OWYHEE COUNTY

CATTLEMEN'S CORNER BEEF NEWSLETTER

MARCH, 2012

University of Idaho Extension

Nutrition and Fetal Programming

Jim Church, UI Extension Educator, Idaho County

Research and the Developing Fetus

For years cattle industry experts have been talking about the importance of meeting the protein and energy requirements of beef cows especially during the third trimester of pregnancy. This was due to the fact that 75% of the fetal growth occurs during this time period.

So how important is nutrition during the first two trimesters? It is very important that protein and energy needs of the cows be meet at this time because of the affect is has on the developing fetus. New research has shown that the fetus is sensitive to the nutrient level of the cow early in the gestation period. A cow that is being fed a nutrient restricted diet can have a fetus that is undernourished which may result in future health and growth problems for the calf. In other words, the fetus is programmed for performance in later life.

Fetal Programming Defined

Dr. David Barker from Southampton University in England was the first scientist to use this term. He says that fetal programming is defined as "the concept that a maternal stimulus or insult at a critical period in fetal development has long term impacts on the offspring".

Dr. Barker was studying human health and the affect that nutrition during the first half of pregnancy has on the future health of babies during their lives. His findings showed that mothers who were malnourished during the first half of their pregnancy had children that had an increased incidence of health problems as adults which included diabetes, obesity and cardiovascular disease.

Animal Scientists in this country have learned this concept of nutrition during gestation and fetal programming applies to cattle as well.

According to Kim Vonnahme, Animal Scientist from North Dakota State University, the key to fetal programming is the development of the placenta and the vascular system that supplies blood flow to the fetus.

The critical time period for attachment of the placenta to the uterine wall and the subsequent vascular system for the fetus begins at 90 days after conception. By the 120th day, blood flow to the fetus has increased greatly. During this critical span of days, (90 to 120 days) if the cow is malnourished, the development of the vascular system between the uterus and the fetus affects the ability of the fetus to get nutrients and oxygen from the mother, thus negatively impacting the growth and development of the fetus.

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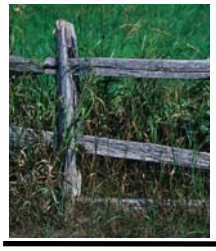

Nutrition and Fetal Programming *. . . continued from page 1*

Of course prior to Day 90 the fetus is developing vital organs along with the development of the placenta so cow nutrition is important at this time as well.

What Happens to Future Calf Performance?

Nutrition Affects—First Trimester:

Research studies have shown that calves born to cows that are fed a diet lacking in protein during the early stages of pregnancy, may be more susceptible to respiratory disease later in life. This is caused by poor lung development in late gestation.

If we look at statistics of the incidence of bovine respiratory disease in feedlot cattle, 15% to 45% of cattle have been affected by BRD and 1% to 5% of cattle placed in feedlots die from BRD. Anything we can do to reduce BRD and respiratory problems will be huge for the industry in the form of additional profits. Maybe fetal programming through proper nutrition can help.

Nutrition Affects—Second Trimester:

A study was conducted to determine the affects of mid-gestation cow nutrition on subsequent calf performance by the University of Wyoming and the USDA Fort Keogh Livestock and Range Laboratory in Montana.

Nutrition Affects—Third Trimester:

The University of Nebraska has also conducted studies specifically on the impact of protein nutrition during late gestation on calf performance. A group of cows grazing dry forage in late fall in the Sandhills area of Nebraska were given protein supplements and compared to cows receiving no supplements.

The results showed that calves from cows that were supplemented with protein were healthier, had improved calf performance meaning they were heavier at weaning and had heavier feedlot end weights, and had improved carcass quality (higher marbling scores) compared to calves out of cows that were not supplemented with protein late in the fall.

How About My Replacement Females?

The Nebraska study also looked at the affect of protein nutrition during late gestation on the fertility of heifer calves born to those cows. Heifer calves from cows that received protein supplements had higher pregnancy rates than heifers from non supplemented cows. Heifers from supplemented cows had a pregnancy rate of 93% compared to 80% for heifers out of non-supplemented cows.

