Bar 50 Ranch

Donald & Marie Heffenreffer, Winchestersonfieldville IA

Consulting visit Feb 29-30, 2015

1) Estimated carrying capacity & Stock policy
2) Recommendations on infrastructure development
3) Cost:Benefit Analysis

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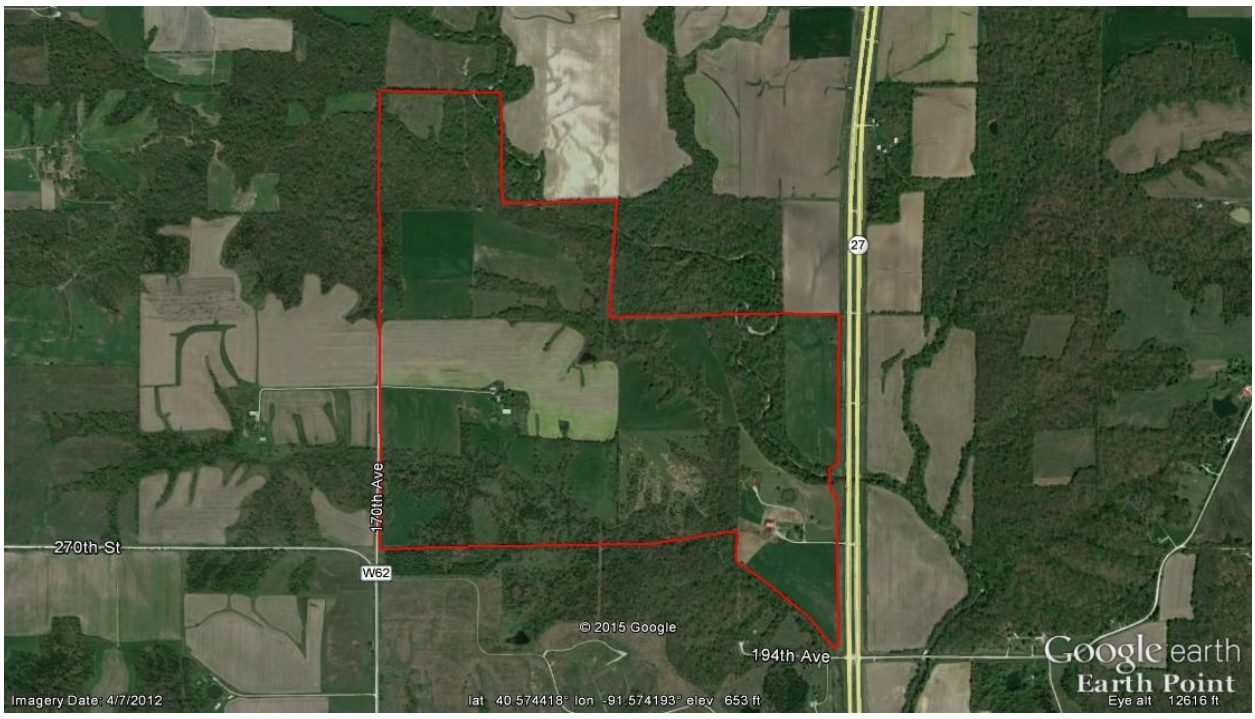

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Goals, Opportunities, & Challenges

I was presented with a broad list of both strategic and tactical goals for Bar 50 Ranch, but the overarching theme was the Heffenreffer family wants to be in the pasture-based livestock business and not just farming. The need for a higher quality of life than what you are currently enjoying came through loud and clear. Donald spends too much time on his day job. Marie is left doing most of the chores including the once-a-week trip to the family farm at Crestfield. With a few other outlying rental properties thrown in, the current operation is strung out and not very labor efficient.

The most interesting strategic objective was 'Operating profit per owned acre of....'' with no dollar value plugged in at the end of the sentence. This, in and of itself, indicates a lack of clarity of purpose. To complete the sentence, you should take what you consider an acceptable salary in your current day-job existence, add 20%, and divide the sum by the number of deeded acres. I think that was the target you were looking for in that statement.

The other strategic goals you listed including improve soil health, forage production, and livestock genetic base all can be viewed as increasing productivity per acre. More productivity per acre means more net revenue per acre only if the increased productivity is gained through management, not just purchased inputs. This is one of the great opportunities of ranching compared to farming. It is difficult to improve farm production without increased inputs, but improved productivity through management is the foundation of successful ranching. It is, of course, also the challenge.

Hopefully you have already upgraded your accounting system as we discussed when I visited last summer. Without solid accounting, it is near impossible to track your financial progress or identify the expense areas that need to be tackled. If you have not yet implemented electronic accounting with QuickBooks or similar program, I strongly encourage you to do so before the 2017 tax deadline.

Since you have already begun your grass-fed meat business, I do not need to outline the opportunities for producing value-added products from the ranch to increase gross income per grazed acre. I do want to remind you of the critical importance of cost management on the transportation, processing, and marketing side of the direct market meat business. Your accounting package does need to be able to sort your production enterprise into cow-calf, growing, and finishing segments to help identify the strong points and weak links in your production stream. The meat business should be a separate enterprise purchasing live cattle from the ranch. Many direct market beef businesses are not profitable in every segment. Your goal for long term sustainability is to be profitable in each segment.

The tactical objectives listed include consolidating the grazing operation, reducing stored feed to no more than 30 days, reduce pinkeye to less than 5%, total death loss to less than 1%, improve perimeter fence, and use only no-till seeding methods. The one where I see the greatest challenge is keeping total death loss to under 1%. Even with the best grazing management practices, herd genetics, and attention to heard health practices, I see very few operations with such a low death loss. This is a worthy goal, but I would accept anything less than 2%.

The remainder of this report will deal with how to get from where you are today to the operation you have outlined with your goal statement.

Estimated carrying capacity of the ranch

I always like to lead off by estimating an appropriate carrying capacity for a farm or ranch because almost everything else we end up discussing comes back to how many critters will be on the pastures. Generally I like working with the USDA Web Soil Survey to come up with these estimates, but we found the Iowa site was largely devoid of any useful productivity data. We will approach the question from two other avenues.

To a large extent forage production and livestock carrying capacity are determined by the amount of precipitation received and the effectiveness of the water cycle on your segment of the landscape. How effectively we manage the pasture to capture solar energy and then harvest it with livestock is the second component of carrying capacity. Based on the historic weather record for your neighborhood we can make an estimate of what the potential range productivity might be based simply on precipitation. One important thing to remember when looking at precipitation records is average precip is not normal precip.

In most continental climates, normal precip is seven years with below average precip and three years above average. It does not take very many high rainfall years to skew the average upwards. Median rainfall is a more important concept than is average rainfall. Median precipitation is generally 10-15% lower than the average, so we could consider the median precip to be about 32"-34" annually

Table 1. Historic weather records for Winchestersonfieldville IA

	Mean		Record				Mean
Month	Low	High	Low	Year	High	Year	Precip
	(°F)						(in.)
Jan	16	32	-23	1982	67	1957	1.32
Feb	22	37	-21	1975	71	1976	1.57
Mar	33	49	-11	1962	81	1967	3.03
Apr	44	62	11	1982	89	1987	3.65
May	55	73	22	1966	93	1953	4.92
Jun	65	82	41	1956	104	1988	4.26
Jul	70	86	47	1974	104	1966	4.44
Aug	68	84	42	1977	104	1983	3.56
Sep	59	77	31	1984	100	2000	3.81
Oct	46	65	15	1972	92	1953	2.77
Nov	34	49	-5	1964	81	1968	2.96
Dec	22	36	-19	1989	70	1970	2.25
Means	44.5	61.0	10.8	1974	88.0	1972	38.54

A second consideration is that not all winter snow turns into usable moisture for the growing season. Finally, heavy rainfall events can generate runoff beyond the soils infiltration capacity and small summer rainfall events can vanish rapidly due to high evaporation rate on bare soils. The result of all these parameters gives us what we call effective precipitation.

While we cannot change how much or how little rain falls from the sky, we can alter what happens to it once it reaches the ground level. Our every day grazing management decisions have profound bearing on the water cycle. Post-grazing residual is the key factor in determining our efficiency of solar energy capture and how much litter we can leave on the ground which are the key determinants of both infiltration and runoff potential.

Of that 32"-34" median precipitation, we may get as much as 90+% into the soil or less than half. That is for us to determine.

Based on a standard table for expected pasture yield per inch of water received, Table 2 shows the expected forage yield and livestock carrying capacity both as standard animal units and a 1200-lb cow as an example. I have optimistically used 30" as the effective annual precipitation. I expect you to do a good job of grazing management to develop a healthy water cycle. I remember you saying good enough is not acceptable. You have received the Excel file for this calculator so you can look at the impact of allowing a less healthy water cycle and getting only 20" or 25" of water into the soil.

Table 2. Estimated potential pasture production and carrying capacity at Bar 20 Ranch based on annual effective precipitation.

