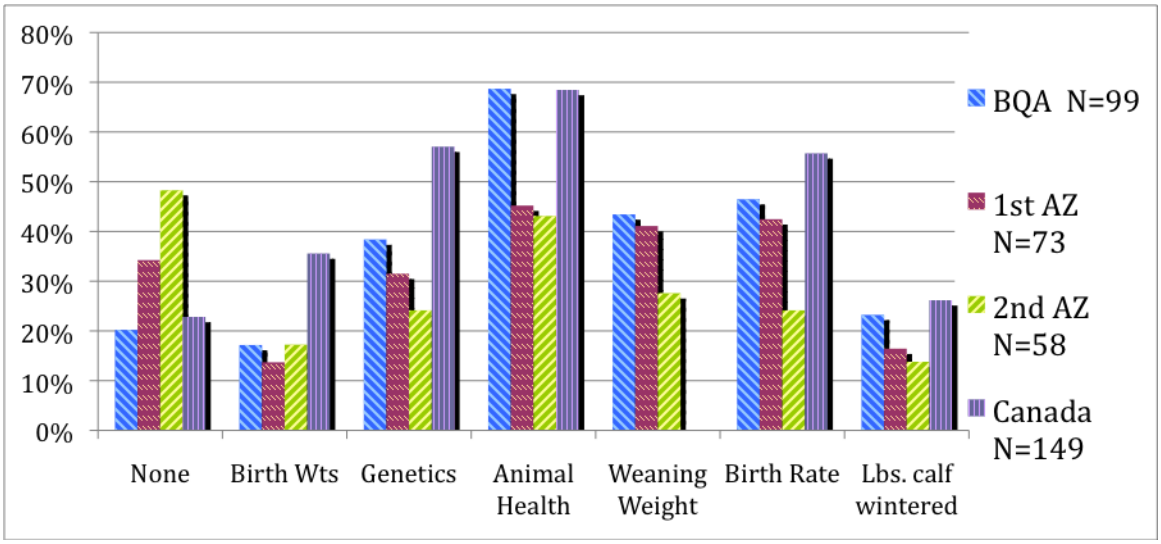


FIGURE 3.19 RESPONDENTS BEEF PROCESSING DATA INFORMATION COLLECTED FOR BEEF OPERATION

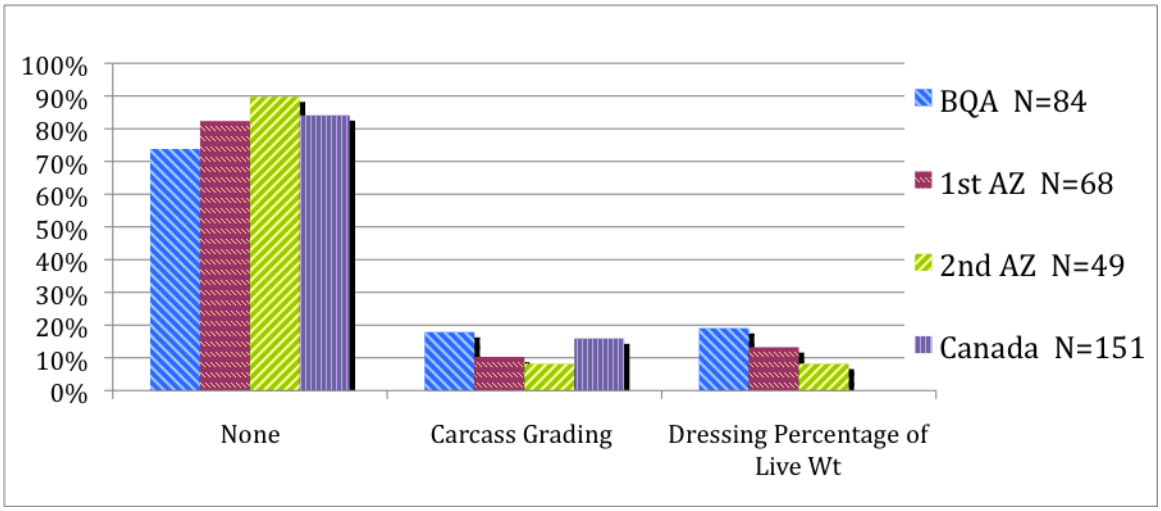


FIGURE 3.20 RESPONDENTS YEARS IT TAKES FOR MARKET PRICES OF BRED COWS TO RETURN TO LONG-RUN AVERAGE PRICE

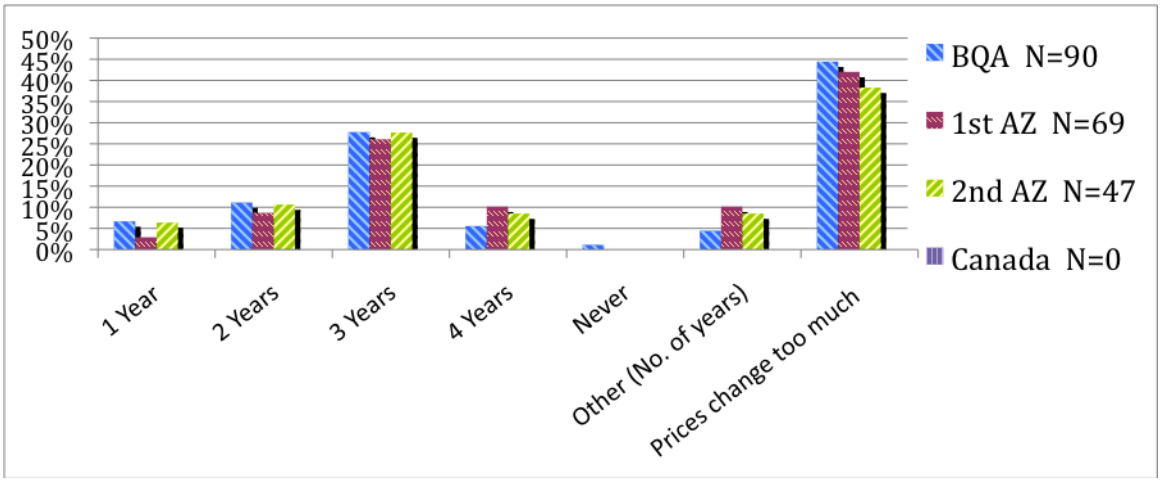


FIGURE 3.21 RESPONDENTS CUSTOM FED CALVES HAVE WRITTEN OR ORAL CONTRACTS IN PLACE

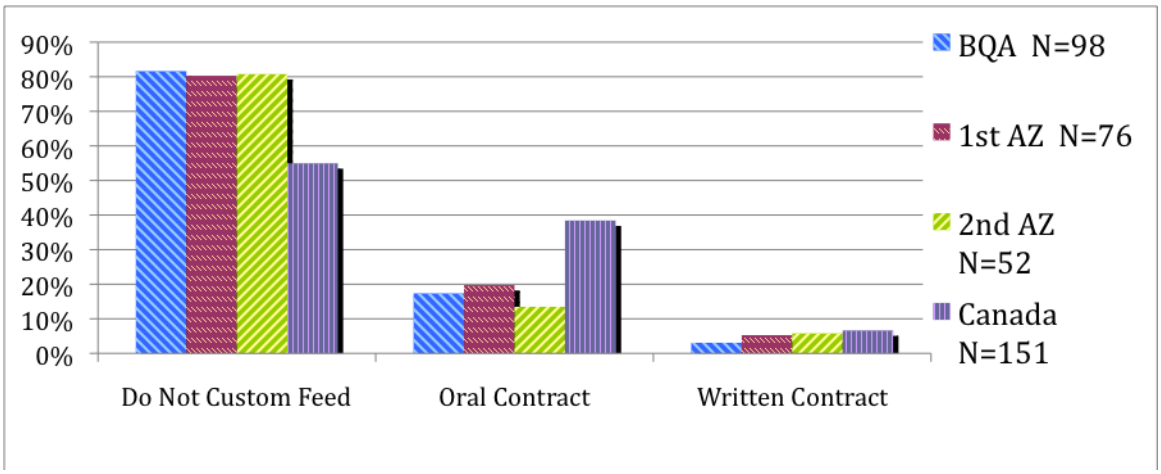


FIGURE 3.22 RESPONDENTS MOST COMMONLY USED CONTRACTS FOR CUSTOM FEEDING

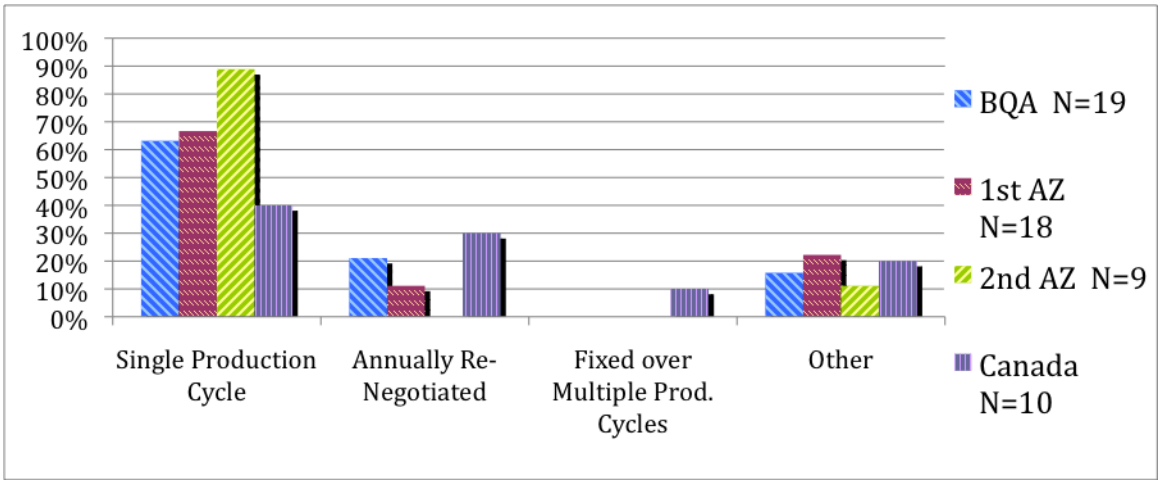


FIGURE 3.23 RESPONDENTS MAXIMUM INCREASE AND MAXIMUM DECREASE IN NET INCOME YOU THINK IS POSSIBLE IN 2007/2009

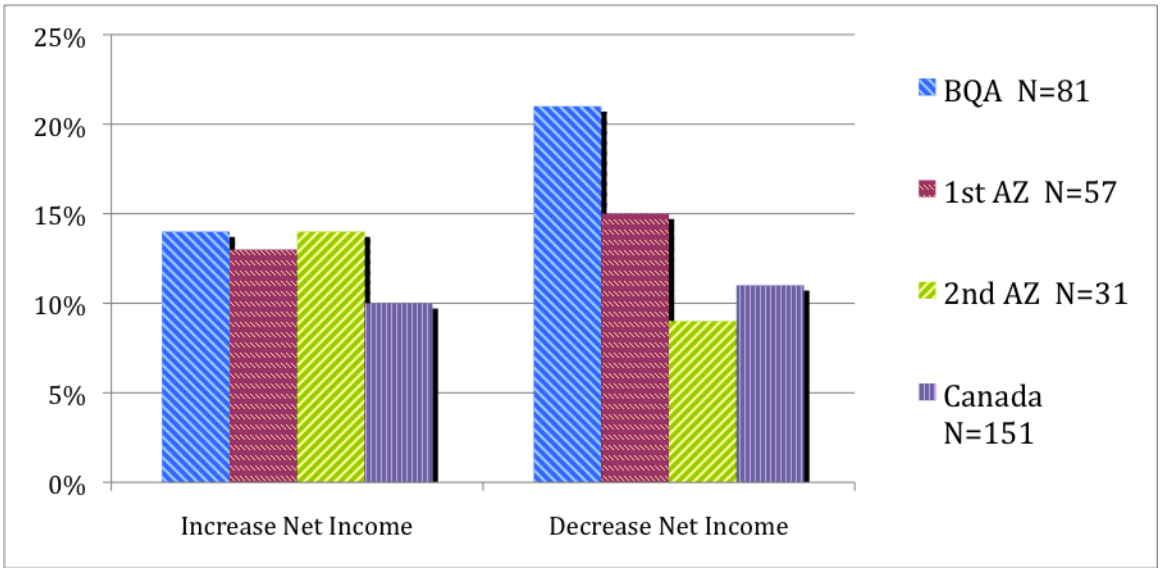


