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The Economics of Hemp Production in Kentucky

Jonathan Shepherd and Tyler Mark

Editor's Note: This is the second article in this newsletter addressing the Economics of Hemp. *Economists' Viewpoints Surrounding the Hemp Boom: Part I* can be found in the February 2019 Economic and Policy Update issue.

The reintroduction of industrial hemp production in the United States has sparked significant interest. Over 1,000 producers in Kentucky have shown interest in the crop by signing up for over 55,000 plus acres collectively for the 2019 production year through the Kentucky Department of Agriculture. However, the infancy of the industry makes it challenging to secure well-documented revenue and cost projections for potential growers to explore potential profitability. In this article, we would like to bring to your attention the release of the 2019 Industrial Hemp Enterprise Budgets developed by the Tyler Mark and Jonathan Shepherd in the Department of Agricultural Economics. They are available at https://hemp.ca.uky.edu/. Estimates used in these revenue and cost projections are based on anecdotal prices, yields, and costs. These budgets only address potential gross revenue and cash operating expenses associated with hemp production. These budgets are completely absent of any fixed or economic costs. The inclusion of these missing costs would impact profitability.

Current observations of the industry reveal that production methods are highly varied but generally fit into one of six production methods represented in these budgets. Yields are also highly variable between and within each production model. Unlike a traditional crop enterprise budget, where using the default production costs estimates may be a reasonable approximation of given producers actual costs, the lacking publically available empirical research centered around hemp production requires potential producers to adjust each line to fit the specifics of their operation. Cost and revenue estimates provided in these budgets should be critically evaluated and adjusted for each producer's scenario. The goal of these budgets are to provide potential growers with a tool they can adjust to their operation. At the very least, potential producers should use the tool to think about the various costs associated with growing industrial hemp.

Many producers are contracting directly with processors/buyers where production method, seed variety, and planting and harvest dates, among other criteria, are dictated by the contract signed. Contract prices vary significantly between processors/buyers as do expected yields and CBD content. As with any legal document, it is essential to read and understand the contract before signing. It is essential for the producer to understand the risks associated with the contract and the consequences if the crop they are producing becomes impractical or impossible to sell, especially if the FDA chooses to

regulate CDB as a scheduled drug. Be sure to understand how CBD content will be evaluated and what crop conditions could result in significantly lower prices or not buying the crop at all. Also, be aware of who technically owns the crop, is it you as the producer or is it the processor/buyer because they may have supplied you with the seed?

Another important consideration is the lack of federal crop insurance available for the 2019 crop. We think that it is vital for potential producers to understand the financial risk they are potentially exposed to. For example, under the tobacco style model for CBD production, variable costs alone can be over $15,000 per acre (or much higher depending on transplant/clone costs and number of plants/acre). In the case of a total crop failure, there would be very little if any of this cost recovered. A potential producer must evaluate this against the profit potential and ultimately their ability to bear this risk. Further, anecdotal evidence suggests that many lending institutions are sitting on the sidelines regarding hemp or at the minimum requiring other (non-hemp) collateral to acquire financing for hemp production. Communication with your lender is critical to determine if industrial hemp production is allowed under your operating notes or if potential revenues will be considered in cash-flow considerations.

Of the six models represented in the budgets, current market and contract conditions are supporting farmers to plant industrial hemp for the production of CDB primarily. Many of these contracts are requiring farmers to produce under the tobacco-style model or plasticulture model. While these two methods are more labor intensive than the others, mechanization is at the forefront of the minds of processors and others. A lot of research is going into mechanizing this process, and it is expected that mechanization will be the future of this type of production. Currently, these models seem to suggest labor requirements will be along the same lines of tobacco or vegetable production on a per acre basis. Having a reliable and available labor source is of paramount importance in these production models. For producers who have not produced tobacco, the intense labor requirements could be overwhelming to potential producers. Further, producers who do not usually rely on H2A employees must get themselves acquainted with the system, its costs, and understand that there are deadlines and waiting periods to get guest workers to their operations.