			Precipitation range (inches/year)	Expected growth (lb/inch-H_2O)
Water received per acre	30.0	*inches*		
Expected DMY per inch precip	325	*(lbs/acre)/inch*	< 10"	50 - 100
Projected dry matter yield	9750	*lb/acre*	10 - 15	100 - 150
Seasonal Utilization target	75.0%	*%*	15 - 20	150 - 200
Grazed forage per acre	7313	*lb/acre*	20 - 25	200 - 250
Daily AU forage requirement	26	*lb/AU*	25 - 30	250 - 325
AUD/A	281	*AUD/acre*	30 - 35	325 - 375
Target length of grazing season	320	*days*	35 - 40	375 - 400
requirement for specified season	8320	*lb/AU for grazing season*		
Required pasture / AU	1.14	*acres/AU for grazing season*		
Property size	400	*acres*		
AU Carrying Capacity	352	*AU annually*		
Total SAUD of this property	128320	*Total AUD*		
Your average livestock wt	1200	*lb/hd*		
Your AU equivalency	1.20	*Your wt / standard AU*		
Carrying capacity as your stock	293	Stock units annually		

Another way to arrive at a pasture yield expectation is to make a conversion from known crop yields to expected pasture potential. What I have found based on both experience through the Midwest and from doing calculations based on corresponding Soil Survey corn yields and pasture yields for specific soils, you can generally figure for every 30 bushels of corn a field will grow, it should produce 1 ton of dry matter forage. You reported average long term corn yield in your area to be 160 bushels so that would suggest a pasture growth potential of 5.33 T/A or 10,667 lbs/acre. Well managed pasture should yield in the same neighborhood as alfalfa hay grown on the same site. Both of these estimates would suggest the 9,750 lbs/acre yield used in Table 2 is on the somewhat conservative side. Thus, I am comfortable with the estimate as being realistic for a normal precipitation year.

Based on 1200-lb cows and 450 deeded acres available for grazing with an expected grazing season on the permanent pastures of 320 days, the ranch has the capacity to carry about 350 standard animal units (1000 lb animal) or about 290 cow-equivalents. This estimate does not include any contribution from either the current rental properties or Marie's family farm at Crestfield. If you are truly interested in consolidating your grazing operations, dropping the scattered rental properties is a first step.

If you choose not to seed current cropland to pasture, we can set up another worksheet to combine the expected crop residue and cover crop opportunities along with the pasture carrying capacity

potential. An example of cropland grazing potential is shown on the following page in Table 3. Once again, in the live version of the spreadsheet you have, you can adjust the number of acres used as residue vs. cover-crop and the expected yields. What I have included here is just an illustration of this tool.

The numbers used in Table 3 are all reasonable for your environment. Strip-grazed corn stalks will generally provide at least two months of grazing for a dry beef cow which would be more than the 60 AUD/acre used in the estimate. Whether it is a summer cover crop or a winter cover crop, in your productive Iowa environment, a three-ton per acre yield is reasonable. The key consideration here is how much residue do you want to leave behind for soil-building purposes? Another positive factor for your highly productive environment is you can utilize a relatively high percentage of the annual forage production and still leave a good amount of residue behind. I just recently completed a report for an outfit very similar to yours in terms of crop and livestock mix, but they were located in eastern Colorado. Using a target level of 1000 lbs residue/acre being left behind, they were only able to harvest 500 to 800 lbs/acre in contrast to your 4500 in this example.

Table 3. Estimated carrying capacity from grazing cropland acres on Bar 50 Ranch

Bar 50 Ranch - cropland acres		
Total cropland acres	50	*acres*
% with grazed crop residue	33%	
number of acres with crop residue	17	*acres*
expected AUD/A from crop residue	60	*AUD/acre*
AUD from crop residue	990	*AUD*
% with grazed cover crop	67%	
number of acre cover crops	34	*acres*
Expected yield/acre	6000	*lbs/acre*
Target residue level	1500	*lbs/acre*
Harvested dry matter yield / acre	4500	*lbs/acre*
Projected cover crop utilization rate	75%	
Harvested animal unit days / acre	173	*AUD/acre*
AUD from cover-crop	8654	*AUD*
Total AUD from cropland grazing	9644	*AUD*
Projected grazing season	45	*days*
Potential carrying capacity	214	*AU*
Acres required per AU	1.24	*acres/AU*
Animal weight for your stock	1200	*lbs/head*
Animal unit equivalent	1.2	*weight/1000 lb*
Number of animals of this class	179	head

Whether you choose to continue to have some of the land custom farmed or put it into either permanent or annual pastures really comes down to a couple of issues. First, if one of your strategic goals is to improve soil quality and health. Ask yourself which land use will move you towards your soil health goal more quickly. Second is the simple financial question of which use generates more net income to the ranch. If you have implemented a solid enterprise-based accounting system, you should be able to answer that question. Without the accounting, you really don't know the answer.

This exercise has given us a general idea of what just the deeded land should potentially carry. If you think you can make you desired level of living with this number of animals, then the rental properties become superfluous. If you need more income than this cattle herd can give you, it is time to look at the role of the rental properties in generating net income or changing the enterprise mix on the deeded land or stacking additional enterprises on the same space currently being used by the cattle enterprise.

These are all possible options and bring us to the topic of stock policy.

Stock policy for the next few years

Stock policy refers to the type and numbers of livestock you will have present on the farm throughout the year. Some outfits strive to be just in the cow calf business while others may run stockers and still others might be in a conception-to-harvest meat production business. Each of these options, and the many others possible in the grazing business, have their own sets of opportunities and challenges.

The ongoing challenges of the cow business are the very large investment typically required to put together a functional set of cows and slow asset turnover. With today's record high for cows, it is more challenging than ever to rapidly purchase or build a herd. Even when buying bred cows, it is usually 6-9 months before you realize any income from the cow herd. It may be up to two years of waiting for a paycheck if you go into the birth-to-harvest meat business.

Buying a set of stockers for summer grazing is just as financially daunting and is especially dangerous if you use the 'buy them in the spring and sell them in the fall' approach. That is generally the path to falling into a classic buy high-sell low scenario. Yes, you can use forward contracting and hedging to reduce the risk, but with market volatility, the risk is always there with spring stockers.

The current set of cows you are running are somewhat above the optimum weight range for efficient conversion of forage to salable weaned calves. While the idea of a cow weaning a calf at 7 months weighing 50% of the dam's weight is widely touted, it rarely happens in real world ranching. You indicated your average cow weight was around 1225 lbs. If the average weaning weight was around 550 lbs at 7 months of age, that would be a weaning weight ratio of 45% which is respectable in the industry. A better measure of cow efficiency is the pounds of forage consumed per pound of weaned calf marketed. Most ranchers do not keep accurate enough records to assess this relationship. If they did there would be lot fewer cows bigger than 1200 lbs in the world.

Table 4. Cow size input and output data from NDSU research by Dr. Kris Ringwall.

Cow size	annual forage intake	calf weaning weight	lb forage / lb calf	calf gain/acre
<1300	11196	617	18.1	31.2
1301 - 1400	11964	611	19.6	28.9
1401 - 1500	12612	589	21.4	26.2
1501 - 1600	13212	598	22.1	25.5
>1600	14256	572	24.9	22.4

Several studies have been published in the last few years looking at this relationship and the consistent conclusion has been once cows exceed 1100 to 1200 lbs liveweight (at BCS 5), the cost of producing a pound of weaned calf increases very quickly. The high cost of maintaining larger animals is the primary driving factor in this relationship.

One of the keys to year-around grazing and overall ranch profitability is having the appropriate type and numbers of livestock on your place. With your operation as a conception-to-harvest direct Market meat business, you are committed to having a certain number of cows to generate the needed number of animals to meet your meat Market demand. Then you also have the commitment to carry those yearlings all the way out to finish. This type of business does limit your stocking flexibility.

A good starting point for setting the cow herd number at Bar 50 is to determine how many head of finished animals you need to generate each year to meet your target salary level and net return/acre objective. Try to maintain the cow herd in this range and then fill up any extra stocking capacity with a more flexible grazing enterprise such as custom grazing stockers or outside cow-calf pairs. If you try to stay fully stocked with your own cows, you are setting yourself up for either doing some culling when you may not want to do or remaining dependent on harvested feed in times of drought or severe winter.

In the stock policy calculator shown in Table 5, we can allocate a certain percentage of our grazing capacity to our main cow herd based on our level of drought aversion and then use the balance for our growing and finishing enterprises. How much you want to allocate to the cow herd and how much toward other enterprises is a direct reflection of your level of risk aversion. If you have high drought aversion you may want no more than half your total grazing capacity allocated to cows. The main idea is to have no more cows on the place than you are confident you could carry in the worst case scenario of a 100-year or drought.

Table 5. Herd production parameters for Bar 50 Ranch stock policy example based on permanent pasture and cropland grazing productivity estimates.

Enter production parameters for your herd in the blue font cells. The number of cows shown in the first block is the number calculated from the Soil Survey pasture yield estimate. The % of feed resources allocated to cows determines what the actual expected number of cows in the herd will be. Next, enter average cow weight. This will determine the AU equivalency of all the other classes of stock. Enter cow to bull ratio. This is fairly minor component, but needs to be done to balance supply & demand. The target finish grade is determined by the 'finish wt as % of dam' entered in B6. A mixed population of steers and heifer will generally hit the High Select:Low Choice line at about 90% of the dam's weight. You can run outside stockers to balance out your forage supply and demand. Enter the number of stockers, days of grazing, and income per day. The percentages entered in F4, F6, and F9 set up the rest of the herd population numbers used in the analysis.