In addition, heifers from supplemented cows calved earlier in the calving season, 77% in the first 21 days, compared to heifers from non supplemented cows, 49% calved in the first 21 days.

So yes, according to the Nebraska study, providing adequate protein nutrition to cows during the late gestation period appears to have a fetal programming affect on the reproductive performance of their daughters.

What Have We Learned?

Current research has shown that fetal programming is real and it impacts the future health of calves. It also influences growth rate, reproductive efficiency in heifers, pregnancy rates and initial calving date. In addition, fetal programming impacts carcass quality in the form of muscling and the amount of marbling.

Cattle producers and cattle industry experts have known for years that it is extremely important to meet the nutrient requirements of cows during the last trimester of pregnancy. With this new research we are finding out that it is vitally important to meet the protein and energy requirements of cows throughout the entire gestation period.

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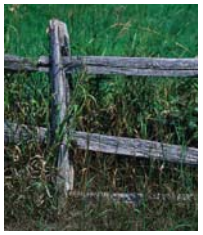

Nutrition and Fetal Programming *. . . continued from page 1*

If we understand how fetal programming works and how it improves the health and productivity of the calves produced, it makes sense to make sure we are meeting the nutrient requirements of our cattle during pregnancy.

This doesn't mean we have to break the bank buying the most expensive protein supplements available and by not grazing dry forages in the fall. We can analyze the forages and supplements that you have available and balance a ration that meets the requirements of your cows at the least cost.

We also know that there is a need to conduct more research on this topic. There is definitely more to learn. For more information on this topic feel free to contact me, 320 West Main, Grangeville, Idaho 83530, jchurch@uidaho.edu, 208-983-2667.

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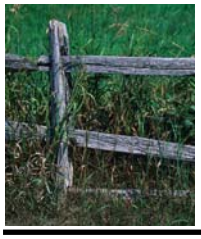
Total Mixed Rations *. . . continued from page 4*

standing forage. Wind and mud may become issues when trying to efficiently deliver TMR's to cows under these conditions. With the availability of modern machinery, a chopped or partially mixed ration may be worth considering. Several commercial PTO driven and portable hay grinders, choppers and feeders which partially breakdown the feedstuffs by slicing, dicing or grinding and delivering the feed either as a single or combination of ingredients are now available. Much of this new equipment does not feed a TMR but rather a chopped and blended buffet of various feed qualities. Anything that can be done to partially breakdown the feedstuff and make it more palatable and efficient for the rumen to digest is the main objective.

Feeding a chopped or blended ration is certainly not for every operation. Cost and economy of size will limit the use of commercial equipment to the larger enterprises who have the required cow numbers to absorb and spread out that initial investment. Savings in feed costs and efficiency may very well outweigh equipment cost for the larger operator.

The bovine was given a unique digestive system enabling her to eat and digest many different feedstuffs of both high and low qualities. Standing forage is generally the cheapest form of feeding cows, however, isn't always available in quality and quantity to meet her total nutritional requirements. Figuring out the proper ration and delivering it in a palatable manner that entices cattle to consume the lower quality feeds is the challenge.



Total Mixed Rations

Ron Torell, Long-Standing Educator and Advocate of Agriculture

When I was a child my mother served beef stew as an inexpensive means to feed her family of eight while forcing me and my siblings to unknowingly eat our vegetables. By combining beef, onions, potatoes, carrots, peas, corn and an occasional turnip in to one pot, that stew was essentially a total mixed ration (TMR). Total cost was less than a quarter per head per day. Relative to a cow-calf operation, let's discuss how a TMR might work for you.