FIGURE 3.24 RESPONDENTS MAXIMUM INCREASE AND MAXIMUM DECREASE IN MARKET VALUE OF COWS SOLD YOU THINK IS POSSIBLE IN 2007/2009

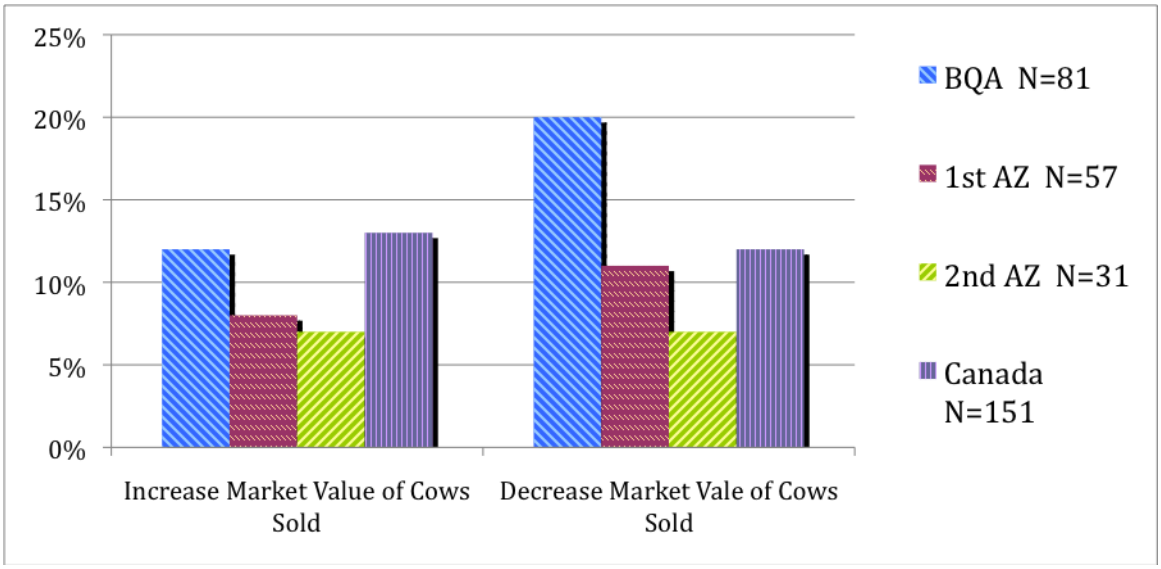


TABLE 3.1 SURVEY BEEF ALLIANCE VERSION ONE

TABLE ONE	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Live performance, pen data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required	Restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$5 /head	$5 /head

TABLE TWO	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Carcass, group data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required	Restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$5 /head	$20 /head

TABLE THREE	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Carcass, individual yield & grade data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$5 /head	$10 /head

TABLE FOUR	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, bonuses based on animal performance	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, pen data	Carcass, group data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	Restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$5 /head	$20 /head

TABLE 3.2 VERSION ONE: RESPONDENTS PREFERENCE TOWARDS CHOOSING ALLIANCE TYPE "A"

Version One	**% Selecting Alliance Type "A"**			
	BQA N=6	1st Arizona Sample N=10	2nd Arizona Sample N=*	Canada N=11
Table One	33.30%	40.00%	*	54.60%
Table Two	42.90%	60.00%	*	54.60%
Table Three	33.30%	42.90%	*	45.50%
Table Four	60.00%	100.00%	*	36.40%

* Denotes 2nd Arizona Sampling had no surveys returned with this alliance question type.