Projected AU number	352	finish wt as % of dam	92%
% forage base allocated to cows	60%	target finish weight	1104
Average cow weight	1200	% of calves to growing phase	62%
Cow to bull ratio	30	% of yearlings shipped before finish	20%
Replacement rate	18%	Finishing calf crops on hand	1.00
Expected weaning rate	90%	Added outside stockers	100
Weaning wt as % of dam	44%	Days of custom grazing	150
Projected weaning weight	528	Custom graze rate /day	$ 1.50
% of calves to ship at weaning	20%		

If you have greater aversion to Market shifts and the possibility of getting caught with stockers in a classic ‘buy high, sell low’ financial wreck, then you may want to allocate more to the base cow herd if that is an enterprise with which you are more familiar and comfortable. Another option is to pursue some avenue other than the buying and selling of extra livestock. Most of the money to be made with stockers is in the sell-buy transaction. What weight gain you actually put on them is secondary to marketing skills. You can be the very best grazing manager in the world and still lose money if you don’t know how to effectively sell and buy cattle.

Once we have made the decision of how much of the forage base is allocated to the base cow herd, then we can set up all the other herd production parameters shown in Table 5. It is these numbers that determine what the rest of the livestock population on the farm is going to look like. There is a section for including outside animals brought onto the property for custom grazing.

Custom grazing provides an opportunity to Market your grass and your grazing skills with minimal exposure to Market risk. If you have greater confidence in your land and cattle management skills than you do in your Marketing skills, you should seriously consider custom grazing for your flexible enterprise. While in this example I am using stockers as the custom graze option, do not automatically think custom grazing means #1 black steers. You might do cow-calf pairs, dry cows, replacement heifers, or steers. Yes, even off-color steers. Custom grazing may also gives you greater flexibility in seasonally adjusting your stock numbers to better match the grazing resources you may have available at different times of the year.

Table 5 shows what the herd structure would look like based on the parameters presented in Table 6. The suggestion here is that you should be able to run a herd of about 175 cows plus their replacements and bulls year-around. This also accounts for about 75 head being finished before 2 years of age. An additional 100 head of 5-wt to 8-wt stockers for about five months to provide flexibility. If you started with lighter weight stockers, the number would go up. If you shorten the time period the stockers are on the ranch, the number could also go up.

The red line shows the total amount of AUDs and lbs of forage required. The last column in the table indicates what percentage of the grazing resource is being used by the different classes of livestock. The green line shows how many total AUD and lbs of grazable forage are potentially available from the combination of pastureland (Table 2) and cropland with 33% grazed as crop residue and 67% growing cover crops as shown in Table 3. This is a fairly aggressive stocking plan with just a no buffer in forage supply, but remember there are 100 head of custom graze stockers in the plan with a 150 day expected grazing season. This is where your flexibility lies or keeping fewer cows.

Table 6. Forage allocation and % usage by the different livestock classes on the ranch balanced with forage supply as determined in the productivity calculators.

Use this calculator to determine total forage requirement in AUD equivalents and as total lbs of feed. Enter the number of days each class of livestock will be on the ranch in F13:F18. The end result should be availabiltiy shown in Row 21 should be greater than the demand shown in Row 18.

Animal class	# of head	Animal Unit factor	AU Equivalents	Calendar days on the ranch	Total AUD requirement	Total requirement as lbs of forage	Cattle class use as % of total
Cows & 1st calf heifers	176	1.20	211	365	76992	2001797	56%
Weaned calves	158	0.53	84	45	3759	97732	3%
Replacement heifers	32	0.96	30	365	11087	288259	8%
Growing steers & heifers	198	0.84	166	180	29951	778715	22%
Finishing steers & heifers	78	1.10	87	150	12994	337855	9%
Bulls	6	1.44	8	365	3080	80072	2%
Total livestock demand:		as AU:	586		137863	3584430	100%
Forage required per AUD:	26			AU carried:	378	1792	(tonsused annuall
Available forage & animal unit days from Soil Survey productivity calculator					137964	3587068	
				Excess or deficit forage balance	101	2639	
				% over or under	0%		

This particular stocking policy leaves you with about 0% buffer in the forage supply in a normal precipitation year. We can change the numbers to reflect any level of available forage buffer you care to have. This just illustrates what the ranch could carry at full stocking potential. In a drier year, there would not be as much forage available, so you would reduce the number of outside cattle you plan to bring in or shorten the time period they are on the ranch. In a better than normal year, you have multiple choices: add more cattle, keep the outside cattle longer, waste some additional forage to build soil.

The key concept is knowing your carrying capacity allows you to have a stocking plan in place.

The final section of the stock policy part of this worksheet calculates how many of what class of livestock you would be selling on an annual basis. Enter the expected price for each type of animal you will be selling and the expected gross income for the ranch will be calculated.

The prices used in this table are consistent with late 2014 Market values for the different livestock classes. What they might be in the near or distant future is total speculation.

What you can see from this projection is the vast majority of the income in this scenario is derived from the pasture finishing operation and sale of a premium priced product.

Increasing or decreasing the number of calves carried all the way out to finishing is the biggest determinant of gross income using the pricing structure shown. Gross income will increase as you increase the number of your own calves kept for finishing, but you do lose flexibility in your stocking rate. More of your forage base is committed to animals that may already be Marketed as finished animals.

Table 7. Using the stock policy calculator to generate a gross income by livestock class based on a specified price scenario.

The prices shown in the current view were those you provided when I visted the ranch. The value per lb may not look very familiar to you. We just manipulated those prices to come up with your per head income projections.

Stock class sold each year	# of head	wt / hd	value / lb	value / hd	gross value	% of sales
Cull cows	32	1200	$ 1.15	$ 1,380	$ 43,664	11%
Weaned calves	32	528	$ 2.40	$ 1,267	$ 40,095	10%
Yearlings not finished	40	840	$ 1.70	$ 1,428	$ 56,573	14%
Yearlings finished	78	1104	$ 2.75	$ 3,036	$ 238,231	59%
Cull bulls	1	1560	$ 1.05	$ 1,638	$ 2,399	1%
Custom grazed stock	100			$ 225	$ 22,500	6%
				Total Gross Sales	$ 403,463	
				Gross income per acre	$ 896.58	
				Value of an AUD on the ranch	$ 2.92	

Even though the custom grazing enterprise does not generate near the income of the growing-finishing operation, it gives you a great deal of flexibility in face or drought or other stresses.

With the Excel file *'B50 Carrying Capacity & Stock Policy Calculator'*, you can tackle a lot of these questions and look at multiple *'what if'* scenarios. This file and the Cost:Benefit Analyzer that we will look at a little later are two of the most useful tools you will be getting from me. I strongly encourage you to learn how to use them and maximize the benefit you got from my charge.

Cattle selection for pasture performance *(Donald, a generic section I put in most reports)*

Perhaps the most unpleasant part of my job is having to tell clients they have less than optimal cattle. This is particularly true for people just getting started in the cow business when they think they have a really nice set of cows. In my view, the most important genetic trait for cow selection is adaptation to your resource environment. This includes the natural resources, the human resources, and capital resources. Every other performance trait becomes moot if you have to modify the environment just so your choice of cattle can just function there.

As you know, we generally speak of such things as moderate framed, thick, deep bodied, easy fleshing, and so forth when we try to describe good, functional cattle that will perform well on pasture and range with little or no external supplemental feed. While the words are easy to say, sometimes we have different interpretations of what those things mean. I like to try to visually depict these things using the client's own cattle as illustrations. Since I have no pictures of your cattle, we will just use other examples.

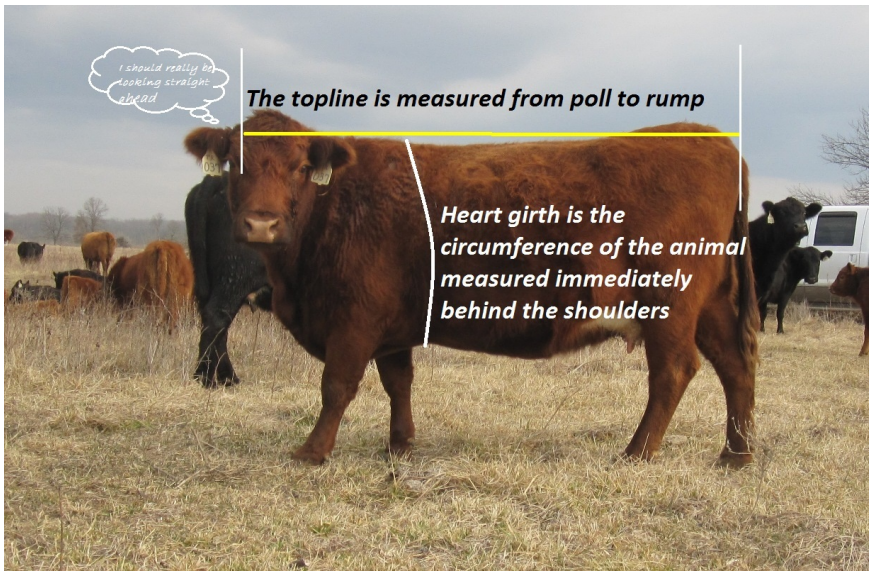
I want to start with a photo of what I view as being an optimal cow (I think ideal is too strong a word!). This cow is from Ozark Hills Genetics in Missouri and I consider this herd to have some of the very best grass-based genetics in the country. This is an 11 year old fall-calving cow with calf at side in February. She has seen no hay for the last seven winters and the only supplement has been salt and minerals. OHG has a whole herd of cows like this. They are the epitome of functional cattle.

