MONITORING CATTLE PERFORMANCE ON PASTURE AT THE KRUSENBAUM FARM.

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INTRODUCTION

After converting from a conventional dairy to a managed-intensive rotational grazing dairy farm in the early 1990's, the Krusenbaums's ('Krusen Grass' Farm) were interested in further improving their labor efficiency to reduce the cost of production and to allow for some vacation time. They implemented seasonal calving so that the majority of their herd was dry during the winter and calved in the spring. To further lighten their load and to minimize capital costs they decided to outwinter the cows, bred heifers, and young stock on the paddocks.

However, by the winter of 1997/98, they were beginning to make some modifications. Although they aimed to have all the cows dry in February, they were more flexible in drying the cows off according to their due date, depending on labor availability. And secondly, they constructed an outwintering shed for the milking string. The former modification was made for reasons of cash flow and total milk production, and the latter for reasons of herd health, cow comfort and more flexible manure management. They now focused their attention on the impact of their outwintering strategies on the bred heifers and young stock.

More specifically, they were concerned about how their herd management decisions were impacting animal weight gain. Was it necessary to separate steers from heifers due to the different levels of aggressiveness of each during grazing? Did crossbreeding their Holsteins with Jerseys result in improved rates of weight gain? Was it necessary to invest in housing for the young stock if winter weight gains were low?

A study in Sweden on behavioral responses of dairy heifers to climate showed that climate had significant effects on main activity and location of the heifers and that heifers adapted their behavior to reduce energy expenditure by spending more time lying in the wooded areas in very cold or windy conditions (Redbo et al., 2001). Knowing this, it was important to provide some protection from the elements so that animals didn't lose a lot of condition. To help maintain condition and weight gain, the replacement cattle were provided high quality round bales or baleage on the paddocks during the winter months. Water was provided in the lot. In extremely cold or windy conditions, animals were supplemented with corn grain and were provided either natural (trees or valley) or artificial windbreaks set up using 2 layers of large round bales.

We decided to ask three questions:

1) Did steers and heifers gain at the same rate?
2) Did Holstein cattle gain at the same rate as Jersey crossbred cattle?
3) Would winter weight gain equal summer weight gain?

This is a report on the first two years of data collection.

MATERIALS AND METHODS

Bred heifers, weaned calves, and male calves were weighed in late fall at the end of the grazing season and again as the overwintering period ended and the paddocks began to green up (early

Spring). Summer weighing was avoided as to not interfere with conception rates during this delicate phase. The target birthing and breeding schedule for this farm is for the calves to be born in March, pass a first winter as young stock, to be bred in June (at ~14 months) and pass a second winter as bred heifers, and finally give birth and enter the milking string in March (at 23 months). Table 1 summarized the number of animals that entered the study. They are grouped as the calves born in Spring 2002 (only measured over their second winter, ~20 mo.), the calves born in Spring 2003 (weighed over two winter seasons, first as calves (~8 mo.) and then as bred heifers ~20 mo.) and those born in 2004 (at the date of this report, only weighed as calves going through their first winter). Table 2 shows the weighing schedule.

Table 1. Replacement heifers and steers in the study.

Animals born in the spring of:	Holstein heifers	Crossbred heifers	Steers (mixed breeds)	Total Animals
2002	11	12	0*	23
2003	12	22	22	56
2004	26	7	23	56

* steers not weighed

Table 2. Weighing dates.

Fall weighing dates	Early Spring weighing dates
December 12, 2003	March 1, 2004
November 5, 2004	February 22, 2005
August 25, 2005	Late February, 2006 (end of study)

Cattle were brought in off the paddocks the morning they were to be weighed. Supplemental feed was withheld until after weighing. One-by-one, cattle were 'run' across a Tru-Test© load bar scale and loading platform set up beneath a holding chute. Though body condition scoring was not recorded, each animal was observed for problems and thrift while on the platform scale. Using phenotype, breed was assigned to each animal. Because the farm does raise some organic beef, male calves (steers) were included in the second and third cohort.