TABLE 3.3 SURVEY BEEF ALLIANCE VERSION TWO

TABLE ONE	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, profit sharing	Sell to Alliance, NO profit sharing
Type of Data Sharing	Live performance, individual data	Live performance, pen data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$20 /head	$0 /head

TABLE TWO	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, profit sharing	Retain Ownership, profit sharing
Type of Data Sharing	Live performance, individual data	Live performance, pen data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	Restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$20 /head	$10 /head

TABLE THREE	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, profit sharing	Retain Ownership, NO profit sharing
Type of Data Sharing	Live performance, individual data	Live performance, individual data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$20 /head	$10 /head

TABLE FOUR	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Retain Ownership, profit sharing
Type of Data Sharing	Live performance, pen data	Live performance, pen data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	Restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$0 /head	$10 /head

TABLE 3.4 VERSION TWO: RESPONDENTS PREFERENCE TOWARDS CHOOSING ALLIANCE TYPE “A”

Version Two	**% Selecting Alliance Type "A"**			
	BQA N=10	1st Arizona Sample N=6	2nd Arizona Sample N=7	Canada N=14
Table One	50.00%	50.00%	28.60%	50.00%
Table Two	30.00%	50.00%	42.90%	28.60%
Table Three	70.00%	33.30%	50.00%	28.60%
Table Four	20.00%	50.00%	33.30%	35.70%

TABLE 3.5 SURVEY BEEF ALLIANCE VERSION THREE

TABLE ONE	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Retain Ownership, NO profit sharing
Type of Data Sharing	Live performance, pen data	Carcass, individual yield & grade data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$20 /head	$0 /head

TABLE TWO	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Retain Ownership, NO profit sharing
Type of Data Sharing	Live performance, pen data	Carcass, group data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$20 /head	$5 /head

TABLE THREE	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Retain Ownership, profit sharing
Type of Data Sharing	Live performance, pen data	Carcass, individual yield & grade data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$20 /head	$5 /head

TABLE FOUR	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Retain Ownership, NO profit sharing
Type of Data Sharing	Carcass, individual yield & grade data	Carcass, group data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$0 /head	$5 /head

TABLE 3.6 VERSION THREE: RESPONDENTS PREFERENCE TOWARDS CHOOSING ALLIANCE TYPE “A”

Version Three	**% Selecting Alliance Type "A"**			
	BQA N=9	1st Arizona Sample N=7	2nd Arizona Sample N=4	Canada N=18
Table One	22.20%	28.60%	50.00%	66.70%
Table Two	11.10%	28.60%	25.00%	66.70%
Table Three	12.50%	50.00%	25.00%	55.60%
Table Four	44.40%	50.00%	50.00%	22.20%

TABLE 3.7 SURVEY BEEF ALLIANCE VERSION FOUR

TABLE ONE	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Retain Ownership, NO profit sharing
Type of Data Sharing	Live performance, pen data	Live performance, pen data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$0 /head	$20 /head

TABLE TWO	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Retain Ownership, profit sharing
Type of Data Sharing	Live performance, pen data	Carcass, individual yield & grade data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$0 /head	$5 /head

TABLE THREE	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Sell to Alliance, NO profit sharing
Type of Data Sharing	Live performance, pen data	Carcass, individual yield & grade data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$0 /head	$20 /head

TABLE FOUR	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Retain Ownership, profit sharing
Type of Data Sharing	Live performance, pen data	Carcass, individual yield & grade data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$20 /head	$5 /head

TABLE 3.8 VERSION FOUR: RESPONDENTS PREFERENCE TOWARDS CHOOSING ALLIANCE TYPE “A”

Version Four	**% Selecting Alliance Type "A"**			
	BQA N=12	1st Arizona Sample N=5	2nd Arizona Sample N=7	Canada N=20
Table One	83.30%	80.00%	100.00%	65.00%
Table Two	58.30%	80.00%	57.10%	85.00%
Table Three	90.90%	75.00%	71.40%	65.00%
Table Four	27.30%	20.00%	33.30%	75.00%

TABLE 3.9 SURVEY BEEF ALLIANCE VERSION FIVE

TABLE ONE	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, bonuses based on animal performance	Sell to Alliance, NO profit sharing
Type of Data Sharing	Live performance, individual data	Live performance, individual data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	Restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$0 /head	$5 /head

TABLE TWO	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, bonuses based on animal performance	Retain Ownership, profit sharing
Type of Data Sharing	Live performance, individual data	Live performance, pen data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$0 /head	$10 /head

TABLE THREE	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, bonuses based on animal performance	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Live performance, individual data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$0 /head	$0 /head

TABLE FOUR	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Retain Ownership, profit sharing
Type of Data Sharing	Live performance, individual data	Live performance, pen data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$5 /head	$10 /head

TABLE 3.10 VERSION FIVE: RESPONDENTS PREFERENCE TOWARDS CHOOSING ALLIANCE TYPE "A"

Version Five	**% Selecting Alliance Type "A"**			
	BQA N=11	1st Arizona Sample N=*	2nd Arizona Sample N=*	Canada N=12
Table One	100.00%	*	*	16.70%
Table Two	100.00%	*	*	41.70%
Table Three	90.90%	*	*	41.70%
Table Four	75.00%	*	*	33.30%

* Denotes 1st and 2nd Arizona samplings did not include this alliance type in the distributed surveys.