Recent cost increases for processed feeds has not lowered the nutritional requirement of the beef cow. Her requirements remain the same and must still be met. Managers can reduce the dependency on processed feeds by matching the cow's nutritional needs to her environment through genetic improvement and by calving in harmony with mother nature. For those operations that rely on processed winter feed, chopping and blending ingredients into a mixed or total mixed ration may be an option to consider. Cows can do very little sorting for preferential ingredients when all feedstuffs are chopped in to small and similar particle sizes then blended together and served up with a molasses gravy. This reduces and/or eliminates waste of the lower quality ingredients in the ration.

We have all experienced the frustration of cows resisting and wasting lower quality long hay in wait for more palatable, better quality feedstuffs to arrive. Case in point is the common practice of feeding unprocessed quality alfalfa hay in combination with straw or lower quality grass hay. On paper a mixed ration of each may meet all of the cow's nutritional needs. With this, however, feed ability becomes an issue. The bully or boss cows clean up the alfalfa leaving the straw or grass hay to the thinner less aggressive cows.

Feeding beef cows a chopped or mixed ration generally does not fit many cow-calf operations yet is widely utilized by the feedlot and dairy industry. The real benefit of TMR's is the ability to cheapen up the ration by utilizing a mix of both high and lower quality and valued feeds. It is easy to balance the ration by weighing and blending all feedstuffs into a complete stew. With the use of grinders, mixers, scales and feed wagons, each bite contains small particle sizes of the required level of nutrients such as energy, protein, minerals and vitamins. Additionally, cattle are fed in a bunk which aids in minimizing waste and makes it easier for managers to monitor and adjust consumption and nutrient levels.

Anything that can be done to partially break down the feedstuff and make it more palatable and efficient for the rumen to digest is the main objective.

The key to success with TMR's is forage analysis of feedstuffs and grouping animals according to their individual nutrient demands. Once this information is known, a least cost ration specific to that group of cattle can be formulated feeding exact amounts of required nutrients for a specific production level. TMR's are often dependent on access to by-product feeds. Geographically some areas of the United States have access to more by-product feeds than others lending themselves to the more economically viable use of TMR's. Many Midwest and Southern states have access to corn stalks, milo stubble, wet distiller's grain, onions, and carrots, while other areas have potatoes, turnips, wheat straw, tomato peels, and cannery waste. It's important to point out that there is the potential for toxins in some by-product feeds that could be fatal when consumed at high levels. On the other hand, when these same by-products are fed in a TMR at low levels they may not pose such a risk. Feed analysis reveals forage quality while additional tests show if any toxins are present and at what level. Managers must also take in to account that storage and transportation of high moisture by-products may not be economically viable for their operation.

Beef cows are often winter fed on the ground in large fields of by-product or aftermath

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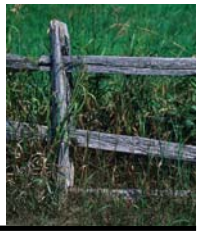
Ranch-Level Economic Impacts of Juniper Encroachment (Juniperus occidentalis) in Owyhee County

Ashley McClain, Neil Rimbey



Introduction

Western Juniper (*Juniperus occidentalis*) is a native species in Oregon, California, Idaho and Nevada. Juniper trees have become a serious threat to the natural sagebrush steppe ecosystem that exists on western rangelands. The western juniper has been encroaching into sagebrush steppe ecosystems since the European settlement of the range, approximately 130 years ago (Miller and Tausch 2001). The encroachment imposes many stresses on an already compromised ecosystem.

Currently juniper species occupy over 74 million acres in the United States, a tenfold increase from the 7 million acres that have been historically inhabited (West 1999). As juniper cover increases to between 1/3 to 1/2 of its maximum cover potential, the understory species (sagebrush, grasses and forbs) rapidly decrease and can be reduced by 80 percent of their original cover (Bates et al. 2005, Miller et al. 2000). Increasing juniper cover also reduces the amount of vegetation available for forage.

The impact of western juniper encroachment to ranchers and ranching profits is economically important since ranching occurs on approximately 80% of the 270 million acres of public land in the western United States (Bhattacharyya et al. 1996). Bates et.al. (2005) found that removing juniper from range plots increased the livestock carrying capacity by nearly ten-fold (the number of acres needed to support an animal unit month (AUM) of livestock grazing went from 47 to 5 acres/AUM).

