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PROFITABLE COW AND HEIFER PREGNANCY RATES

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"We have all heard the saying, 'Money isn't everything', and then we have also heard the reply, 'It is if you haven't got it'. I'm sure the same is true about beef cow fertility."

John J. Winninger, Winninger Ranch, Meeteetse, WY
Speaker at the 2nd Range Beef Cow Symposium
December 1971, Cheyenne, WY

INTRODUCTION

Wow! What a challenging topic. Why is it challenging? Because there is not one right answer; nor is the question easy to define or analyze. However, there are some underlying principles that I believe apply in most situations. I will spend most of my time on those principles with the hope that you as a cattle manager can use these principles to make good decisions.

Disclaimer: I am not an economist and I do not profess to understand all of the economic and financial interactions and how they interact with the biological realities contained in this topic. I do, however, feel that I have some limited understanding of the biological principles related to reproduction and pregnancy rates.

BACKGROUND

Perspectives from Forty Years Ago:

Range Beef Cow Symposium I (1969) and II (1971): Forty years ago, in 1969, the first Range Beef Cow Symposium (RBCS) was held in Chadron, NE. Two years later, in 1971, the second was held in Cheyenne, WY. In an attempt to help us understand where we are today concerning profitable cow and heifer pregnancy rates, I consulted the proceedings from these two symposiums. In 1969 there were two presentations related to the general topic of factors that impact pregnancy rates in beef cows (Minyard, 1969 and Wiltbank, 1969). In 1971 there were four presentations related to this topic (Glaus, 1971; Kearl, 1971; Kercher, 1971 and Winninger, 1971).

Journal of Animal Science: In addition to RBCS presentations, there are several publications by Dr. Jim Wiltbank (Wiltbank et al., 1961; 1962; 1964. Wiltbank, 1974. Bond and Wiltbank, 1970) during that era that outlined some of the fundamental relationships between nutrition and reproduction. Since nutrition is a primary driver of pregnancy rates, I took a look at these publications. The Wiltbank articles and the early RBCS presentations have provided a basis for many of the recommendations for the past four decades.

Using these resources as my guide, these are a few of the fundamental principles that seem to be consistent regarding the biology of pregnancy rates in cows and heifers.

TEN UNDERLYING PRINCIPLES OF REPRODUCTIVE PERFORMANCE FROM 40 YEARS AGO

Nutrition and Reproduction

1. Level of energy intake has more direct impact on estrous cycles and pregnancy rates than does protein level in the diet. However in order to have optimal digestion of forage diets, adequate protein intake is necessary.

2. Level of energy prior to calving primarily impacts the length of the anestrus period following calving. Precalving nutrition is reflected in the body condition of the cow or heifer at the time of calving.

3. Postcalving nutrition primarily impacts the fertility or conception rate of cows at the time of breeding. Body condition at the start of breeding is a reflection of postcalving nutrition.

4. Management practices that allow cows and heifers to be in a gaining condition before and after calving result in higher pregnancy rates than if there is no weight gain during these times.

5. Yearling replacement heifers must reach puberty (sexual maturity) before they can be bred. To insure that heifers reach puberty, they must be fed to reach a threshold or target weight by the start of the breeding season.

Genetics and Reproduction

6. In a Nebraska research herd in the mid 1960's calf crop weaned was shown to be 6.4% greater for crossbred cows than for straightbred cows. This was due to significantly higher pregnancy rates and first service conception rate in crossbreds (Cundiff et al., 1974).

7. In the same study involving cows in Nebraska in the 1960's, the cumulative effect of individual heterosis and maternal heterosis by increasing pregnancy rates, survival rates in calves and actual weaning weights combined to improve pounds of calf weaned per cow in the breeding herd by 23% (Cundiff et al., 1974).

8. A crossbreeding study in Virginia with British Breeds during the late 1950's and early 1060's reported a 10% advantage in calves weaned from crossbred matings. This indicated heterosis for fertility of the dam and livability of the calf (Gaines, et al., 1966).