Functional cattle tend to have a few phenological traits in common within and across cattle breeds. One of those traits is how their total height is distributed. In general we are looking for cattle with greater than 2/3rds of their total height made up by body depth. Less than 1/3rd of total height should be in the legs. In the past we measured this in the chute, but I find you can get a pretty good assessment with a field photo and then just measuring the proportions on the photo.

These type of cattle can be found in any beef breed, but it is much easier to find them in the British breeds and in herds that have avoided the push towards 'bigger is better'. To me it is far more important to get the right type of cattle than it is to have a particular breed just because that is what is popular in the neighborhood.

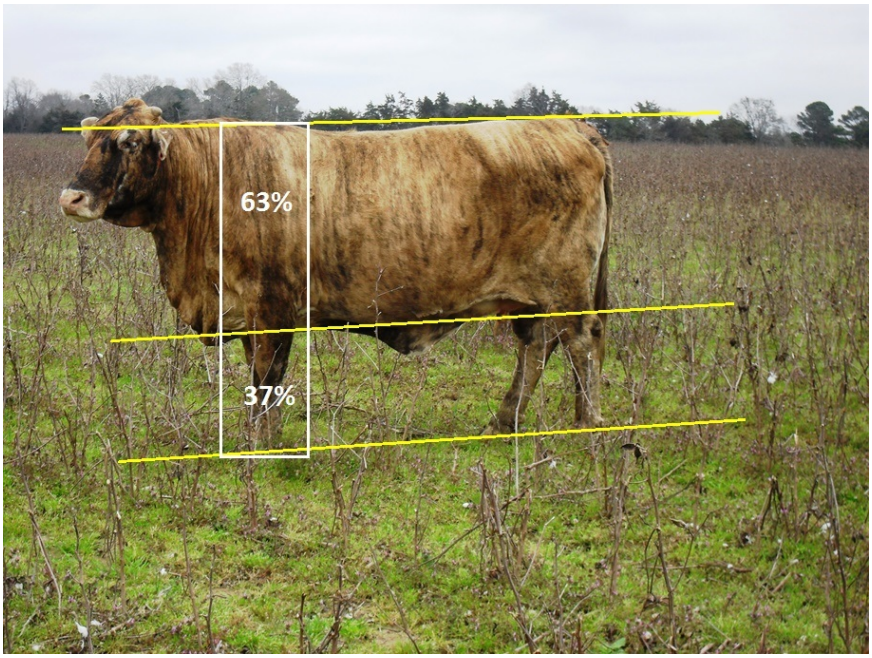
Cow type is more important than cow breed!

Another physical trait we look at is the ratio of heart girth to top line on an animal. As a general guideline we want the heart girth to be at least equal to the top line when the cow is at BCS of 5. When we start increasing heart girth to exceed top line, good things start happening. From the meat producer's viewpoint, the good thing is a 3-4% increase in cut-out meat yield per 1" of increased heart girth above top line length. That is substantial.



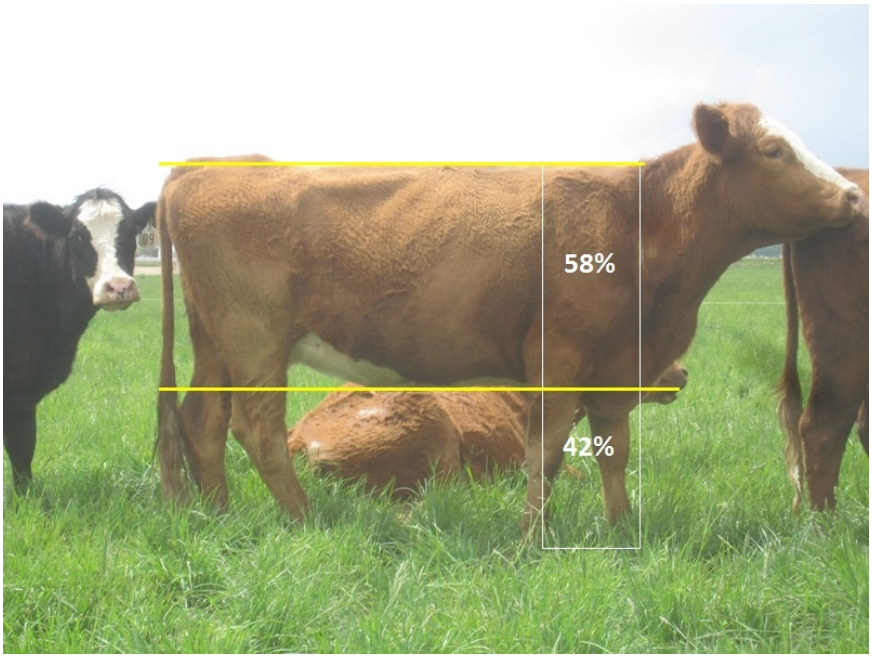
Unfortunately we still have to put the animals in the chute to take these two measurements.

Here is one of Nolands's cows. I commented on this tiger stripe as looking to be a fairly functional cow. She stacks up fairly well with a 63:37 body depth ratio. She is suckling a calf and is in pretty good body condition for the early Spring transition period. Some grass-fed producers might want to shy away from her because of the Brahman influence and the perception of poor carcass traits. Breed her to a good Red Angus, South Poll, or Polled Hereford and the carcass would be just fine.



If you put together a herd of cows like this old girl, they would cost you less than Black Angus or Brangus cows, probably perform better on the farm, and produce carcasses that would grade and yield right where you need them to be. As I recall, I thought this cow was a little on the big side with a weight between 1300-1400 lbs, so you would want just a smaller version of her weighing in the 1100-1200 lb range. She has just enough Brahman to really help her heat tolerance, but not enough to limit carcass potential.

Here is a very good example of what you do not want. This is an ugly rip with less than 60% of her height in her body. She is narrow through the heart girth and flat sided. This is a hard keeping cow with very little socially redeeming value. She happens to be a Simmental but the Angus cross standing behind her wasn't much better, This was one of those places where I did have to tell the owner, who was very proud of his cows, that he had really lousy cattle.



Here is a data set from research done at North Dakota State U by Dr. Kris Ringwall and it is very telling when it comes to the detriment of owning big cows. The sad thing is they didn't have any cows down in the 1100-1200 lb range to extend the comparison.

Contrary to what people seem to think, big cows do not automatically wean bigger calves. The opposite is often the case especially when forage resources are limiting. This particular study was done under drought conditions when big cows with big maintenance requirements can't cover enough ground in a day to meet their needs.

Cow size (lbs)	annual forage intake (lbs/cow)	calf weaning weight (lbs)	lb forage /lb calf	calf gain/acre
<1300	11196	617	18.1	31.2
1301 - 1400	11964	611	19.6	28.9
1401 - 1500	12612	589	21.4	26.2
1501 - 1600	13212	598	22.1	25.5
>1600	14256	572	24.9	22.4

With the majority of costs of being in the cow-calf business being land-based costs, upping the conversion efficiency of forage to salable product is a critical step towards building a consistently profitable business.

When the opportunity comes to get back into the cow business, look for cows or heifers coming out of herds with mature cow weight at BCS 5 generally in the 1000-1200 lb range. These will typically cows in the frame score range of 3-5. Make sure the bulls you use are of the same mature frame score if you intend to keep any heifers. If you use bulls of larger frame score than the cow population, you will experience steadily increasing cow weights in your herd and quickly be right back to your current situation.

Recommendations for infrastructure development

It is important to remember that the goal is not just to develop more fence and water infrastructure than anyone else in the neighborhood. The goal is to make your land healthier and more productive so that your livestock are healthier, more productive, and that you can raise more of them. Managing the duration of time any piece of pasture or soil is exposed to livestock is the key to making the land healthier and more productive. Fence and stock water developments are simply the tools we use to facilitate the management of time and space.

The fence and stock water requirements are driven by the level of management intensity you want to impose. Shortening the grazing period has several benefits for the pasture including eliminating opportunity for overgrazing, increased recovery times, promoting biodiversity, among many others. The duration of time for the grazing period to accomplish these benefits depends on the growth rate of the pasture or range. In a high natural rainfall or irrigated pasture environment, my preference is daily moves with a maximum of 3-4 day occupancy on any area.

From the grazing animal's perspective, longer grazing periods tend to reduce individual animal performance unless the stocking rate is very low. Since increasing stocking rate is one of the critical components of creating a profitable ranching business, low stocking rates are not at all desirable. Shorter grazing periods are especially important when grazing late season or dormant season forage as the livestock are always selecting the highest quality forage as they move into a new pasture. This high-grading often results in declining performance as the stock spend more days on a forage resource with both declining availability and nutritional value. For these nutrition-based reasons, keeping dormant season grazing periods to three days or less can help maintain animal performance without supplementation. My preference is still to move stock every day even in winter, but some graziers prefer a little more time off in the winter.

Shorter time periods on smaller areas generally translate to higher stock density which results in more even nutrient redistribution. On the negative side, excessive animal traffic leads to soil compaction. Contrary to what many ranchers think, spreading cattle out over larger areas actually dramatically increases their daily travel mileage resulting in more hooves hitting the ground every day and delivering more physical impact on the soil. Shorter grazing periods at higher stock densities reduce daily travel distance and reduces animal impact on the soil.