This project uses the change in available AUMs to determine the change in costs, returns and cow numbers as juniper encroachment advances from phase 1 to phase 3 on a representative ranch in southwestern Idaho.

Methods

The economic situation, available resources and production rates were defined for a representative 300 head cow/calf ranch in the Jordan Valley area of Owyhee County, Idaho, as shown in Table 1. A dynamic multi-period linear programming (LP) model was used to determine optimal production levels and economic returns over a 40-year planning horizon. The LP model maximized net present value of the net annual ranch returns, subject to the various resource and production constraints. Real (constant 2005) livestock prices were used and ran with 100 different price iterations per year.

Table 1. Characteristics and resources of the representative ranch.

Description	Units	Value	Description	Units	Value
Land Resources Owned			**Miscellaneous Income/Expenses**		
Alfalfa Hayland	Acres		Fixed Ranch Expenses	$	24,430
Native Meadow Hayland	Acres	325	Family living Allowance	$	24,000
Convert Meadowland to Pasture	Acres	325	Off-Ranch Annual Income	$	30,000
Deeded Rangeland	AUMs	240	Required Minimum Cash Reserves	$	500
Land Resources Leased or Purchased			**Efficiency Measures**		
State Trust Land	AUMs	144	Calf Crop	%	88
BLM	AUMs	2,098	Calf Death Loss	%	4
Private Leased Land	AUMs	500	Cow Death Loss	%	2
Purchased Alfalfa	Tons	Unlimited	Bull Death Loss	%	1
Purchased Meadow Hay	Tons	Unlimited	Steer Calf Sale Weight	Lbs	440
Livestock Resources			Heifer Calf Sale Weight	Lbs	390
Animal Units Yearlong	AUY	333	Heifer Yearling Sale Weight	Lbs	800
Brood Cows	Head	286	Cull Cow Sale Weight	Lbs	950
Replacement Heifers	Head	65	Cull Bull Sale Weight	Lbs	1,800
Bulls	Head	19			
Horses	Head	6			

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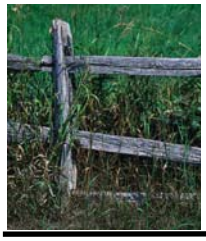


Ranch-Level Economic Impacts of Juniper Encroachment in Owyhee County *. . . continued from page 5*

Forage availability was calculated using herbage availability data by western juniper encroachment phase from Bourne and Bunting, 2011, and Stebleton and Bunting, 2011. Total herbage production was converted to available AUMs per acre and incorporated into the model as AUMs available on the Bureau of Land Management (BLM) grazing allotment.