9. Crossing British breeds with Brahman-type breeds in a Louisiana study in the early 1960's caused significant improvement in reproductive performance compared to parental straightbred performance (Turner et al., 1968).

10. Significant heterosis effects exist for age at puberty in British breed crossbred heifers that are independent of heterosis for average daily gain (Wiltbank et al., 1966).

THE GOLDILOCKS PRINCIPLE

We all remember the childhood story of Goldilocks and the Three Bears. In that fairytale, Goldilocks sample three bowls of porridge. One was too hot, one was too cold – but alas, one was "just right". She then sampled three beds, again one was too hard, one was too soft – but the last bed was "just right".

Breeds and Biological Type. During the past 40 years, the beef industry has also done a good deal of sampling. Much of this sampling has had to do with breeds and biological types of beef cattle. In the late 1960's and early 1970's the industry began to realize that the biological type of cattle then being used in the U.S were generally "too small", with "too little milk" and weaning calves that were "too lightweight". In an effort to change the biological type at that time there were numerous breeds imported into the U.S. from Europe. These breeds were crossed with the predominant English breeds prevalent in the U.S. at that time.

The imported breeds brought many desirable traits with them, including faster growth rates and in some cases, higher fertility. This was also the time when the advantages of crossbreeding were being widely accepted and practiced. As a result of crossing these new breeds into the existing cowherd and the resulting heterosis, we were producing calves with much heavier weights at weaning and which grew faster in the feedlot. However, we soon found our cows typically had "too much milk", were "too big", and required "too much" supplemental feed inputs. This process also took its toll on reproduction with "too many" open cows and "too many" calves that were "too big" at birth which resulted in "too many" calves lost at calving time.

Feed Inputs and Economical Responses. Similar learning has taken place over the past 40 years with regard to feed inputs. During the era of the first few Range Beef Cow Symposia, the nutritional requirements for reproduction were being better understood. As a result there was a strong tendency to recommend greater levels of feed in order to get heifers developed to conceive as yearlings and to shorten the postpartum anestrus period in cows. So, even though the reproductive performance improved, there was concern that the cost of doing so was "too high".

As we transitioned into the 1990's and 2000's the industry began to move toward more appropriate matching of cow biological type with the environment where the cows were producing. This was a result of increased costs of production resulting from many facets on the inputs side of businesses. There was a clear recognition that production costs must be controlled in order to survive. This led to blending of breeds, emphasis on optimums compared to maximums and development of cows and production systems that were closer to being "just right". I call this the "Goldilocks Principle."

INDUSTRY CHALLENGES

The economic environment that the beef industry operates in has necessitated more emphasis on cost control over the 40 year period in which the RBCS has been held. Figures 1 and 2 show how annual cow costs have increased during the 2000s and the corresponding changes in calf prices. A rough comparison of cow cost divided by calf prices in 1997, for instance, shows a ratio of 295/80=3.7; while in 2009 this ratio is 405/98=4.1. While this

quick and dirty approach may not stand up to intense scrutiny by an economist, it does illustrate the increased pressure to control costs relative to income.