TABLE 3.11 SURVEY BEEF ALLIANCE VERSION SIX

TABLE ONE	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Sell to Alliance, NO profit sharing
Type of Data Sharing	Live performance, individual data	Carcass, individual yield & grade data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	Restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$10 /head	$20 /head

TABLE TWO	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Carcass, group data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$10 /head	$20 /head

TABLE THREE	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Live performance, individual data	Live performance, pen data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$10 /head	$5 /head

TABLE FOUR	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Carcass, individual yield & grade data	Carcass, group data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$20 /head	$20 /head

TABLE 3.12 VERSION SIX: RESPONDENTS PREFERENCE TOWARDS CHOOSING ALLIANCE TYPE “A”

Version Six	**% Selecting Alliance Type "A"**			
	BQA N=11	1st Arizona Sample N=2	2nd Arizona Sample N=1	Canada N=15
Table One	54.60%	50.00%	100.00%	53.30%
Table Two	70.00%	50.00%	100.00%	20.00%
Table Three	60.00%	50.00%	100.00%	40.00%
Table Four	60.00%	50.00%	100.00%	33.30%

TABLE 3.13 SURVEY BEEF ALLIANCE VERSION SEVEN

TABLE ONE	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Retain Ownership, profit sharing
Type of Data Sharing	Carcass, group data	Carcass, group data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$10 /head	$0 /head

TABLE TWO	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Sell to Alliance, NO profit sharing
Type of Data Sharing	Carcass, group data	Carcass, group data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$10 /head	$10 /head

TABLE THREE	**Alliance A**	**Alliance B**
Sale Type	Sell to Alliance, NO profit sharing	Retain Ownership, profit sharing
Type of Data Sharing	Carcass, group data	Live performance, individual data
Production Protocols	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$10 /head	$20 /head

TABLE FOUR	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, profit sharing	Sell to Alliance, NO profit sharing
Type of Data Sharing	Carcass, group data	Carcass, group data
Production Protocols	NO restrictions on vaccination and use of, antibiotics & minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$0 /head	$10 /head

TABLE 3.14 VERSION SEVEN: RESPONDENTS PREFERENCE TOWARDS CHOOSING ALLIANCE TYPE “A”

Version Seven	**% Selecting Alliance Type "A"**			
	BQA N=5	1st Arizona Sample N=2	2nd Arizona Sample N=1	Canada N=13
Table One	100.00%	0.00%	100.00%	79.60%
Table Two	80.00%	0.00%	100.00%	53.90%
Table Three	80.00%	50.00%	0.00%	84.60%
Table Four	20.00%	100.00%	100.00%	38.50%

TABLE 3.15 SURVEY BEEF ALLIANCE VERSION EIGHT

TABLE ONE	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, profit sharing	Retain Ownership, NO profit sharing
Type of Data Sharing	Carcass, group data	Carcass, individual yield & grade data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	Restrictions on vaccination and use of, antibiotics & minimum number of animals required
Alliance Participation Fee	$0 /head	$0 /head

TABLE TWO	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, profit sharing	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Carcass, group data	Carcass, individual yield & grade data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$0 /head	$10 /head

TABLE THREE	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, profit sharing	Retain Ownership, NO profit sharing
Type of Data Sharing	Carcass, group data	Carcass, group data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	NO restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$0 /head	$5 /head

TABLE FOUR	**Alliance A**	**Alliance B**
Sale Type	Retain Ownership, NO profit sharing	Sell to Alliance, bonuses based on animal performance
Type of Data Sharing	Carcass, individual yield & grade data	Carcass, individual yield & grade data
Production Protocols	Restrictions on vaccination and use of, antibiotics & minimum number of animals required	Restrictions on vaccination and use of, antibiotics & NO minimum number of animals required
Alliance Participation Fee	$0 /head	$10 /head

TABLE 3.16 VERSION EIGHT: RESPONDENTS PREFERENCE TOWARDS CHOOSING ALLIANCE TYPE “A”

Version Eight	**% Selecting Alliance Type "A"**			
	BQA N=16	1st Arizona Sample N=5	2nd Arizona Sample N=1	Canada N=15
Table One	43.80%	0.00%	0.00%	60.00%
Table Two	31.30%	20.00%	0.00%	53.30%
Table Three	64.70%	50.00%	100.00%	13.30%
Table Four	35.30%	25.00%	0.00%	53.30%