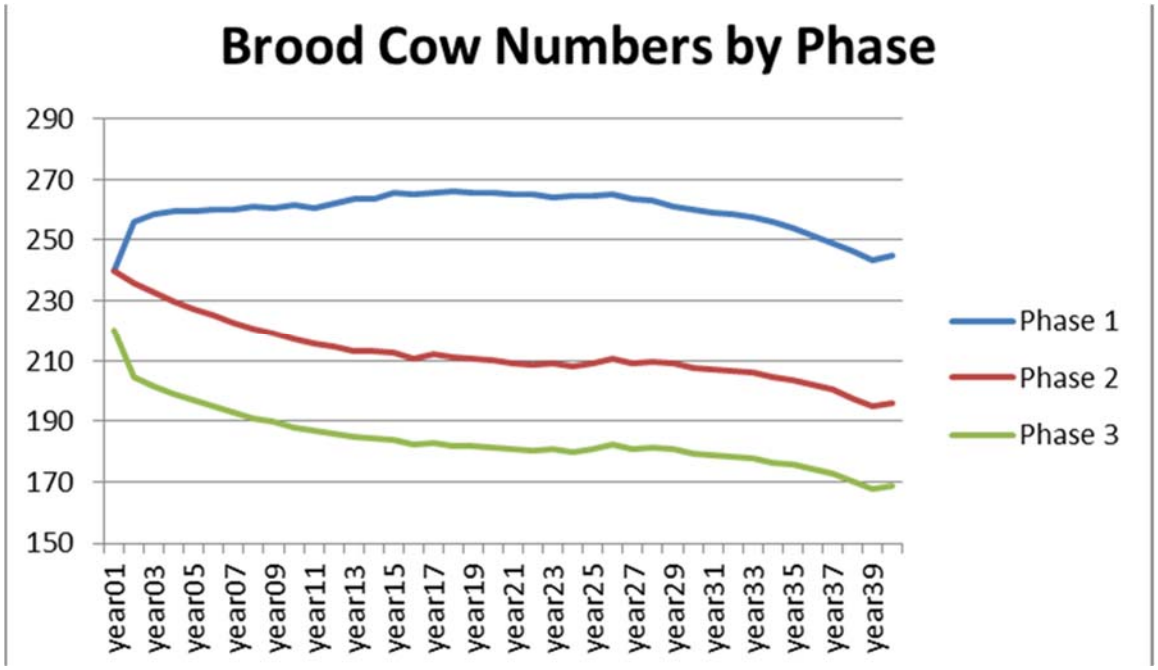
Results

As juniper encroachment advances from phase 1 to phase 3 cow numbers and profits decrease, while forage costs per head increase. Brood cow numbers by phase are shown in Figure 1. Phase 1 was used as the baseline scenario. 2,098 AUMs were available on the BLM allotment during phase1. This allowed the model ranch to maintain an average of 260 head of brood cows. The AUMs available were not limiting on herd size in this model. Forage costs per cow calculated at these production rates averaged $122. Profits averaged $43,381 per year in the phase 1 model.

Forage production calculations for phase 2 showed a decrease in available AUMs from 2,098 to 1,322 (37% reduction). This loss of spring-fall forage became the limiting constraint on the herd size. The herd decreased to an average of 213 head, an 18% reduction. Forage costs increased to $127 per head, a 3.9% increase. The decline in herd size and increased feed costs resulted profits declining by 5.6% to an average of $37,421 per year.

Phase 3 encroachment caused further reductions in herbage availability to 835 AUMs (60% reduction) on the BLM allotment. This resulted in further reductions in herd size to an average of 184 head, a 29% reduction from the base model. This also caused a 10.3% increase in forage costs per head when compared to phase 1 encroachment, to an average of $136. Profits also declinedby 27% to an average annual revenue of $31,656.

Figure 1: Differences in brood cow number by phase of western juniper encroachment



Conclusion

The results of this analysis shows that as western juniper encroachment increases from phase 1 to phase 3, profitability and sustainability of the ranch unit declines, due primarily to the loss of

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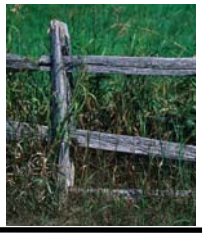

spring-fall forage. The costs associated with running the ranch also increased, due to the lack of alternative forage sources during the spring-fall period. The net present value of the model ranch income over the 40 year planning horizon was estimated at $588,858, $517,408, and $444,946, for phases 1-3, respectively. The increase in western juniper encroachment from phase 1 to phase 3 reduced net present value of the ranch by 24.4%. As juniper encroachment increases, available forage decreases and becomes the constraining variable, restricting the number of cattle that can be sustained by the ranch. Overall the model indicates that juniper encroachment decreases the profitability of the ranch and increases the costs.

As juniper encroachment increases, available forage decreases and becomes the constraining variable, restricting the number of cattle that can be sustained by the ranch.

The next step in this study will incorporate cost data for cutting, burning and mechanical removal methods and estimate the ranch-level profitability of maintaining early phases of juniper encroachment.

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-Will Rogers