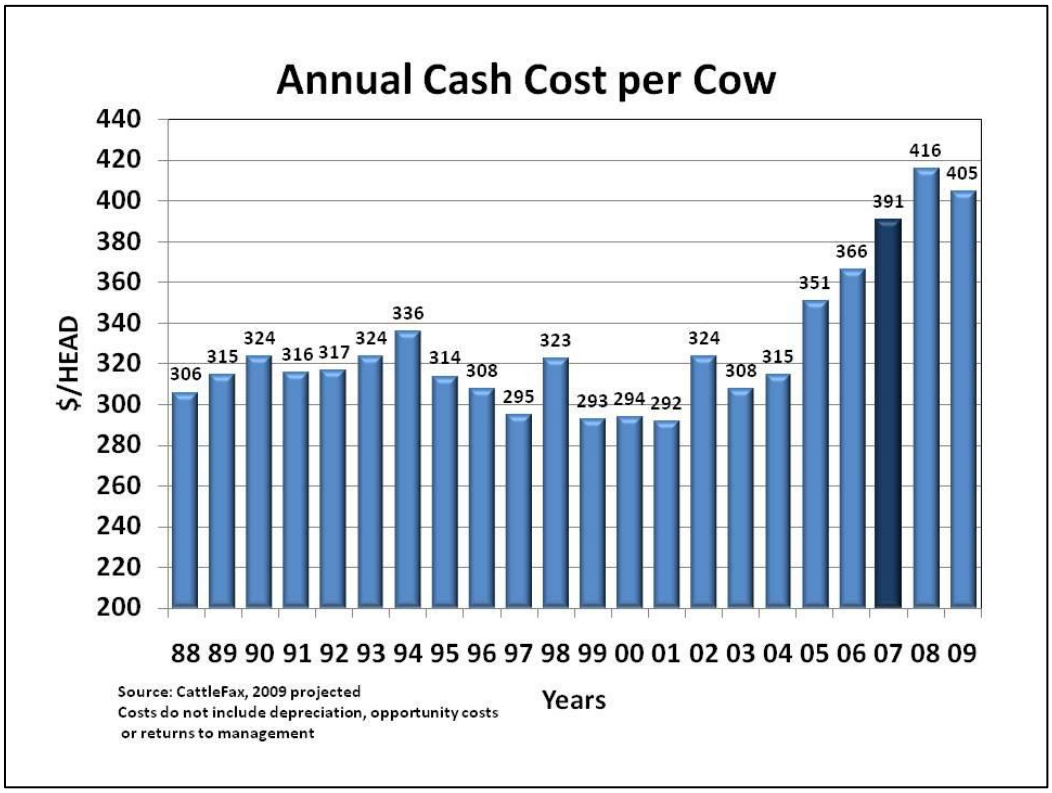

Figure 1. Annual cash costs per cow from 1988 through 2009. This illustrates the marked increase in costs during the 2000s. Data courtesy of CattleFAX.

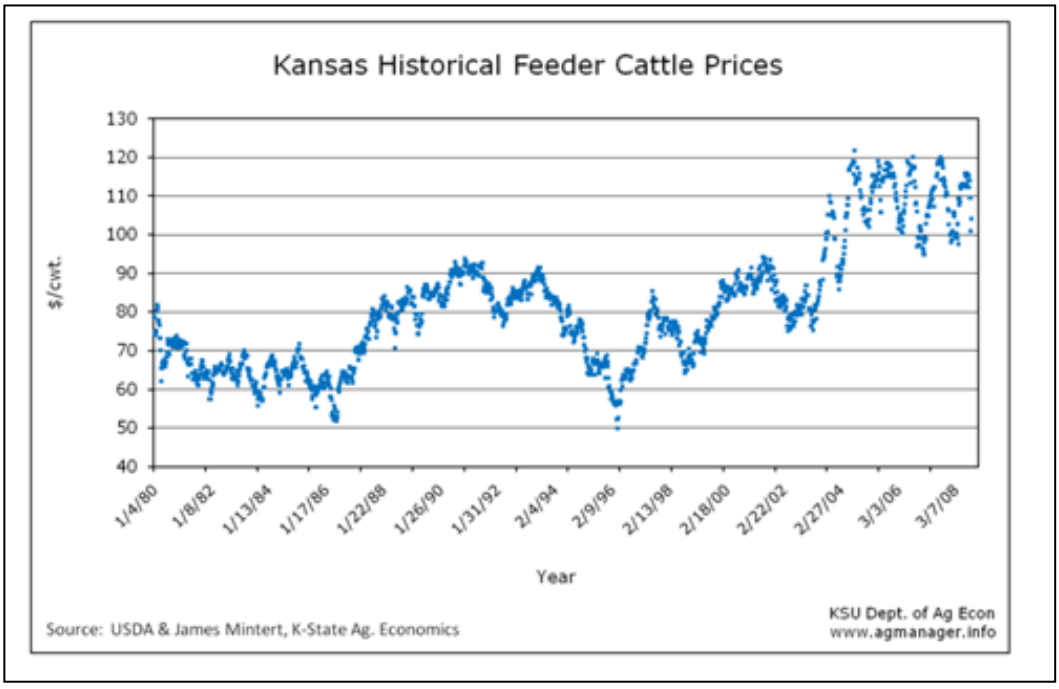

Figure 2. Variation in feeder calf prices over time and long-term trends in calf prices. Data courtesy KSU Department of Agricultural Economics.