Appendix D: Chapter 4 Tables and Figures

Figure 4.1 Hierarchical Model Structure

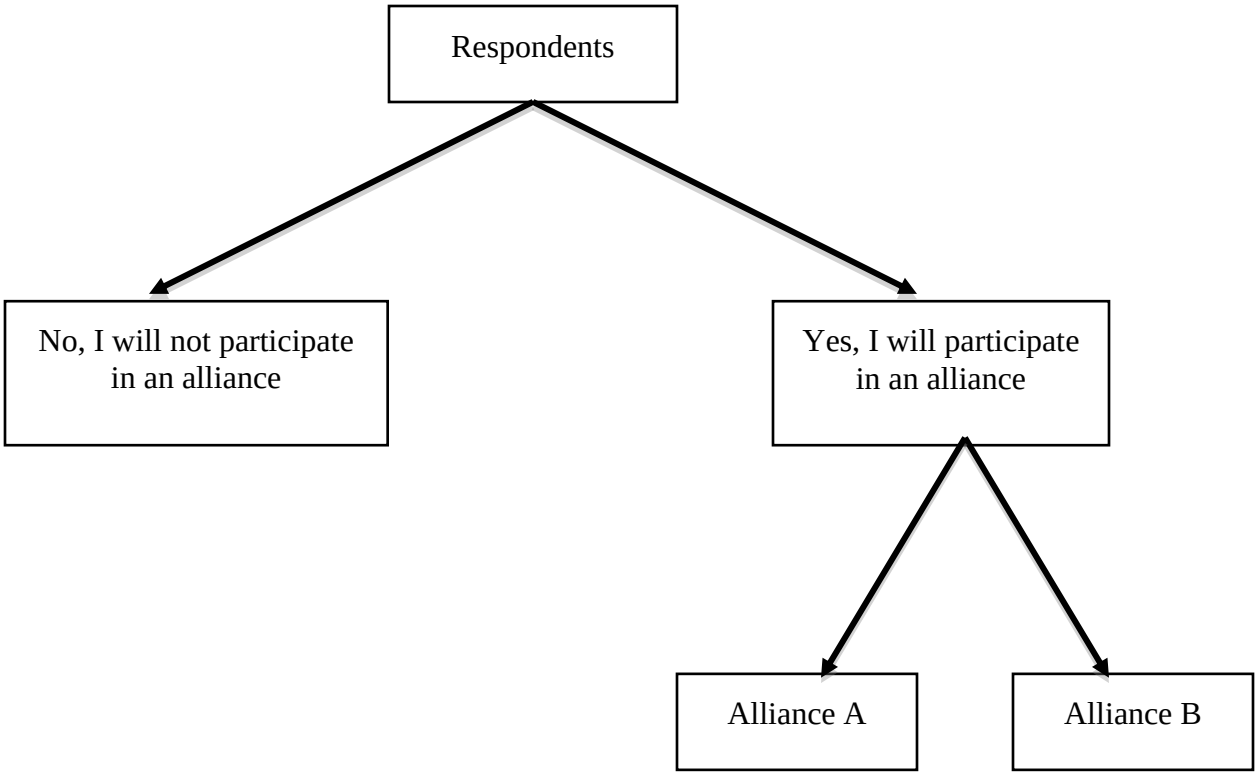


Table 4.5 Model One with Arizona Rancher BQA data only, where Y_i=1 for willing to join alliance

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	5.91***	1.15	
Cow-Calf Operation	1.14	1.03	18.00%
No Other Farm Activities	-0.04	0.6	-0.56%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.24	0.63	-3.70%
Market Calves through Formal Agreement	-0.01	0.62	-0.16%
Collect Production or Processing Data	-0.79	0.94	-12.00%
Oral Contract in Place for Business	1.65*	0.96	26.00%
Written Contract in Place for Business	-0.31	1.23	-4.80%
Income From Beef Greater than 50%	1.73**	0.66	27.00%
Age less than 40 years	-7.91***	0.74	-122.00%
Age between 51 and 60 years	-6.97***	0.55	-107.00%
Age greater than 60 years	-7.44***	0.47	-115.00%
Education	0.53*	0.28	8.00%
Sold as weaned claves	-0.01	0.008	-0.20%
Sold as preconditioned calves	-0.01	0.01	-0.20%
Retained ownership of calves	0.03	0.03	0.40%
Cow herd size between 51-150 head	0.58	0.59	8.90%
Cow herd size greater than 151 head	-0.25	0.89	-3.90%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level
Number of Observations Used = 82

Table 4.6 Model One with Arizona NASS data only, where Y_i=1 for willing to join alliance

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-1.32	0.99	
Cow-Calf Operation	-0.25	0.5	-8.00%
No Other Farm Activities	-0.27	0.34	-9.00%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.14	0.46	-5.00%
Market Calves through Formal Agreement	-0.34	0.36	-12.00%
Collect Production or Processing Data	0.83	0.62	28.00%
Oral Contract in Place for Business	0.34	0.39	11.00%
Written Contract in Place for Business	-0.62	0.78	-21.00%
Income From Beef Greater than 50%	0.4	0.35	13.00%
Age less than 40 years	0.19	0.85	6.00%
Age between 51 and 60 years	-0.81*	0.46	-27.00%
Age greater than 60 years	-0.71*	0.42	-24.00%
Education	0.32*	0.16	11.00%
Sold as weaned claves	0.001	0.005	0.04%
Sold as preconditioned calves	0.002	0.007	0.09%
Retained ownership of calves	-0.002	0.007	-0.06%
Cow herd size between 51-150 head	0.18	0.38	6.00%
Cow herd size greater than 151 head	0.47	0.44	16.00%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level
Number of Observations Used = 99

Table 4.7 Model One with Canadian data only, where Y_i=1 for willing to join alliance

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-0.11	0.78	
Cow-Calf Operation	-1.21**	0.39	-23.00%
No Other Farm Activities	-0.99*	0.4	-19.00%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	0.04	0.36	0.80%
Market Calves through Formal Agreement	0.05	0.51	0.90%
Collect Production or Processing Data	-0.15	0.41	-2.90%
Oral Contract in Place for Business	-0.09	0.35	-1.75%
Written Contract in Place for Business	-1.65**	0.62	-31.20%
Income From Beef Greater than 50%	-0.37	0.35	-6.90%
Age less than 40 years	0.03	0.48	0.50%
Age between 51 and 60 years	-0.29	0.4	-5.50%
Age greater than 60 years	-0.47	0.49	-8.80%
Education	0.41*	0.21	7.70%
Sold as weaned claves	0.01*	0.005	0.24%
Sold as preconditioned calves	0.01*	0.007	0.25%
Retained ownership of calves	-0.002	0.008	-0.03%
Cow herd size between 51-150 head	0.52	0.36	9.80%
Cow herd size greater than 151 head	1.73***	0.49	32.80%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level
Number of Observations Used= 150

Table 4.8 Model One with Canadian data only, where Y_i=1 for willing to join alliance (With On-Site Variable)