Data was analyzed with a pair T-test approach for each group using SAS 8.2 Proc Mixed. LSMEANS were used to report the means. There were no gender x season or breed x season interactions so the main effects are averaged across seasons in this report.

RESULTS AND DISCUSSION

Heifer vs. Steer Weight Gain

Looking at the unbred heifers and steers, weight gain of steers, although arithmetically higher, wasn't statistically consistently higher from year to year (Table 3). We would like to get another year of data before basing a decision on separating males and females into different grazing groups.

Table 3. Average daily weight gain as a function of gender.			
Year	Class of cattle	Winter1	Summer2
		lbs/day	
Calf2003	Unbred Heifer	1.37	1.51
	Steer	1.50	1.57
p-value		*0.1043*	*0.3018*
Calf2004	Unbred Heifer	1.22	1.46
	Steer	1.26	1.55
p-value		*0.4946*	*0.1044*

Overwintering period and the effect of breed

Bred Heifers: Bred heifers (Calf2002) were weighed going through their second winter at about 1050 lbs/animal or 75% of their mature weight (Table 4). By the end of their second winter, some bred heifers had already calved and thus were moved to the milking string. Although the Holstein heifers tended to be heavier than the crossbreds there was no effect of breed on average weight.

The following winter (2004-2005), another set of bred heifers (Calf2003) was weighed. Similar to Calf2002 group, breed was not significant factor in average body weight at the start of the winter but by late February the Holstein heifers were heavier. It is interesting to note that this group performed better in a harsher winter of 04/05 (1.82 lb/day) than did Calf2002 during the previous milder winter (1.36 lb/day) ($p<0.0025$). Although the animal weight gain was very different in these two winters prior to calving, DHIA herd records show that the Krusenbaum heifers calve at an average age of 24 months of age, and a median age of 23 months (Nordlund, pers comm. 2005).

Yearling heifers: The young stock at 8-9 months old averaged 475 lbs the first year (Calf2003) and 430 (Calf2004) the second year going into their first winter and came out of winter season (~12 mo. of age) at 584 (Calf2003) and 559 (Calf2004) lbs on average (Table 5). As with the bred heifers there was generally no effect of breed on animal weights going into the winter or coming out of the winter. These animals were small compared to industry standards where the desirable weights at 14 months (breeding age) are between 825-875 lbs for Holstein heifers and 580-600 lbs for Jerseys (Crowley et al., 1991; Hoffman, 1997). Vargas et al (1998) actually found a significant effect of heifer weight at 13 months on age at first calving. They reported that the chance of calving was consistently higher for heifers with higher body weights at 13 months, and it decreased linearly from the top to the lowest quartiles. Although somewhat light, DHIA records show a very high rate of conception for the 1st-calf heifers at nearly one service per conception, exceeding their goal of 1.5 services per conception.

Table 4. Bred heifer body weights—winter weight gains				
	Calf2002		Calf2003	
	Dec. 12, 2003	March 1, 2004	Nov. 5, 2004	Feb. 22, 2005
	Start of 2nd winter	End of 2nd winter	Start of 2nd winter	End of 2nd winter
Breed	----------lbs----------			
Holstein	1058 N=12	1162 N=11	975 N=12	1201 N=10
Jersey Cross	1048 N=17	1173 N=13	937 N=22	1126 N=21
Mean	*1053*	*1168*	*956*	*1163*
p-value	*0.7936*	*0.8410*	*0.1155*	*0.0245*

Table 5. Young heifers body weights—winter weight gains				
	Calf2003		Calf2004	
	Dec. 12, 2003	March 1, 2004	Nov. 5, 2004	Feb. 22, 2005
	Start of 1st winter	End of 1st winter	Start of 1st winter	End of 1st winter
	----------lbs----------			
Holstein	490 N=12	600 N=12	440 N=26	576 N=26
Jersey Cross	461 N=22	568 N=22	420 N=7	541 N=7
Mean	*475*	*584*	*430*	*559*
p-value	*0.0694*	*0.1345*	*0.4420*	*0.2150*

