MID-TERM REPORT – Project # P0038396 (FCEB# 8)

Title: Understanding the relationship between feed efficiency and fertility in replacement beef heifers

Principle Investigator: Dr Cliff Lamb and Nicolas DiLorenzo, North Florida Research and Education Center

Relevance to Florida Cattle Industry: Reducing feed costs in beef cattle can significantly improve profits to the production enterprise. Studies have shown differences in residual feed intake (RFI) values that range between -4.3 lb/day to 4.0 lbs/day. This represents a difference of over 8.3 lb/day feed savings in efficient versus inefficient animals. The savings in feed costs between low and high RFI animals could be as high as $92 (assuming 170 days on feed and $130/ton of feed). The relationship of fertility and feed efficiency has barely been researched. To beef producers, fertility often is overlooked as one of the most important traits to ensuring the economic viability of their operations. The University of Florida-IFAS Feed Efficiency Facility (FEF) is unique as it is the only facility in the Southeastern United States that has the capability to measure feed intake in real-time, and the GrowSafe^{TM} system is a robust data collection system that significantly increases data acquisition over conventional individual feed measuring systems, thereby increasing the number of variables that can be analyzed and estimated. Therefore, the proposed study would investigate feed efficiency in animals that are known to be adapted to subtropical/tropical climates (such as Brangus and Braford) and the efforts at improving the efficiency of feed/forage use will have a large impact on reducing input costs of beef production.

Objective: The objectives of the proposed study is to investigate feed efficiency in animals that are known to be adapted to subtropical/tropical climates (such as Brangus and Braford), and the relationship between feed efficiency and fertility in replacement heifer.

Methods: Eighty-nine replacement beef heifers, Angus, Brangus, and Braford genetics produced at the NFREC, were enrolled in the experiment. Heifers were weaned and back-grounded on pasture for three months. From 10 to 12 months of age heifers entered the FEF and received a diet high in forage to reflect a similar diet to that received on pasture, and heifers had ad libitum access to feed. While in the FEF, heifers were exposed to a 14 d adaptation period, followed by a 70 d data collection period that included the collection of data for residual feed intake, feed to gain ratio, various measurements of temperament, and stress responsiveness. Body condition score and body weight were collected weekly. Puberty in heifers was evaluated by weekly collection of blood samples from January to May for analysis of progesterone. An antral follicle count was assessed on all heifers at the first day of the breeding season using transrectal ultrasonography. Subsequent fertility (conception and pregnancy rates) were evaluated after breeding by the use of transrectal ultrasonography.

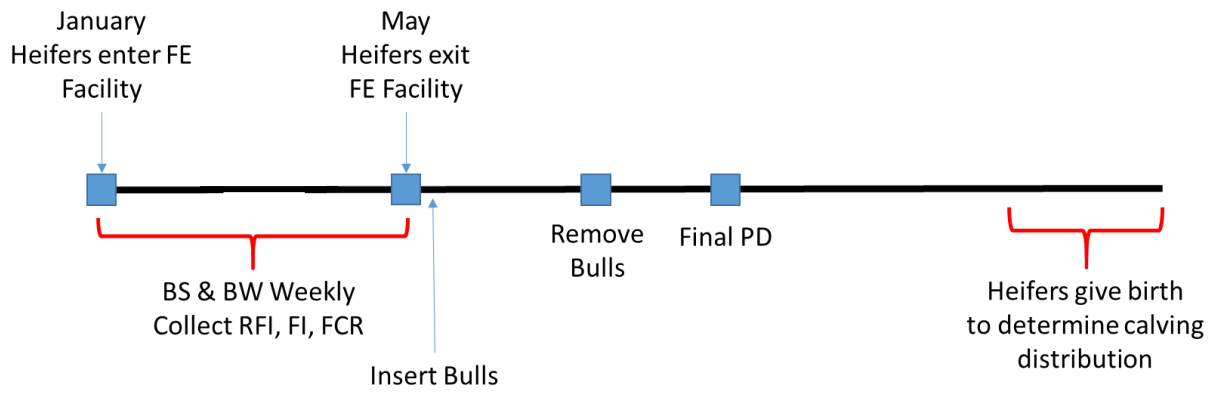

Figure 1. Yearly timeline of data collection events.

Results: Our preliminary data, after one year of data collection on 89 heifers of Angus, Brangus, and Braford breeds currently reveals no difference exists in the mean age at puberty among breeds (Table 1). However, a second year of data is necessary to increase the number of observations per breed to reduce the possibility of reporting a Type II statistical error. Using survival analyses it appears that Angus and Brangus heifers attained puberty earlier during the breeding season than Braford heifers. However, average daily gain (ADG) during the heifer development and feed efficiency determination portion of the project demonstrated that Angus and Brangus heifers was greater than in Braford heifers, but there was no difference among treatments for RFI (Table 1). Preliminary Pearson correlation coefficients currently indicate that there is a correlation between the age at the onset of puberty and dry matter intake of heifers and a correlation between the onset of puberty and residual feed intake (Table 2).

Table 1. Mean age at attainment of puberty for Angus, Brangus, and Braford heifers.

	Heifer breed		
	Angus	Brangus	Braford
No. of heifers	51	27	11
Mean age at puberty attainment, d	399 ± 6	410 ± 8	404 ± 12
Average daily gain, lb	3.5 ± 0.1[a]	3.4 ± 0.1[a]	3.0 ± 0.2[b]
Residual feed intake, lb	-0.29 ± 0.40	0.59 ± 0.55	-0.10 ± 0.85

Table 2. Pearson correlation coefficients among feed efficiency and fertility traits for replacement beef heifers.