Another expensive component of hemp production is seed and/or plant costs. This is mostly because of the limited certified seed supply. Seed costs vary widely based upon genetics and other attributes. For example, feminized seed is much more costly on a per seed basis than non-feminized seed. Seeding rates also vary greatly from model to model and from processor to processor. Most growers should have already made arrangements with potential seed or plant suppliers for the 2019 crop. Access to seed that is best for CDB production and fits well in Kentucky's climate may be hard to find at this point. There also is a learning curve associated with producing plants from seed. While we refer to the "tobacco model," producing transplants from seed is not the same process many tobacco farmers are familiar. Be sure to seek informed counsel before growing your transplants. With the passing of the farm bill, domestic seed production will likely result in cheaper seed costs and better genetics in coming years.

As mentioned before, unlike more traditional commodity row crops such as corn or soybeans, there are no standard management practices that have been established as of yet for industrial hemp. For example, as a grain farmer, you can get a particular seed rate program and fertility prescription for your given geographical area and soil type. With the aforementioned costs of seed, this can be a significant driver in costs without established yield correlations. Publically available empirical evidence regarding fertility programs has not been established. Some producers fertilize to more of a corn model, while others would suggest more of a tobacco fertility program.

The harvested hemp crop must also be dried. Dry down in the field is not an option such as it is with traditional grain crops. Further, it cannot be cut and left in the field for some time as is the case with tobacco or hemp for fiber. There is much variance in drying costs depending on the method. Some producers will cut the crop and hang it in a tobacco barn the same day. Others will use new structures or modify existing structures with drying floors that force natural or

heated air through the crop. Even more, elaborate drying structures include automated drying barns that use heat and automatically rotate the crop through are another option. This is one area where harvesting the crop and getting it dry could be a challenge in the production of hemp. The fact that, in most cases, it must be harvested and the drying process started on the same day could cause a choke point in some operations, especially if you do not have adequate drying facilities and are relying on others.

Security costs are another potential concern for some producers. Most processors/buyers do not require there to be an elaborate security plan in place. However, the producer must realize that they have a very valuable crop. Common sense must be used when evaluating potential planting sites. Planting in fields close to roads may not be the first choice for potential planting sites.

Unlike other crops, good communication with your neighbors considering their planting intentions of hemp is also essential from the perspective of pollen drift. Research is still being done to determine the "safe zone." However, anecdotal evidence suggests that pollen may be able to drift 10 miles or more. If you are planting feminized seed, transplants from feminized seed or clones, a neighbor producing a crop with male plants could partially offset the efforts and costs of your feminized production model.

While it has already been noted, it bears repeating. These enterprise budgets do not cover fixed costs associated with hemp production. Considering the varied production methods, trying to arrive at a reasonable fixed cost approach is nearly impossible at this point. As producers learn more about the most efficient way to produce this crop, this issue will be re-addressed in future years. Further, many producers are modifying non-hemp specific equipment to be used for this crop. Others are investing in new hemp infrastructure for their operations and need to consider the financial implications of potentially declining hemp farm-gate prices as hemp supply increases. Simply stated there are too many variables within a particular production method to even begin to address fixed or economic costs.

Industrial hemp production for CDB is proving itself to be a great example of risk versus reward. While the potential to make significant returns above variable costs exists, it is not without risks of the same magnitude. Given the profit potential, some farmers may be inclined to grow significant acres with no prior hemp production experience. It may be wise not to bite off more than you can chew the first year. Growing this crop successfully requires experience that is not necessarily lent by experience with more traditional crops.