Table 6. Average daily weight gain of bred and yearling heifers						
Group	Class	Season	Holstein	Jersey-Hol. Cross	Mean	Pr > F
			Average daily gain (lb/day)			
Calf2002	Bred heifer	Winter '03-04	1.27	1.45	1.36	0.5343
Calf2003	Bred heifer	Winter '04-05	1.97	1.74	1.82	0.1304
Calf2003	Yearling heifer	Winter '03-04	1.39	1.35	1.37	0.7239
Calf2004	Yearling heifer	Winter '04-05	1.25	1.22	1.24	0.6450
Calf2003	Yearling heifer	Summer '04	1.51	1.51	1.51	0.9887
Calf2004	Yearling heifer	Summer '05	1.51	1.26	---	0.0033

In Table 6 the animal measurements are "standardized" by presenting their average daily weight gain. Industry standards are approximately 1.8 lb/day for pure Holstein heifers and 1.5 lbs/day for pure Jerseys (Crowley et al., 1991). As with total weights, breed was not significant in all but one case (summer '05). The winter weight gain of 2004-2005 for the yearling heifers was low (1.24 lb/day) and worthy of concern (Table 6). During that winter temperature fluctuated above and below freezing allowing for both rain and snow events. Intervals of freezing and thawing cycles created ice sheets and muddy paddocks. In the first week of January 2005, over 2" of rain fell which caused many problems and headaches for the cattle and paddock condition was

damaged. Winterkill of both grass and legume was prevalent. Animals had a hard time walking in the icy conditions, which likely negatively impacted feed and water intake.

Weight gains for the young heifers: 1st winter season vs. 2nd grazing Season

Due to confounding effect of fetus growth with the bred heifer growth, we only looked at differences between seasonal weight gain of the young stock. Since the difference between breeds was not significant (Table 6), they are averaged in the comparison of winter and summer weight gains (Table 7). To further increase the number of observations steers are included since, as a group, they did not gain weight at a different rate than the heifers (see Table 3). Based on the first two years of data, we find that the year of measurement is significant (the rough winter of 2004/5 markedly reduced the growth rates of the young animal), and season is significant with winter gains lower than summer gains. The interaction is one mainly of scale as the stock that suffered in the winter, markedly increased their weight gain in the summer, while the less affected animals from the year before kept more similar growth rates in both seasons. Overall, weight gains in the winter were modest (1.33 lb/day). Across breeds, weight gain during the grazing season averaged 1.51 lb/day but weight gain was below the target of 1.8 lb/day.

Table 7. Seasonal effect on weight gain (lb/d) on 2003 and 2004 young stock (including steers).

	Season		
	Winter1	Summer2	*Mean*
Group	----------lb/day----------		
Calf2003	1.42	1.53	*1.47*
Calf2004	1.24	1.49	*1.36*
Mean	*1.33*	*1.51*	

Group*season interaction $p<0.0207$. Both main effects significant at $p<0.01$

SUMMARY

In this study, the Holstein and Jersey Holstein crosses are gaining weight at the same rate, as are the heifers and steers. At this point, it appears un-necessary to break the young stock out into different groups for summer grazing and winterfeeding. It was found that summer weight gains were higher for young stock (including steers) (1.51 lb/d) than in the two winters already monitored (1.42 and 1.24 lb/d). The heifers in this study were only gaining weight at about 80% of the industry standard of 1.8 lbs/day. Although most research would suggest that these animals would be more difficult to inseminate and calve at a later date, DHIA records indicate that conception rate is above the industry standard of 1.6 and average age at calving is 23 months. From this partial analysis, it appears that the Krusenbaum outwintering strategy permits the young stock, although a bit small to move into the milk string in an orderly fashion. Furthermore, using this outwintering strategy reduces capital investment in housing. However, there is some risk associated with over wintering young stock out on pasture as can be seen from low weight gain of 1.24 lb/d during the winter of 2004-2005. We will continue to monitor the replacement stock performance, which will allow for adapting future management decisions.

CITATIONS

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