COMPARISON OF FEEDLOT PERFORMANCE, CARCASS MERIT AND CHEMICAL COMPOSITION OF CROSSBRED CATTLE

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DEDICATION

I would like to dedicate this dissertation to my wife Christina and my son Ruben Joseph. Your love and support made this possible.

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ABSTRACT

Feedlot performance, carcass merit and chemical composition were compared using Waguli , Brangus, Hereford x Tuli and Wagyu x Crossbred Gene Combination (CGC) breeds. Steers were penned in the following manner: 6 Waguli steers, 6 Hereford x Tuli, 6 Wagyu x CGC and 8 Brangus. There was a significant difference ($P < 0.05$) between Brangus and Waguli for ADGs. F:G was lower ($P<0.05$) for Hereford x Tuli compared to the other crossbreeds. A heavier final weight was observed ($P<0.05$) for the Wagyu x CGC than all other crossbreds. There was a significant difference ($P<0.05$) for REA between Wagyu x CGC and Hereford x Tuli and Waguli. Wagyu x CGC had higher shear force values (SFV) ($P<0.05$) than all other crossbreeds. Cost of gain was lower ($P<0.05$) for Hereford x Tuli compared the other breeds. Hereford x Tuli also had less protein ($P<0.05$) than to the other breeds.

A second study was conducted comparing limit feeding (LF) vs. full feeding (FF) strategies. 23 steers and 27 heifers were penned by sex and were randomly assigned a treatment; 4 pens received the LF treatment and 4 were FF. ADG was lower ($P<0.05$) for LF and FF heifers compared to both LF and FF steers. Dressing percentage was lower ($P<0.05$) for LF steers compared to LF and FF Heifers. LF heifers YG was higher ($P<0.05$) compared to FF steers. Quality grades were higher ($P<0.05$) for LF and FF heifers compared to LF and FF steers. REA /cwt was significantly higher ($P<0.05$) for FF heifers compared to LF and FF steers. SFV were

lower ($P<0.05$) for FF heifers compared to LF and FF steers. A significant difference ($P<0.05$) in cost of gain was noted between LF steers and the rest, also between LF heifers and FF steers. Primal cut price/cwt was significantly lower ($P<0.05$) for LF heifers compared to FF steers. Lipid percentage was higher ($P<0.05$) LF heifers compared to FF steers. Moisture percentage was lower ($P<0.05$) for LF heifer compared to the other groups.

Keywords: feedlot performance, carcass merit, beef cattle breeds, tenderness evaluation, soft tissue chemical composition, limit feeding,

CHAPTER 1:

INTRODUCTION STUDY #1 AND #2

For many years, the utilization of British cattle breeds (eg. Angus, Shorthorns, and Hereford) was the standard for the American beef producer. These types of cattle provided quality carcasses giving palatability to the consumer. However, there was one major disadvantage associated with these carcasses; they had excessive subcutaneous and intermuscular fat. This proved to be an issue for the packer and the consumer. The subcutaneous fat was generally not used for anything but a low value by-product. This became a loss for the packer because it diminished the total pounds of saleable product and the intermuscular fat caused the meat to be less desirable to the consumer. In an effort to improve yield grades, the U.S beef industry initiated the use of crossbreeding. In today's feedlots, the majority of the cattle on feed are crossbreds.

In today's beef market, the main consideration is how to have the highest percentage of quality grade Choice with a yield grade 2 using the least amount of investment (time, environment and capital). Achieving this goal is important to the producer and consumer alike and therefore the evaluation of traits that crossbred calves yield is necessary to optimize production.

Additionally, feeding protocols can greatly change the efficiency outcome of cattle on feed. Feeding strategies such as limit feeding and feeding more than once daily can potentially improve feed efficiency. Limit feeding is also a great strategy to

have more beef produced by a single animal. Moreover, limit feeding may allow feedlots to market their cattle at a more profitable time.

In study #1, Waguli steers were compared to Wagyu x CGC, Hereford x Tuli and the Brangus breeds comparing feedlot performance and carcass merit. Feedlot performance was determined on the following: Average Daily Gain (ADG), Feed to Gain ratio(F:G) and cost of gain, while data such as dressing percentage, quality grade, yield grade, tenderness evaluation and chemical composition of the animal were used to determine carcass merit. The overall objective of this study was to compare Waguli's feedlot performance and carcass merit to other crossbred animals.

In study #2, different crossbred cattle (Waguli, Hereford, Angus) were fed using limit feeding. Feedlot performance was determined on the following: ADG, F:G and cost of gain, while data such as dressing percentage, quality grade, yield grade, tenderness evaluation and chemical composition of the animal. The overall objective of this study was to compare once a day feeding at libitum to limit feeding and evaluate feedlot performance, carcass merit and chemical composition of the carcasses.