These are the criteria we must consider as we plan the layout of the grazing cell. Given your precipitation environment and pasture composition, I am planning for daily cattle moves with no more than 3-4 days returning to a single water point during the growing season and no more than one week of back-grazing in the winter.

For the most part, more frequent moves can be accomplished within the permanent paddocks with the use of temporary polywire fences. As we move through the planning process, it will become painfully aware that stock water development comes at a much higher per acre cost than does subdivision fencing. You may decide to use more or less permanent fencing than what I have outlined, but it will be difficult to realize the desired soil, plant, and animal benefits without the full stock water development proposed.

On productive land like this with a gently rolling landscape, my preferred approach is to develop a flexible grazing corridor design. Basically we want to lay the permanent fences out to create a series of long pastures that can easily be subdivided into the daily grazing paddocks using temporary fence and movable water tanks. In the typical rectangular survey system of the Midwest, we can take a 160 acre quarter section and divided it into four 660 ft wide corridors using permanent electrified hi-tensile fences. Each pair of corridors has a stock water pipeline installed along their common fence. Generally there will one permanent year-around drinking point per 40 acres in an open quarter-section pasture.

Your pastures are not nearly so consistent as the perfect section or 1/4-section, so the corridors are of variable width and do not all run the same direction. Figure 1 shows my recommendations for fence and stock water developments on the Home Place.

The grazing corridor widths range from 350' to 660' and were largely based on logical splits within existing fence locations and where we could easily put water. The one exception to the corridor approach was the pasture between the homestead and the main highway. When I was at the ranch, I had suggested setting up a 'mini' grazing cell in that area as a demo area for your customers of events similar to the pasture walk I had been there for in August. So in that area I have proposed a 9-paddock mini-cell with permanent electrified HT fence using the pond as water source for five paddocks and the remaining four using a gravity feed drinker about 500 ft below the pond. If you didn't want to put in that much permanent fence (although it is just a bunch of short runs), you could so something very similar with temporary fence.

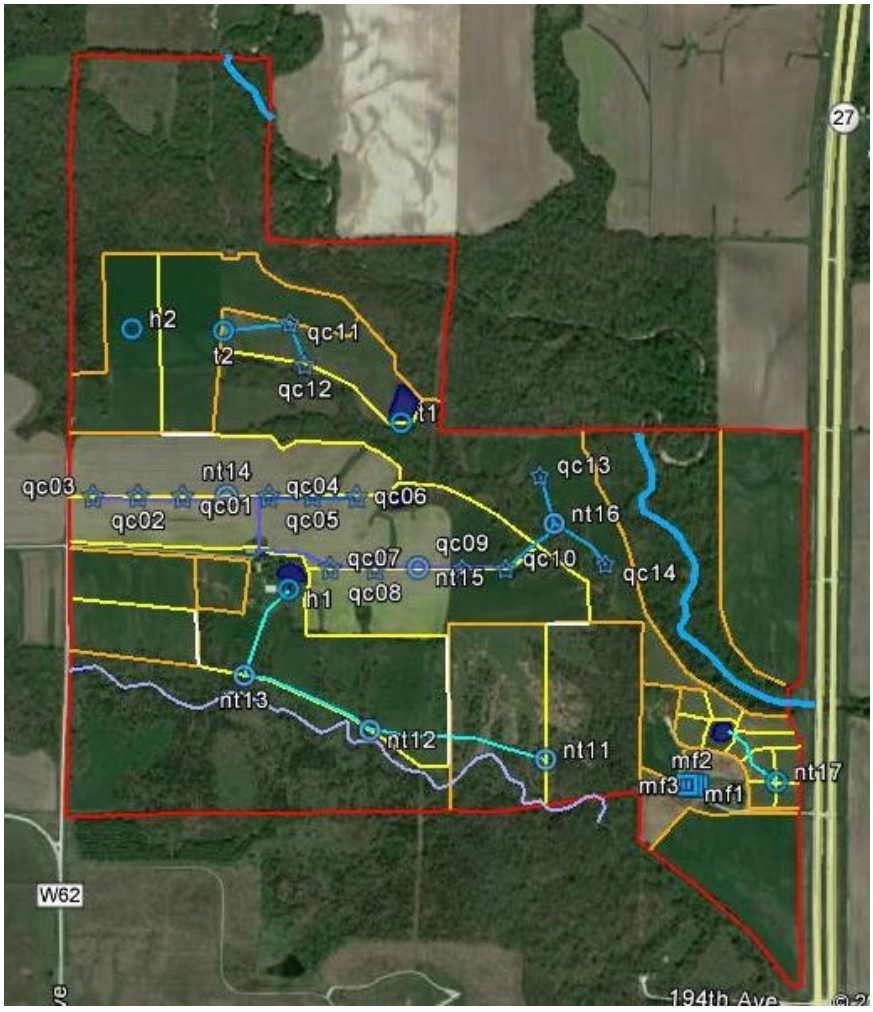


Figure 15. Grazing cell layout for Bar 50 Ranch Home Place.

I will briefly outline what my thinking was on the rest of the place on the following pages.

Even though Little Sugar Creek has water most of the time, it isn't reliably there all of the time. That is the reason for the gravity fed pipeline originating from the pond at the old farmstead near the center of the property. Tanks 11, 12, and 13 are supplied by this line. This allows the corridor north of the creek and the wintering area west of the main homestead to be easily strip grazed. If the creek does go dry, the pasture south of the creek would have access to two of the tanks.

Trying to use a creek for MiG from both directions tends to be a bit of a hassle, so this layout only requires south of the creek to utilize the creek as primary water source while strip grazing.

All the lines to the north and east of the central farmstead are pressurized lines originating from a well at the farmstead. The primary criteria for this water source is that it be able to deliver at least 15 GPM at the end of the pipeline. Most of the pipeline system up here has a net drop in elevation so that works very much in your favor for pipe sizing and minimizing friction loss in the pipeline.

The only pipeline with net elevation gain is the one running up to the northwest along the corridor fence in the big crop field and that gain is only 5 ft. Figure 2 shows the stock water calculation used for determining the required pipeline size needed for this line to deliver the water demand of the herd. I used maximum herd size of 200 mature cows with a peak water demand of 35 gallons per day (GPD). As you can see, a 1.25" pipeline will meet this demand as long as the well can provide the needed 15 GPM.

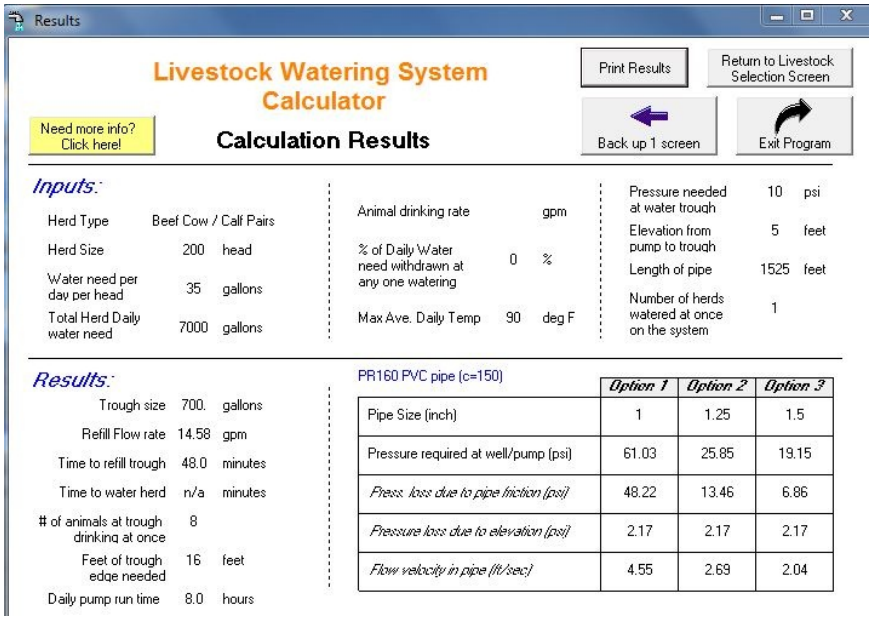


Figure 2. Stock water calculations for pipeline #3 running north to northwest from old farmstead well.

The short pipeline serving the mini-cell in front of the house should work with only a 1" pipeline, but if all the other pipelines require the 1.25" pipe, I would be inclined to put this one in as 1.25" as well. When you standardize pipe size across the entire place, you only need to keep one size of pipe fittings on hand for emergency repairs. The cost differential between a 1" and 1.25" pipeline for a 525' run would be about $100-$125 for both pipe and fittings.

If you don't already know it, running waterlines to develop a grazing cell is always much more expensive the fencing cost. For these types of grazing cells, we generally see the installed stock water cost to be 2-3X the fence cost. This project is no exception. Table 8 on the following page provides a cost summary for proposed fence and stock water developments on the Home Place and Bertleshofer 80.

One of the first things you might notice after reviewing Table 8 is the installed costs for the Home Place are much lower than for the Bertleshofer Place. Relative size is one factor, but another big difference is the Home Place could be laid out in very efficient corridors while the other place was just pretty awkward plus needing to add the pond on the south side also ramped up the cost.