	Hemp Grain			Hemp Fiber			CBD Row Crop W/Grain Harvested			CBD Row Crop Ensield No Grain Harvested			CDB Tobacco Model			CBD Plasticulture		
	Quant.	Price	Total	Quant	Price	Total	Quant	Price	Total	Quant	Price	Total	Quant	Price	Total	Quant	Price	Total
Gross Returns Per Acre																		
CBD%	-	-	-	-	-	-	3.00%	-	-	3.50%	-	-	6.00%	-	-	6.00%	-	-
Price Per %	-	-	-	-	-	-	$1.00	-	-	$1.00	-	-	$5.00	-	-	$5.00	-	-
Total Yield (lbs)	-	-	-	-	-	-	1,500	-	-	-	-	-	-	-	-	-	-	-
Dry Matter Yield (lbs)	-	-	-	-	-	-	1,300	$3.00	$3,900	1,500	$3.50	$5,250	1,000	$30.00	$30,000	1,200	$30.00	$36,000
Hemp Grain (lbs)	1,200	$0.70	$840	-	-	-	1,000	$0.70	$700	-	-	-	-	-	-	-	-	-
Hemp Fiber (lbs)	-	-	-	10,000	$0.07	$700	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenue			$840			$700			$4,600			$5,250			$30,000			$36,000
Total Variable Costs Per Acre			$898			$1,077			$1,682			$1,489			$15,763			$10,471
Return Above Variable Cost Per Acre			-$58			-$377			$2,918			$3,761			$14,237			$25,529

*Selected budget components. For the complete enterprise budgeting tool visit: https://hemp.ca.uky.edu/

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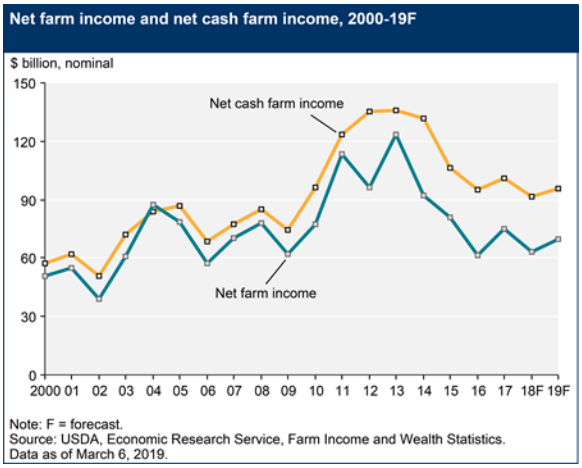
2019 Farm Income Forecast

Jerry Pierce

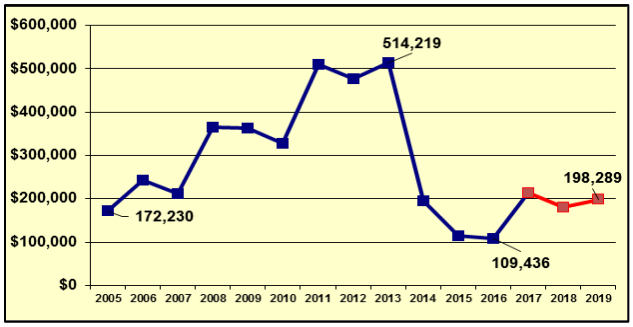
USDA released its early forecast of 2019 US farm income on March 7. "Net farm income, a broad measure of profits, is forecast to increase 10.0 percent from 2018 levels." This is a first-of-the-year projection, before planting, weather, politics, and international markets come into play. But it gives a few hints as to what to expect, and how to plan for the year ahead.

First, take the increase in historical perspective. The projected 2019 net farm income (NFI) is lower than that of 11 of the 19 years on the USDA graph. It is 49 percent below the 2013 peak and is below the average for 2000-2018. Not a stellar year.



Now look at the forecast increase when applied to actual numbers from farms participating in the Kentucky Farm Business Management (KFBM) program. The blue line represents historical averages for KFBM farms. The red line illustrates USDA's projected percentage changes in NFI for these farms. Projected 2019 NFI is $198,288. This is 39 percent below the 2013 peak $514,219, and 22 percent below the 2010-2018 average $253,329.

KFBM Net Farm Income



KFBM data represents average NFI for farms participating in each year. These are commercial farms. For 2017, 83 percent were primarily cropfarms, the average number of tillable acres was 2041, and total gross farm returns averaged $1.7 million. NFI has been adjusted for inflation to 2019 dollars.

Net farm income (NFI) differs from net cash income. NFI includes the value of crops and livestock produced during the year, whether sold or kept in inventory. It does not include sales of production from previous years. Only the costs of production for the year are included, whether paid in cash, prepaid the year before, or owed at the end of the year. NFI does not include the depreciation taken on tax returns, but a longer-term "economic" depreciation.