CHAPTER 2:

LITERATURE REVIEW

Section 2.1: The Crossbreeding System

While most characteristics of purebred cattle are widely known, most cattle in the United States are crossbreds expressing many traits. Crossbreeding programs are used throughout the world because of the vast possibilities of traits they offer. These programs allow for the creation of elite combinations of the most favorable genotypic and phenotypic traits from the various breeds of cattle. This result can also be termed as heterosis. Heterosis can more accurately be defined as offspring that have superior qualities than both parents and will perform well in several different scenarios. Heteroris can be individual, maternal or paternal, with maternal having the greatest influence. This proves to be an advantage of the crossbreeding system which allows for heterosis or hybrid vigor meaning crossbred cattle are more complimentary. Additionally, Franke (1980) found that crossbred cattle will grow faster, grade higher, have more backfat and have a lower shear force value than pure breed parents.

Currently there are several different strategies to creating a productive and profitable crossbreeding program. One crossbreeding program is to combine different types or breeds of cattle. *Bos taurus* cattle breeds can be categorized into two types: British or Continental. Popular British breeds are Angus and Hereford

and some Continental breeds include Charolais, Limousin and Gelbvieh. In crossbreeding these types, the British breeds (Hereford, Angus and Shorthorn) offer their ability to increase the quality of the carcass (Casas et al., 2005), whereas the Continental breeds bring increased performance and improved muscling, creating a more desirable meat product. A study conducted by Comerford and associates (1998) found that the Continental breeds (Simmental and Limousin) had significantly greater REA when compared to Hereford and Brahman. It was also noted by Comerford and associates that when the Simmental and Limousin breeds were used in a crossbreeding program their influence tended to increase REA in the offspring.

These crossbred animals allow the rancher to retain high marbling characteristics, while increasing muscling and decreasing subcutaneous fat. An example of a developed breed obtained by crossing a Continental with a British is the Balancer. The Balancer is the hybrid result of the Gelbvieh breed crossed with an Angus. This cross offers better performing cattle (eg. ADG, F:G) with high marbling or intramuscular fat (American Gelvieh Association, 2011).

Another crossbreeding program that is traditionally used is to compare two sub species of cattle: *Bos taurus* and *Bos indicus*. *Bos taurus* cattle generally include European cattle that are more adapted to cooler climates, whereas the *Bos indicus* (or Zebu) are more adapted to hot climates and are more drought resistant. As a result of these characteristics, *Bos indicus* cattle are shipped to places where heat

and parasites lowered productivity (Herring et al., 1996). Crossing these two sub-species, resulted in keeping the favorable carcass traits of the British/Continental breeds, while increasing the cattle's resistance to disease and harsh weather conditions (e.g. Heat Tolerance). Beaver et al. (1989) found that *Bos indicus* cattle had smaller organs and less internal, making their maintenance requirements low. When low quality forage was fed to *Bos indicus* and *Bos taurus cattle*, Zebu cattle were shown to better utilize and digest higher amounts of dry matter (DM) (Beaver et al., 1989). The combination of these advantages makes *Bos indicus* cattle, the excellent source to provide heat tolerance and hardiness genes.

Paschal and associates (1994) found that the more commonly used *Bos inducus* breeds are the Red and Gray Brahman. This is due to the lack of availability of the other various Zebu breeds (Paschal et al., 1994). According to Herring et al., Brahman are high in fertility, milk production and longevity (1996). Furthermore, commercial herds in more temperate areas, have an increased percentage of *Bos indicus* influenced cattle because of higher productivity by the cow, as well as calving ease by *Bos indicus* x *Bos taurus* cattle (Paschal et al. 1994). However, they have been found to have delayed age of puberty, newborn calves with lower vigor, and carcasses that have less intramuscular fat and less tender beef when compared to the *Bos taurus* (Herring et al., 1996). Despite these disadvantages, Brahmans still show an economic advantage in a "market-based system" because of their growth characteristics (Herring et. al., 1996). Data suggest that a level of three-eighths for

maximum *Bos indicus* to achieve positive heterosis effect and no negative effects on tenderness (Leheska and Montgomery, 2009). Johnson et al. (1980), reported that top loin steaks with the ¼ Brahman influence did not have a significant difference in tenderness when compared to 100% Angus top loin steaks. Furthermore, other researchers quoted by Johnson et al. (1980) reported that tenderness was only significant in cattle possessing 50% plus Brahman. Some examples of breeds that have a Brahman influence include: Brangus, Braford and Droughtmaster. These breeds are especially important to use in feedlots that are located in hot/dry areas, such as Southeast Texas.

There are more aggressive crossbreeding programs that attempt to combine all the positive traits associated with British, Continental, and Brahman (*Bos indicus*) cattle. One example, developed at the King Ranch in Texas, was a breed called Santa Cruz. This breed was created in the late 1980s in response to the need for more "market appropriate" cattle. The Santa Cruz is a composite breed combining the Santa Getrudis (Shorthorn x Brahman), Red Angus and the Gelbvieh. This combination yielded cattle that had superior traits in both the feedlot and seedstock scenarios (Breeds of Livestock, 1995-2009). Like the Santa Cruz, the Southern Balancer breed was developed with the diverse production environments in mind. The Southern Balancer breed is composed of a minimum of 25 % Gelbvieh, 6.25%-50% heat tolerance (Brangus, Beefmaster, Braford, Brahman, Brangus, Red Brangus, Senepol and Santa Gertrudis) and the remaining percentage is comprised of Angus