Table 8. Cost summary for proposed fence & stock water developments on the Bar 50 Ranch Home Place and Bertleshofer Place

Acres in project	480 *acres*		Capital recovery perioc		5
Expected carrying capacity	350 *animal units*		Annual interest rate		4.75%

Fence Project component	Material Cost	Material Cost/acre	Labor Factor	Labor Cost	Installed Cost	Installed Cost/acre
Energizers	$ 1,918	$ 4.00	10%	$192	$2,110	$ 4.40
Home Place	$ 6,162	$ 15.40	75%	$4,621	$10,783	$ 26.96
Bertleshofer	$ 1,925	$ 24.06	75%	$1,444	$3,369	$ 42.11
Offset wires	$ 243	$ 0.51	50%	$121	$364	$ 0.76
Temporary fence	$ 1,426	$ 2.97				
Fence subtotal cost	$ 10,248	$ 21.35		$ 6,379	$ 16,627	$ 34.64

Water Project component	Installed Cost	Installed Cost/Acre	Comments
Home Place	$ 32,768	$ 81.92	*Based only on pasture acres*
Bertleshofer	$ 10,573	$ 132.16	*Based only on pasture acres*
Stock Water subtotal cost	$ 43,341	$ 90.29	*Average across the entire ranch*
Total project cost	$ 59,967	$ 124.93	*Installed fence & stock water cost*
Annualized project cost	$ 13,755	$ 28.66	*Amortized based on criteria in G2-G3*

One way to bring the Bertleshofer cost down is top view it as only a summer grazing property. Rather than installing year-around tanks or drinkers as shown, just put in hydrants or Quick Couplers and use a movable tank. That by itself would almost cut the water development cost in half. Even though I have proposed certain things in this report, it is not Gospel Law and there are ways to reduce some of the costs. Especially on the smaller 80 acre tract.

I did not do any development plans for the rental properties as you may decide you no linger need them if through more intensively managing the home property, you are able to run more cattle on fewer acres. If you do decide to retain the rental properties, you now know the nuts and bolts of how to approach various properties for simple and efficient pasture subdivision. You have a copy of the Excel fence & stock water calculator and you can learn how to use that yourself with a few projects.

Before we move on to the actual cost:benefit analysis, I want to talk about pasture infrastructure costs in the sense of land costs and value. I fully expect if you implement the tools I have outlined and learn to use them effectively, you will increase the carrying capacity of your pasture land by at least 50% above present levels.

Averaged across both properties, the infrastructure cost is about $125/acre. What this means in real world terms is you are buying another half-acre for $125 capital improvement cost and your future management and labor inputs. Where else can you buy an acre of productive grazing land for $250/acre?

Nowhere in the US! That is the real value of investing in improving your own land

Cost:Benefit Analysis

The next question is how do we know any of this is worth doing. There are three pieces of information we need to make this assessment. 1) What is the expected increase in carrying capacity from implementing this management change. We have made that projection conservatively at 50%. 2) What is the gross margin value of adding an additional AUD to the ranch? I have done a half dozen of these assessments for clients in the last month and based on commodity cow-calf Marketing, the average value has been about $1.35 / AUD. With your value added meat program, I am kicking the ante up to $1.75. Many of our direct Market clients are in the $2.25 - $2.75 range. 3) What will this cost to implement? We determined in the previous section an installed cost for fence and water will likely average about $125/acre across the entire ranch with some individual units being higher and some being lower.

Table 9 takes these three pieces of information along with a specified capital recovery period, interest on our investment, and expected added repairs and maintenance on the new infrastructure. The bottom line is an annualized return on investment of about 30%. This ROI substantially beats most other investments today. Remember, this was based on full retail price for all the needed inputs and I am sure we can work to reduce those costs.

Table 9. Cost:Benefit analysis using the average commodity cow-calf gross margin return / AUD from several of our clients.

Use this calculator to determine the cost:benefit ratio for any practice that increases annual forage yield over a period of time. Enter your information into the blue font cells in the top block and also the projected % increase in forage yield in succeeding years in C17 thru C36. If you don't have an estimate for the response, why are you doing the improvement practice in the first place?? You can adjust the capital recovery period to determine how many years it will take to cash flow the project.

Base yield	180	*expected lb/acre yield before implementing the new practice*
Additional AUD to be harvested	342	*Calculated in lower part of work sheet based on response expected*
Value of an additional AUD to your ranch	$ 1.35	*fair market value for output of one standard animal unit day*
Total value of added forage	$ 462	*added value of total additional forage produced for life of practice on 1 acre*
One time per acre cost for practice	$ 125.00	*one-time cost/acre to implement the practice*
APR	5%	*interest charged or expected return on money invested*
Capital recovery period	5	*years of benefit from the practice*
Annual cost of practice	$28.87	*annual cost + interest or standard rate of return on investments*
Annual R&M as % of initial capital cost	6%	*enter a % of the original capital cost to assign for annual R & M*
Additional Repair & Maintenance	$7.50	*original capital cost (B10) x annual operating cost (B14)*
Total cost for the practice	$ 181.86	*recovery period X annualized cost*
Benefit of the practice above cost	$ 280	*total value - total cost*
Cost:Benefit ratio	2.54	***This is your added return per dollar invested on the practice***
Annualized return on investment	30.8%	***Annualized return on investment***

If we do nothing more than change the gross margin value per AUD to $2.25 which is what many of our grass-fed beef clients have shown us, the ROI jumps to 65%. Any other improvements we may make in gaining production cost efficiencies will further increase the ROI.

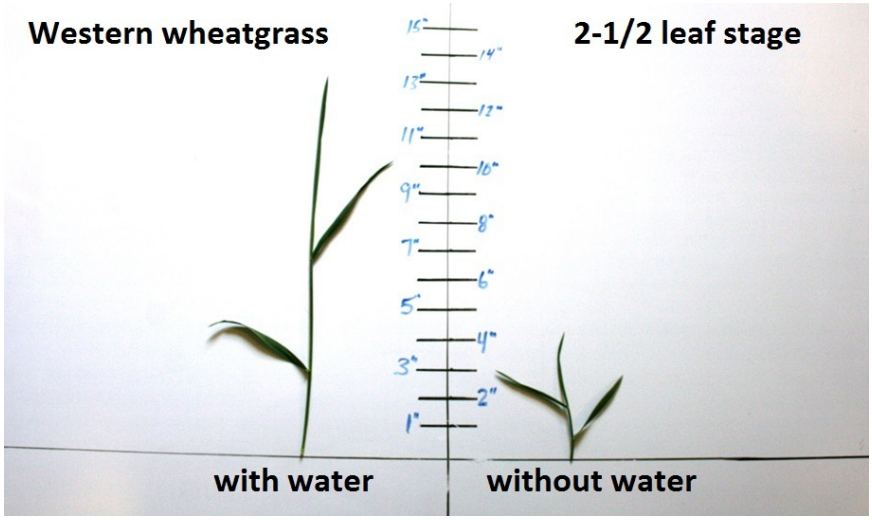
One more important consideration is we are using a five year capital recovery period on ranch improvements that have 20-30+ year life expectancies.

A few comments on grazing objectives:

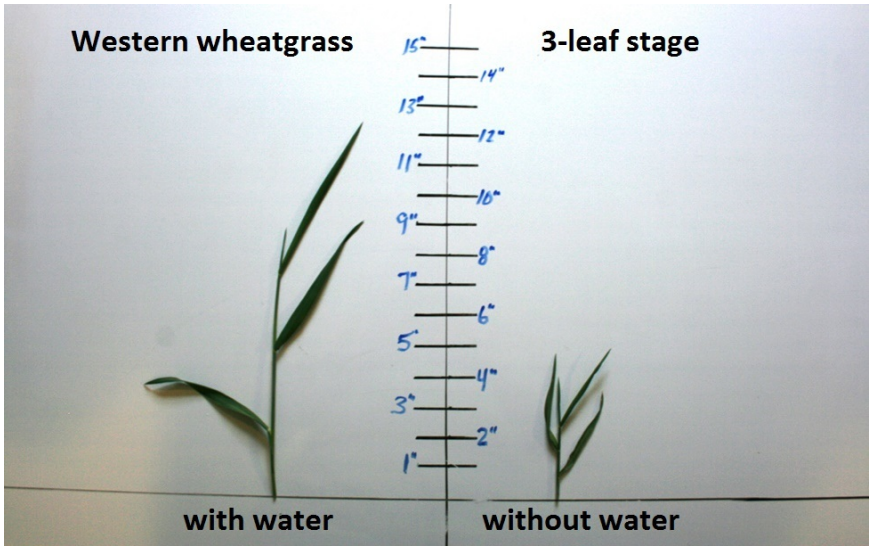
(Donald, this is another more or less generic section that I send to many clients because it contains several important grazing management concepts. Even though it was originally written for a client who was managing center pivots, it is applicable to both high natural rainfall (anything > 25" precipitation) or irrigated pastures. On your permanent pasture I would expect you to carry out several grazing cycles annually. This will likely include 3 or 4 in the growing season and another in the dormant season on some of the pastures.)

We spent a fair bit of time talking about leaf growth stages when we were out in the pasture. Basically leaf stage is simply a numeric accounting of how many fully emerged leaves are present on each individual tiller of grass. Remember, overgrazing happens one plant at a time, not as the entire pasture.

The illustration to the right shows western wheatgrass at the 2 ½ - leaf stage. A leaf is considered fully developed when the collar has formed. The collar is the 'hinge' where the leaf blade joins to the sheath, the part that wraps around the stem. Leaf stage is an indication of the energy flow in the plant. Until there are three fully formed leaves on the plant, more energy is flowing from the roots to top than top to roots.