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-0.07	1.002	
On-Site Survey	-2.94***	0.69	-38.00%
Cow-Calf Operation	-1.54**	0.52	-20.00%
No Other Farm Activities	-0.97*	0.49	-12.50%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.53	0.48	-6.80%
Market Calves through Formal Agreement	0.29	0.67	3.70%
Collect Production or Processing Data	0.11	0.55	1.40%
Oral Contract in Place for Business	0.33	0.44	4.30%
Written Contract in Place for Business	-2.04*	0.82	-26.20%
Income From Beef Greater than 50%	-0.15	0.44	-1.90%
Age less than 40 years	0.89	0.64	11.50%
Age between 51 and 60 years	0.31	0.53	3.90%
Age greater than 60 years	-0.31	0.66	-3.90%
Education	0.62*	0.27	7.90%
Sold as weaned claves	0.03***	0.008	0.36%
Sold as preconditioned calves	0.04**	0.01	0.46%
Retained ownership of calves	0.01	0.01	0.15%
Cow herd size between 51-150 head	0.03	0.45	0.42%
Cow herd size greater than 151 head	2.25***	0	29.00%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level

Number of Observations Used= 150

Table 4.9 Model One with All data pooled, where Y_i=1 for willing to join alliance (Arizona Rancher BQA, Arizona NASS, and Canadian data combined)

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-0.68	0.53	
Cow-Calf Operation	-0.61**	0.23	-16.00%
No Other Farm Activities	-0.39*	0.2	-10.00%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.04	0.22	-1.00%
Market Calves through Formal Agreement	-0.2	0.22	-5.30%
Collect Production or Processing Data	0.12	0.27	3.20%
Oral Contract in Place for Business	0.12	0.2	3.20%
Written Contract in Place for Business	-0.89*	0.35	-23.10%
Income From Beef Greater than 50%	0.26	0.18	6.80%
Age less than 40 years	-0.28	0.31	-7.40%
Age between 51 and 60 years	-0.66*	0.26	-17.00%
Age greater than 60 years	-0.75**	0.26	-19.50%
Education	0.34***	0.1	8.90%
Sold as weaned claves	0.003	0.003	0.09%
Sold as preconditioned calves	0.004	0.004	0.09%
Retained ownership of calves	-0.003	0.004	-0.09%
Cow herd size between 51-150 head	0.5*	0.21	13.00%
Cow herd size greater than 151 head	0.95***	0.24	24.50%
BQA respondent	0.99***	0.23	25.80%
Canada Respondent	0.63**	0.24	16.20%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level
Number of Observations Used= 331

Table 4.10 Model Two with Arizona Rancher BQA data only, where Y_i=1 for choosing alliance A

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-0.48	0.77	
Cow-Calf Operation	0.18	0.34	5.00%
No Other Farm Activities	-1.21	0.21	-34.00%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.73	0.22	-21.00%
Market Calves through Formal Agreement	-0.79	0.22	-22.00%
Collect Production or Processing Data	0.84	0.57	24.00%
Oral Contract in Place for Business	0.19	0.24	5.00%
Written Contract in Place for Business	1.34**	0.49	38.00%
Income From Beef Greater than 50%	-0.1	0.22	-2.90%
Age less than 40 years	-0.5	0.37	-14.00%
Age between 51 and 60 years	-0.59	0.33	-17.00%
Age greater than 60 years	-0.79	0.29	-22.00%
Education	0.09	0.11	2.50%
Sold as weaned claves	-0.003	0.002	-0.08%
Sold as preconditioned calves	-0.004	0.003	-0.10%
Retained ownership of calves	0.03**	0.01	0.70%
Cow herd size between 51-150 head	0.41	0.25	12.00%
Cow herd size greater than 151 head	0.48	0.31	14.00%
Sale Type Difference	0.3*	0.16	8.00%
Profit Sharing Difference	0.22*	0.11	6.00%
Carcass Data Sharing Difference	0.13	0.21	4.00%
Individual Data Sharing Difference	0.2	0.12	6.00%
Restriction Protocol Difference	0.5***	0.12	14.00%
Animal Required Difference	-0.15	0.15	-4.00%
Alliance Participation Fee Difference	-0.02	0.008	-0.50%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level
Number of Observations Used = 328

Table 4.11 Model Two with Arizona NASS data only, where Y_i=1 for choosing alliance A

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-1.58**	0.59	
Cow-Calf Operation	0.04	0.27	0.97%
No Other Farm Activities	0.04	0.19	1.10%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.25	0.27	-6.40%
Market Calves through Formal Agreement	0.21	0.21	5.40%
Collect Production or Processing Data	1.03**	0.37	26.00%
Oral Contract in Place for Business	0.09	0.21	2.30%
Written Contract in Place for Business	-0.14	0.43	-3.60%
Income From Beef Greater than 50%	0.48*	0.2	12.20%
Age less than 40 years	0.44	0.41	11.10%
Age between 51 and 60 years	-0.63*	0.27	-16.00%
Age greater than 60 years	-0.004	0.24	-0.11%
Education	-0.02	0.09	-0.57%
Sold as weaned claves	-0.004	0.003	-0.10%
Sold as preconditioned calves	-0.004	0.004	-0.10%
Retained ownership of calves	0.003	0.004	0.07%
Cow herd size between 51-150 head	-0.09	0.21	-2.30%
Cow herd size greater than 151 head	-0.57*	0.25	-14.50%
Sale Type Difference	0.35*	0.17	8.90%
Profit Sharing Difference	0.26*	0.12	6.50%
Carcass Data Sharing Difference	-0.42*	0.18	-10.60%
Individual Data Sharing Difference	0.31*	0.14	7.80%
Restriction Protocol Difference	0.17	0.11	4.20%
Animal Required Difference	0.08	0.13	1.90%
Alliance Participation Fee Difference	-0.01*	0.007	-0.42%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level