Why USDA projects revenue will be up

"Total crop receipts are expected to increase 2.0 percent from 2018 forecast levels." This is based on increases in corn prices and increases in both quantity and price of wheat. Soybean receipts are expected to decline in both price and quantity sold.

"Total livestock receipts are expected to increase 2.6 percent." This includes an increase in price and quantity of milk sales and beef cattle. Poultry remains the same, and hog income declines.

"Direct government farm payments are forecast to decrease 16.8 percent." This includes payments from ARC and PLC because of better crop prices, and the Market Facilitation Program.

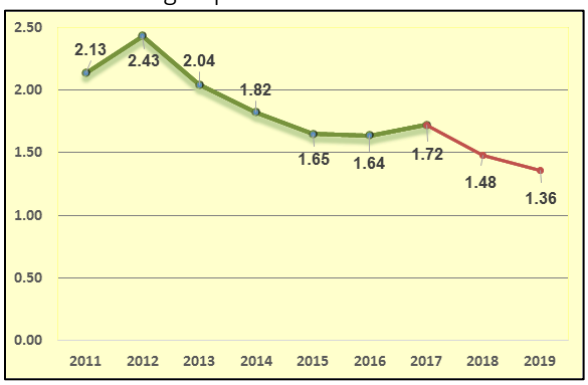
"Total production expenses are forecast to be largely unchanged from 2018 forecast levels." Costs are unchanged because USDA projects farmers will use less. Fuel is the only cost forecast to decline. Labor, interest, and feed costs are expected to increase.

What will this do to balance sheets?

USDA forecasts liquidity measures to worsen. "Working capital, which measures the amount of cash that would be available to fund operating expenses after paying off debt due within 12 months, is forecast to decline almost 25 percent from 2018." Lenders look closely at the ratio

of working capital to debt due in 12 months. USDA forecasts would push the working capital ratio down to 1.36 for the average KFBM farm at the end of 2019. At that point, most farms will begin to have difficulty obtaining financing for 2020.

KFBM Working Capital Ratio



What to do with this information

When rain is in the forecast we make plans. When farm revenue is not projected to make up for 2018 performance, and the financial condition is supposed to worsen, we can make plans. Here are some things to consider:

- Can you farm this year? Can you obtain enough financing to farm? If not, consider cashing out while there is still equity in the assets.

- Can you project a profit on *your* farm? A breakeven? Run the numbers. See the Crop Budgets at http://www.uky.edu/Ag/AgEcon/extbudgets.php and Dr. Greg Halich's article on High-Input Grain in last month's issue.

- Is your working capital at risk of becoming critically low? If so, consider increasing crop insurance coverage. See Dr. Todd Davis' February and March Marketing and Management Updates http://www.uky.edu/Ag/AgEcon/extmkt.php

- Carefully consider the choices of ARC or PLC for 2018-19.

- Look to reduce cost. But be careful not to reduce dollars of productivity more than dollars of saved cost.

- Market what you produce. Know what price you need to cover cost, and to make a profit. Seek pricing opportunities.

- Work hard. Produce the heck out of crops and livestock. But work with a plan in mind.

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Summer Stocker Outlook for 2019

Greg Halich and Kenny Burdine

As we progress through the end of winter and pastures start to grow, stocker operators are looking to place calves into summer grazing programs. Calf prices typically rise in the spring and our calf market has risen by roughly $8 per cwt from fall 2018. At the time of this writing (March 11, 2019), fall 2019 CME© feeder cattle futures were trading around $153 per cwt, which was roughly a $10 premium over the March contract. This expected increase in feeder cattle prices between now and fall suggests there is a lot more upside price potential for calves as we move closer to grass growth. Some operations likely placed calves during the winter, with the intention of purchasing stockers before the typical spring price peak. However, many more will place calves as pastures green up in the coming weeks. It is imperative that stocker operators pay careful attention to the market, their costs, and what can be paid for stocker calves this spring.