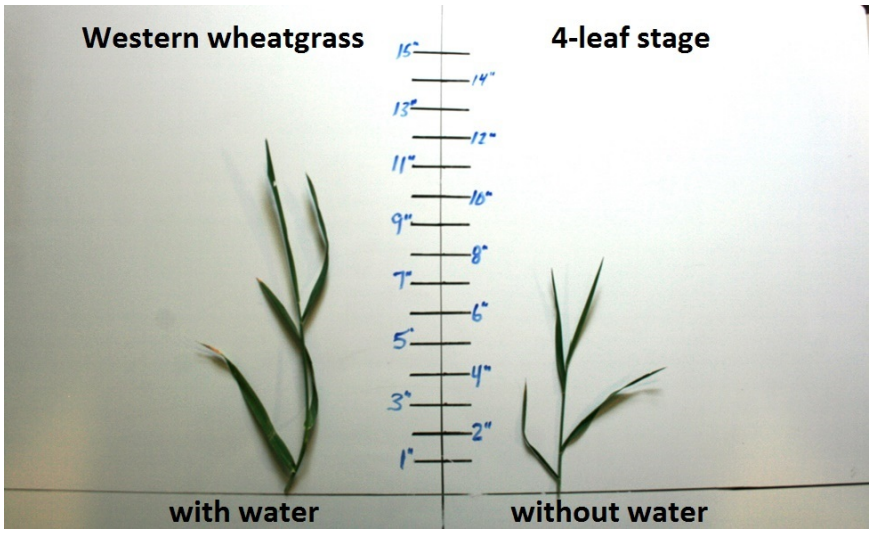


When the plant reaches the 3-leaf stage, the energy balance in the plant shifts towards sending energy flow to the roots or other storage organs. In the case of most bunch grasses, the energy storage is in the stem bases just above and just below ground level. For rhizomatous grasses like western wheatgrass and smooth brome, the storage is in the rhizomes or root system.

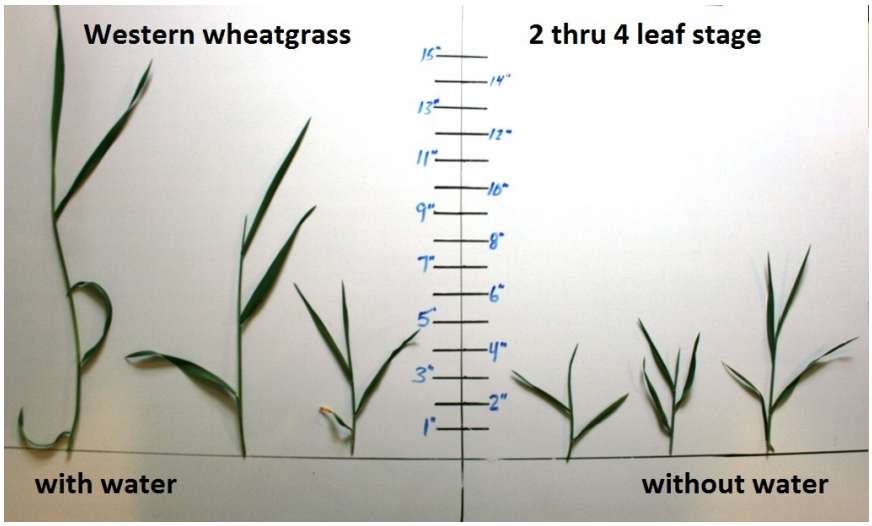


Three-leaf stage is the earliest growth stage at which a grass should be grazed! Later is better!

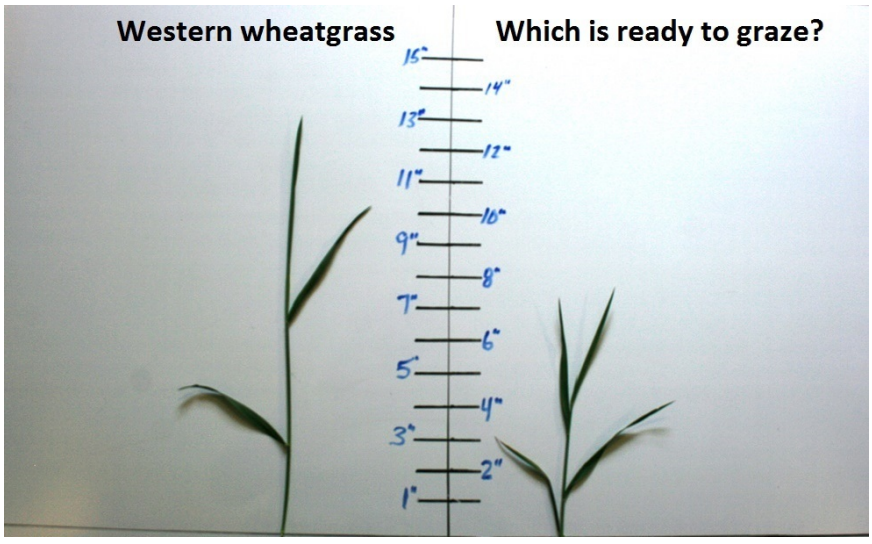
These plants both have four fully emerged leaves and the fifth leaf is beginning to form. My preference is to graze pastures at 4 ½ to 5 ½ leaf stage. Delaying grazing to this growth stage has allowed the pasture to develop into a very efficient solar panel and capture a relatively high percentage of available solar energy. Delaying beyond this point leaves are starting to die off the bottom of the plant and net photosynthesis declines.



This photo shows tillers at 2 - 3 - 4 leaf stages with or without irrigation. The irrigated pasture at 4-leaf stage is already up above 15" height while the non-irrigated tiller is only about 7" tall. Very often I get asked what the height of the pasture should be when grazing is initiated. This illustration shows why the answer to that question must be 'It depends!'

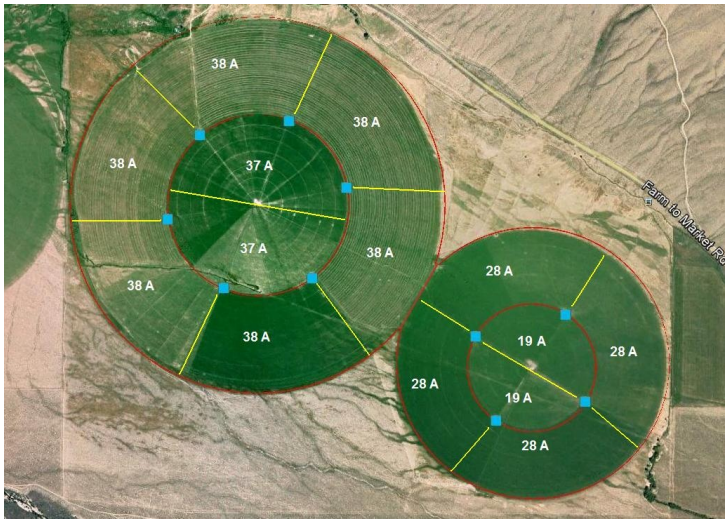


In this photo we have the irrigated tiller at 2 ½ -leaf stage standing 13" tall and the dry land tiller with 4+ leaves at 7" height. So which is ready to graze? Strictly from a physiological basis, the 7" pasture is more ready to be grazed than is the 13" pasture. This is why I spent so much time with you on understanding leaf stage, because it is more important than height!

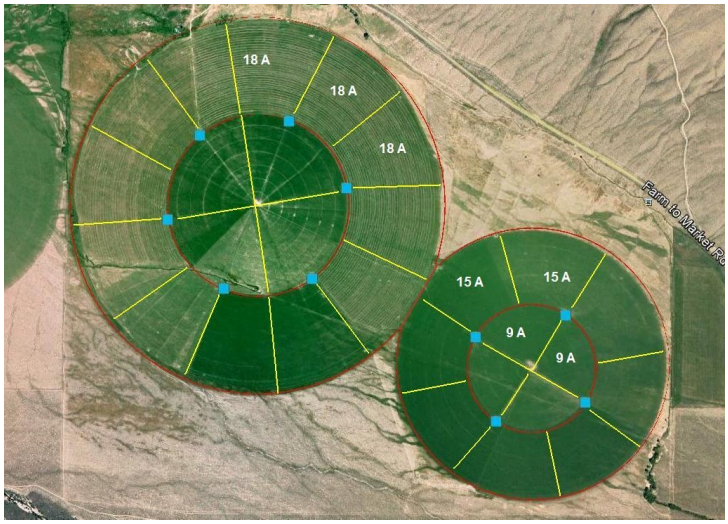


This series of figures shows how I approach the grazing season on our pivots using daily moves. Even though this illustration is done with pivots, it is just as applicable in high rainfall environments.