Item[1]	Initial BW	Final BW	DMI	ADG	RFI
Age at onset of puberty	0.154	0.174	**0.278**	0.139	**0.222**
	0.149	0.104	**0.008**	0.195	**0.037**
Initial BW		**0.948**	**0.380**	**0.381**	0.002
		<0.001	**<0.001**	**<0.001**	0.987
Final BW			**0.466**	**0.655**	0.001
			<0.001	**<0.001**	0.989
DMI				**0.453**	**0.863**
				<0.001	**<0.001**

[1] BW = Body weight; DMI = dry matter intake; RFI = residual feed intake

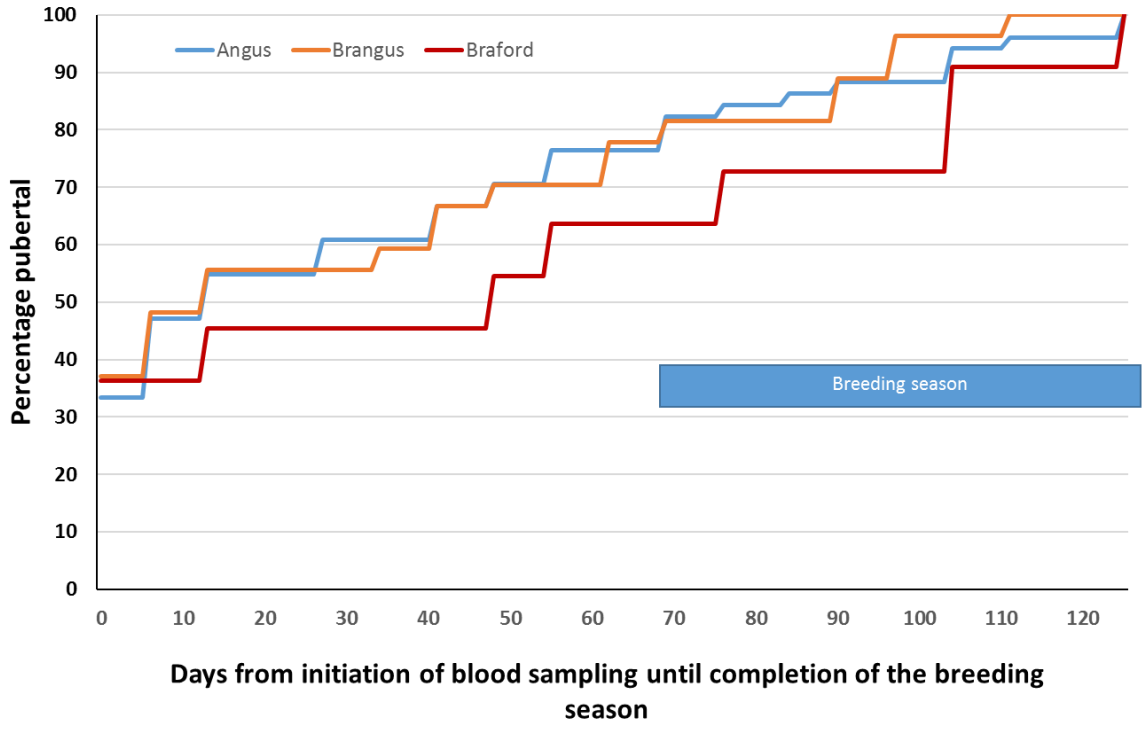

Figure 1. Survival analysis of onset of puberty prior to and during the breeding season for Angus, Brangus, and Braford heifers

Conclusion: Since this is a mid-term report and only reports data from heifers during the initial year of the experiment, it is unwise to report any definitive conclusions; however, during year 1 it is evident that Angus and Brangus heifers had greater average daily gain during the development phase and appear to attain puberty earlier during the breeding season than Braford heifers.

BUDGET FOR FLORIDA CATTLE ENHANCEMENT FUND- BUDGET JUSTIFICATION

PROJECT TITLE: Understanding the relationship between feed efficiency and fertility in replacement beef heifers - (FCEB# 8)

DETAILED LINE ITEM DESCRIPTION	QTY	% Complete	TOTAL	EXPLANATION/JUSTIFICATION OF DELIVERABLE	COMPLETION DATE
Blood sample analysis	Various	100%	$ 8,000.00	Immulite analysis of P4 samples to complete the progesterone anlyses for Year 1	9/1/2017
Hair sample analysis for DNA for	Various	100%	$ 27,364.00	Collection and analyses of DNA samples from hair follicles for Year of the project	9/1/2017
Materials and supplies, for year 1	Various	100%	$ 5,104.00	Estrus synchronization and artificial insemination supplies for Year 1 of the project	9/1/2017
Research Animals (per diem)	Various		$ 14,400.00	Research animals housed at the Feed Efficiency Facility to measure feed intake individually	9/1/2017
Analysis of data and final report	Various		$ 6,465.00	Data analyses for Year 1 to assess the relationship between feed efficiency and fertility and preparation of final report	9/1/2017
IDC	N/A		$ 7,359.78		
GRAND TOTAL: (equal to percentage of completion)			**$ 68,692.78**		