The purpose of this article is to assess the likely profitability of summer stocker programs for 2019 and establish target purchase prices for calves based on a range of return levels. While it is impossible to predict where feeder cattle markets will end up this fall, producers need to estimate this and not rely on the current price (March) for 750-850 lb feeder calves. The fall CME© feeder cattle futures (adjusted for basis) is the best way to estimate likely feeder cattle prices for fall.

Grazing costs including pasture costs, veterinary and health expenses, hauling, commission, etc. are estimated and subtracted from the expected value of the fall feeders. Once this has been done, a better assessment can be made of what can be paid for stocker cattle this spring in order to build in an acceptable return to management, capital, and risk.

Key assumptions for the stocker analysis are as follows: 1) Graze steers April 1 to October 1 (183 days), 1.5 lb/day gain (no grain feeding), 2% death loss, and 5% interest on calf. The interest rate used in this analysis may seem high for producers who are self-financed or have very low interest rates, but is likely 1-2% too low for those going through traditional lenders. Given these assumptions, sale weights would be 775 lbs and 875 lbs for 500 lb and 600 lb purchased calves, respectively. Using a $153 CME© futures contract for October 2019 to estimate sale price, a 775 steer is estimated to sell for $148.50 and an 875 steer is estimated to sell for $142.50. This estimate uses a $6 per cwt basis for an 800 lb steer and a $6 per cwt price slide. These sale prices are also based on the assumption that cattle are sold in lots of 40 or more head. Stocker operators who typically sell in smaller lots should adjust their expected sale prices downward accordingly.

Estimated costs for carrying the 500 and 600 lb steers are shown in Table 1. Stocking rates of 1.0 acre per 500 lb steer and 1.2 acres per 600 lb steer were assumed in arriving at these charges. Most of these are self-explanatory except the pasture charge, which accounts for variable costs such as bush-hogging, fertilizer, seeding clovers, etc., and is considered a bare-bones scenario. Sale expenses (commission) are based on the assumption that cattle will be sold in larger groups and producers will pay the lower corresponding commission rate. However, producers who sell feeders in smaller groups will pay the higher commission rate which will likely be around $40 per head based on the revenue assumptions of this analysis. Any of these costs could be much higher in certain situations, so producers should adjust accordingly.

Table 1: Expected Variable Costs 2018

	500 lb Steer	600 lb Steer
Pasture Charge	$25	$30
Vet	$20	$20
Interest	$24	$26
Death Loss	$20	$21
Sale	$16	$16
Haul	$15	$18
Mineral	$10	$12
Other (water, etc)	$10	$12
Total Variable Costs	*$140*	*$155*

Note: Interest and death loss varies slightly by purchase price.

Target purchase prices were estimated for both sizes of steers and adjusted so that gross returns over variable costs ranged from $25-125 per head. This gives a reasonable range of possible purchase prices for each sized calf this spring. Results are shown in Table 2. For 500 lb steers, target purchase prices ranged from $1.78 to $1.97 per lb. For 600 lb steers, target purchase prices ranged from $1.61 to $1.77 per lb. When targeting a $75 per head gross profit, breakeven purchase prices were $1.87/lb for 500 lb steers and $1.69/lb for 600 lb steers.

As an example of exactly how this works for a 500 lb steer targeting a $75 gross profit:

775 lbs steer x $1.485 (expected sale price)	*$1,151*
Total Variable Costs	*- $140*
Profit Target	*- $75*
Target Purchase Cost	*$936*

Target Purchase Price = $936 / 500 lbs = $1.87 / lb

Table 2: Target Purchase Prices For Various Gross Profits 2018

Gross Profit	500 lb Steer	600 lb Steer
$25	$1.97	$1.77
$50	$1.92	$1.73
$75	$1.87	$1.69
$100	$1.82	$1.65
$125	$1.78	$1.61

Notes: Based on costs in Table 1 and sales price of $148.50 and $142.50 for 775 lb and 875 lb sales weight respectively for 500 lb and 600 lb purchased steers.