So where does this lead us in relation to the topic of this paper? Understanding the interactions of cow herd nutrition with reproductive performance is key to making wise decisions about heifer development and cow nutrition programs. Historically, general recommendations have been based on the idea that "more is better". However with costs of production rising and prices of calves declining, it is necessary to rethink traditional supplementation approaches. Several researchers are exerting selection pressure for cows and heifers to be developed on lower levels of energy intake and are discovering that there is an apparent "fetal programming" result. In other words, heifer calves that are in utero during periods of lowered energy intake by the dam are requiring lower levels of energy themselves when they become reproductive cows. This is an intriguing area of discovery that will require further study, but may hold important potential for the future.

Here are two examples of studies that have shown little or no reduction in reproduction when decreased levels of feed inputs have been used. Funston and Deutscher (2004) developed heifers on either a traditional 60% of anticipated mature weight target, compared to heifers developed to a 55% target weight. Although they did not exactly hit either target, their results of 53% vs 58% of mature weight showed no reduction in reproduction while decreasing development costs.

> "A 3-yr study was conducted with spring-born heifers (n = 240) to determine the effects of developing heifers to either 55 or 60% of mature BW at breeding on reproduction and calf production responses….. Developing spring-born heifers to 53% of mature [body weight] BW did not adversely affect reproduction or calf production traits compared with developing heifers to 58% of mature BW, and it decreased development costs." Funston and Deutscher, 2004.

In a somewhat similar approach, Roberts et al. (2009) evaluated reproductive performance evaluated in composite heifers born over a 3-yr period that were randomly assigned to one of two development schedules for a 140-d period, beginning about 2 mo after weaning at 6 mo of age and ending at about 12.5 mo of age. Heifers in the control treatment were fed to appetite (n = 205) while heifers on a restricted development scheme were fed at 80 % of the intake amount consumed by the control heifers (n = 192). Below is a brief summary of the results of this study:

> "Pregnancy rate from AI tended to be less (P = 0.08) in restricted (48 ± 4 %) than control heifers (57 ± 3 %). Proportion pubertal at breeding and pregnant from AI were positively associated (P < 0.1) with heifer age and ADG from birth to start of study. Final pregnancy rates were 87 and 91 % for restricted and control heifers, respectively (P = 0.27). Day of breeding season that conception occurred was negatively associated with ADG from birth to weaning (P = 0.005), but was not associated with ADG within treatment (P = 0.60). Economic analysis revealed a $33 reduction in cost to produce a pregnant heifer under the restricted protocol when accounting for pregnancy rates and differences in BW and market prices between selection at weaning and marketing as open heifers at l.5 yr age. A potential economic advantage exists for rearing replacement heifers on a restricted level of feeding during the postweaning period." Roberts et al., 2009.

CONCLUSIONS

In conclusion, let me summarize. Forty years ago, at the time the Range Beef Cow Symposium started, scientists and producers were beginning to understand the linkages between nutrition and reproduction. Feeding recommendations at that time were generally based on a "safe margin" in order to avoid drastic reductions in pregnancy rates. This was also a time when feed and other inputs to cow production enterprises were low. At about that time (late 1960's) we began to import new and different genetics into our cow base. These breeds brought more growth, more milk and a large heterotic effect when crossed with the traditional English-based breeds in the US. While we did see improvements in reproduction due to heterosis, there were also problems in not being able to meet the nutritional demands of the higher milking, faster growth cattle that resulted from these genetic changes.

Cattle producers then began to blend breeds and select within breed populations for more efficient biological types that better fit the production environments in the US. At the same time, costs such as labor, fuel, feeds, and pasture began to increase and annual cash cow costs began to rise dramatically. These changes have forced producers to be more judicious with feed inputs as well as look for additional methods to maintain reproduction, but at a lower cost.

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