Number of Observations Used = 396

Table 4.12 Model Two with Canadian data only, where Y_i=1 for choosing alliance A

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-1.65***	0.39	
Cow-Calf Operation	-0.25*	0.14	-8.00%
No Other Farm Activities	-0.18	0.21	-5.90%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.41**	0.15	-13.20%
Market Calves through Formal Agreement	0.22	0.21	7.30%
Collect Production or Processing Data	0.97***	0.25	31.60%
Oral Contract in Place for Business	-0.02	0.15	-0.64%
Written Contract in Place for Business	0.21	0.26	7.00%
Income From Beef Greater than 50%	0.11	0.15	3.50%
Age less than 40 years	-0.31*	0.19	-10.20%
Age between 51 and 60 years	-0.03	0.17	-0.81%
Age greater than 60 years	-0.09	0.21	-2.90%
Education	0.11	0.08	3.60%
Sold as weaned claves	0.003	0.002	0.11%
Sold as preconditioned calves	0.003	0.003	0.11%
Retained ownership of calves	-0.0008	0.003	-0.02%
Cow herd size between 51-150 head	0.73***	0.19	24.00%
Cow herd size greater than 151 head	0.51**	0.19	17.00%
Sale Type Difference	0.17	0.12	5.50%
Profit Sharing Difference	-0.2*	0.09	-6.50%
Carcass Data Sharing Difference	-0.06	0.14	-2.00%
Individual Data Sharing Difference	-0.42***	0.09	-14.00%
Restriction Protocol Difference	-0.003	0.09	-0.08%
Animal Required Difference	0.0003	0.12	0.01%
Alliance Participation Fee Difference	0.01*	0.006	0.34%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level

Number of Observations Used= 472

Table 4.13 Model Two Canadian data only, where Y_i=1 for choosing alliance A (With On-Site Variable)

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-1.68***	0.39	
On-Site Survey	-0.32*	0.16	-10.00%
Cow-Calf Operation	-0.25*	0.14	-8.00%
No Other Farm Activities	-0.19	0.21	-6.10%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.47**	0.15	-15.00%
Market Calves through Formal Agreement	0.23	0.22	7.50%
Collect Production or Processing Data	1.05***	0.25	34.00%
Oral Contract in Place for Business	0.04	0.15	1.40%
Written Contract in Place for Business	0.3	0.26	9.50%
Income From Beef Greater than 50%	0.14	0.15	4.60%
Age less than 40 years	-0.22	0.19	-7.00%
Age between 51 and 60 years	0.05	0.17	1.80%
Age greater than 60 years	-0.05	0.21	-1.60%
Education	0.11	0.09	3.40%
Sold as weaned claves	0.004	0.003	0.14%
Sold as preconditioned calves	0.004	0.004	0.14%
Retained ownership of calves	0.0003	0.003	0.01%
Cow herd size between 51-150 head	0.66***	0.19	21.40%
Cow herd size greater than 151 head	0.5**	0.19	16.30%
Sale Type Difference	0.16	0.12	5.00%
Profit Sharing Difference	-0.22*	0.09	-7.10%
Carcass Data Sharing Difference	-0.07	0.14	-2.15%
Individual Data Sharing Difference	-0.41***	0.09	-13.20%
Restriction Protocol Difference	0.03	0.09	1.10%
Animal Required Difference	-0.01	0.12	-0.43%
Alliance Participation Fee Difference	0.01*	0.006	0.32%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level
Number of Observations Used= 472

Table 4.14 Model Two All data pooled, where Y_i=1 for choosing alliance A (Arizona Rancher BQA, Arizona NASS, and Canadian data combined)

Variable	Coefficient	Standard Error	Marginal Effect
Intercept	-1.67***	0.27	
Cow-Calf Operation	-0.2*	0.11	-6.50%
No Other Farm Activities	-0.39***	0.1	12.70%
Pork, Dairy, Sheep, Div. Livestock, Other Activities	-0.41***	0.1	13.50%
Market Calves through Formal Agreement	-0.11	0.1	3.70%
Collect Production or Processing Data	0.97***	0.18	32.10%
Oral Contract in Place for Business	0.007	0.09	0.23%
Written Contract in Place for Business	0.16	0.17	5.30%
Income From Beef Greater than 50%	0.07	0.09	2.20%
Age less than 40 years	-0.04	0.14	-1.20%
Age between 51 and 60 years	-0.16	0.12	-5.40%
Age greater than 60 years	-0.09	0.12	-3.10%
Education	0.07	0.05	2.40%
Sold as weaned claves	-0.0006	0.001	-0.02%
Sold as preconditioned calves	0.0008	0.002	0.02%
Retained ownership of calves	-0.00009	0.002	0.00%
Cow herd size between 51-150 head	0.29**	0.1	9.80%
Cow herd size greater than 151 head	0.18	0.11	5.90%
BQA respondent	0.51***	0.11	17.00%
Canada Respondent	0.66***	0.12	21.80%
Sale Type Difference	0.21**	0.08	7.00%
Profit Sharing Difference	0.03	0.06	0.97%
Carcass Data Sharing Difference	-0.09	0.09	-2.80%
Individual Data Sharing Difference	-0.06	0.06	-1.90%
Restriction Protocol Difference	0.15**	0.05	5.00%
Animal Required Difference	-0.02	0.07	-0.65%
Alliance Participation Fee Difference	-0.006	0.004	-0.18%

* Denotes significance at 10% level, ** Denotes significance at 5% level, *** Denotes significance at 1% level

Number of Observations Used= 1,196