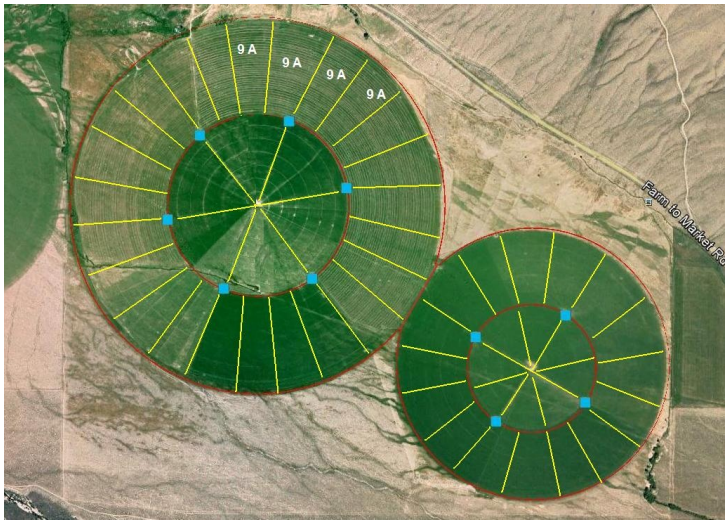
I will begin the first cycle when tillers reach the 2 ½ to 3 ½ leaf stage. From a pasture inventory standpoint, this is generally about 30 available stock-days/acre. My objective on this cycle is to get across the entire pasture area to try to get a small bite off everything. This illustration is with 500 pairs on 450 pivot acres. I don't worry about getting a high stock density on this first rotation. I don't worry about trying to take 50% utilization. It is take a bite and move along. This cycle usually takes 2-3 weeks.



On the second cycle I slow the rotation down a little bit. Note the allocated paddock areas are only half the size they were in the first rotation. Stock density is going to be twice as high and utilization rate should be somewhat higher, though it may still not be 50%. It just depends on growing conditions. It is during this grazing cycle that we will begin to graze out seed heads while they are starting to elongate but before they ever emerge from the boot. This cycle will usually take about 4 weeks.



By this point just 6-7 weeks into the grazing season, I have been across everything twice and have staggered growth occurring across the pastures and some seed heads have already been removed. Now we slow the rotation down to 5 to 7 weeks depending on the irrigation water availability and growth rate. We do this by allocating smaller daily paddocks and allowing utilization rate to increase to the 50-60% range. From this point on we are trying to leave appropriate residual.



When you start into daily rotation of pastures as a core part of your management, it is critically important to be able to accurately estimate the amount of feed you need to allocate to the herd(s) on a daily basis. This is actually remarkably easy to do once you are set up for daily strip grazing. You do not necessarily need to commit to doing daily strips on pasture or rangeland for the rest of your life, but doing it for a period of time is the easiest way to train your eye.

Here is the basic process for calibrating your eye. Look at the pasture and look at your herd. Set up a strip that you think will feed that herd for one day. Measure the area. With smart phone technology it is easy to just drive around the strip and get the area using any one of the several available mapping apps. Come back tomorrow and see how they did. If they grazed it too short, you guessed wrong and give them a bigger area for today. If they didn't eat nearly as much as what you thought they should have but they are content, give them a smaller area today.

If it turned out just the way you expected, then you are well on your way to being a master grazier!

Do this for 4 - 6 weeks and you will be able to look at just about any growing or stockpiled pasture and know how to allocate the feed to optimize both animal performance and post-grazing residual for improving soil health and water cycle.

With the grazing corridor system, you can install the permanent line posts at a measured spacing based on the corridor width to make the area between any pair of posts a known acreage. This makes feed allocation and record keeping very easy.

If you are not using a back fence because you need to allow the stock to return to a fixed watering point by walking across previously grazed areas, you will need to monitor animal behavior to make sure they are not returning to graze new growth on previously grazed areas. That is what we commonly refer to as 'back-grazing'. On high natural rainfall or irrigated pasture you can usually allow 3-4 days for animals to cross over the previously grazed strips before back-grazing becomes a problem.

If you move stock in the morning, look at the herd in the late afternoon or evening. If over 80% of the herd is grazing on the strip you gave them that morning, they are telling you that is still the best bite of feed in the pasture. That is what you want them to be doing. If more than 30-40% are out picking around where they have already been, then they are telling you the allocated strip was not enough so give them a bigger strip tomorrow. The cattle will tell you most things you need to know about the effectiveness of your grazing management.

Failure to properly execute the first several weeks of the grazing season generally leads to one of two possible outcomes. If the cattle go out too early, graze pasture too short, and come back to it to soon, you will quickly be out of pasture resulting in poor animal performance and potentially financial loss. If cattle go out too late and pasture is allowed to mature ahead of the cattle, individual animal performance typically is poor as is pasture regrowth potential for the remainder of the season.

Once pasture reaches this growth stage, your best option is to rotate the stockers quickly across all the paddocks allowing them to remove only the top 20-25% of the plants that may still have enough energy to support acceptable stocker gains. After that clean up the remaining forage with cow-calf pairs or dry cows in the fall or winter and try to do better next Spring.

Pasture improvement strategies:

Soil testing and nutrient management

You have already implemented the grid soil sampling approach across the entire ranch. While the cost of this initial base line sampling may have been of concern to you, I believe soil testing almost always pays, as long as it is done properly. A well-designed soil testing program done on a field by field basis can save you a lot of money. Even if you do not plan to use any fertilizer, this information still helps us select which forage species and varieties may work the best on your land and it also serves as a guide as to where hay feeding could be used to enrich the soil.

The one disappointment I had from the results I saw was the failure to get some of the micronutient evaluations (unless I missed something somewhere in what you sent me!) We will be talking about legume interseeding in the next segment. Several micronutrients are needed to have healthy, productive legumes in the pasture. These include S, B, and Mo. In the next round of sampling, let's make sure we get those bases covered.

What I did see in the samples were critically low P levels almost everywhere. I know you don't want to use commercial fertilizers, but in the short term some judicious use of P fertilizer might be warranted. Materials like 11-52-0 or 18-46-0 used at the 100 lb/acre rate to provide roughly 50 lbs of phosphate are not detrimental to soil microbial life, but I would not suggest you do any more than that. That will at least get some P into the system to help establish and maintain legumes in the pasture.

There were variable levels of K in the soil, but I think that is something that can be addressed through high stock density grazing and some targeted hay feeding.

If you are in an area where poultry litter or hog manure is readily available, this may be your least cost source for adding necessary nutrients to the soil. Raw litter with a high N content can burn pastures if applied at excessive rates and the high N input may make grasses more competitive and reduce legume presence in the pasture. Composted manure has lower N content and the release rate is slower than with raw litter making compost a better choice for most pasture applications. The presence of many micronutrients in litter make it more valuable than most commercial fertilizer mixes. Very often cost comparisons are made only on the basis of NPK and little or no credit is given to the other minerals present in the litter.

Purchased hay is another means of adding nutrients to your soil at a relatively low cost. Remember, over 90% of what goes in the front end of a cow or sheep comes out the back end. As long as hay is being fed out in the pastures in a manner that encourages good manure distribution across the feeding area, all excreted minerals ultimately feed the soil. I prefer unrolling large round bales as opposed to using ring feeders as a soil nutrient management tool. Square bales, small or large, can be flaked off and fed anywhere in the pasture.

Legume & Grass interseeding:

In the above soil nutrient discussion, I emphasize the need for maintaining base levels of nutrients required for legume establishment and persistence. Having a strong legume component in all of your pastures is the key to having productive, low-cost pastures. We should see 40-50% of the annual forage growth coming from the legume component.

As you make the transition away from alfalfa, you will want to introduce additional legumes into your pastures. Red, white, and alsike clover as well as birdsfoot trefoil are all well adapted to your region and should be included in all pastures. There is no reason to go with just one or the other of these. The greater the species diversity in the pasture, the more productive and stable it is over time. Having birdsfoot trefoil in all the pastures will help reduce the bloat risk from other legumes in the same pasture. Do not be afraid of high levels of mixed legumes in the pasture!

If you want to plan a mixture of all four of the recommended legumes, I suggest 3-4 lb red clover + 2-3 lb birdsfoot trefoil + one lb each of alsike clover and white clover. I usually recommend locally produced common red clover in lieu of the higher priced improved varieties. When I lived in No Mo, there was quite a bit of red clover seed production taking place in there and in southern IA. Seed from a neighbor would be the best source. White clover varieties that we have seen used successfully in the Midwest include '*Will*', '*Regal*' *'Durana'*, and '*Alice*'. All alsike clover is common variety and seed is produced in many of the northern states as well as Canada. The closer it is produced to Iowa, the better. For birdsfoot trefoil we recommend 'Norcen' or 'Bull'.

For all legumes to have effective N fixation, they must be infected with the appropriate strain of *Rhizobium* bacteria. All of the clovers I have recommended use the same inoculant, however there is a special inoculant used on birdsfoot trefoil.

For the most part you can rely on broadcast seeding in late winter or early spring to improve legume composition of the pastures. My preference is seeding on a fresh late-season snow cover. First reason is it makes it very easy to see where you have been. The darker colored seed draws heat and will sink down into the snow. The second reason is these late-season snows generally melt from the bottom up and draw the seed down into the soil as they melt. You can generally count on a successful establishment using this approach.

Stockpiling pasture with existing legume components and allowing natural seed set to occur is a low-cost means of maintaining long term legume stands. If you want to rely on natural reseeding to maintain legume stands, a minimum 50 to 60-day recovery period is required by most species to have enough mature seed to ensure stand survival. Letting a pasture produce mature seed, grazing it for 24 to 28 hours and then moving the stock to another pasture where you would like to establish legumes is a good way of spreading legumes around the farm. Using a harrow to disperse the manure piles containing the seed usually results in a more uniform stand than leaving piles intact. The higher the stock density on the pasture, usually the better this system works.