For heifers, sale price for heavy feeders will be lower than comparably sized steers and they will not generally gain as well. In this analysis, we assumed the price discount for these heifers is $8 per hundredweight lower than for the same weight steers and we assumed heifers would gain 10% slower than steers. With these assumptions, purchase prices would have to be $0.17/lb lower for 500 lb heifers and $0.15 lower for 600 lb heifers compared to the steer prices found in Table 2. Thus when targeting a $75 per head gross profit, breakeven purchase prices were $1.70/lb for 500 lb heifers and $1.54/lb for 600 lb heifers.

Your cost structure may be different from that presented in Table 1, and if so, simply shift the targeted gross profit up or down to account for this. If your costs are $25 higher per calf, then you would shift each targeted profit down by one row: For example, you would use the $125 gross profit to estimate a $100 gross profit if your costs were $25 higher. Another way to evaluate this is that a $1 increase in costs would decrease the targeted purchase price by $0.20 per cwt for 500 lb steers and $0.17 per cwt for 600 lb steers.

It is important to note that the gross profits in Table 2 do not account for labor or investments in land, equipment, fencing, and other facilities (fixed costs). Thus, in the long-run, these target profits need to be high enough to justify labor and investment, as well as a management return. In some locations, calf markets may already be at levels that would place expected returns on the lower end of the range analyzed. This is all the more reason that stocker operators should carefully think through their budgets and make rational purchasing decisions.

There is a tendency for calf prices to reach their seasonal price peak when grass really starts growing in early spring. There is little reason to think this won't happen in 2019, which will result in tighter expected margins for stocker cattle placed in the upcoming weeks. Also, the placement of calves into stocker programs represents a significant cost and there is always a great deal of uncertainty about fall sale price. For this reason, stocker operators should also consider risk management strategies as they place calves into grazing programs.

Hedging, through the sale of futures contracts, provides solid downside risk protection, but will subject the producer to margin calls if cattle prices increase. Entering a cash forward contract with a feedlot or order buyer, or offering cattle through internet sales with delayed delivery, will reduce or eliminate price uncertainty, but will also limit marketing flexibility should weather conditions necessitate sale at a different time. Finally, strategies such as put options and Livestock Risk Protection (LRP) Insurance offer a less aggressive strategy that provides downside price protection (at a price), but more ability to capitalize on rising prices.

Regardless of what makes the most sense for the individual producer, time spent considering price risk management is likely time well spent in these volatile markets. A link to a publication on the basics of using futures' markets to manage price risk in feeder cattle can be found at https://www.uky.edu/Ag/AgEcon/pubs/ext2013-0128.pdf and a publication that introduces LRP insurance can be found at http://www2.ca.uky.edu/cmspubsclass/files/kburdine/2008-04.pdf. The best way to ensure profitability is to budget carefully and to manage downside price risk.

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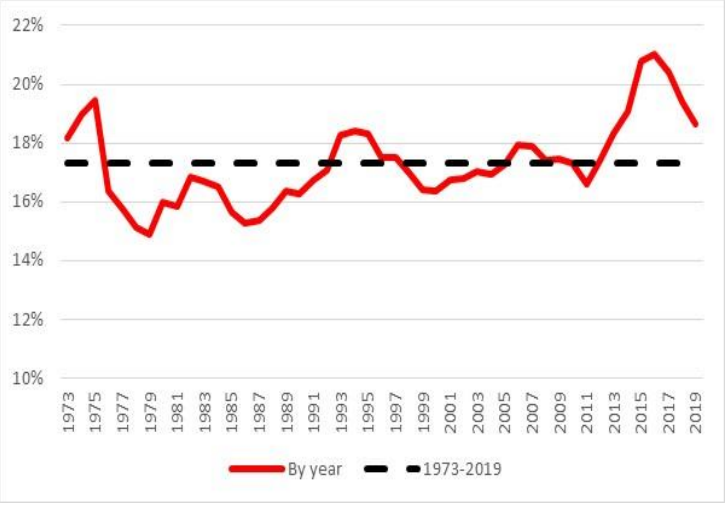
Does 2019 Mark the End of Beef Herd Expansion?

Kenny Burdine

After some delay due to the federal government shutdown, USDA released their January 1 estimates for cattle inventory on February 28th. At the national level, beef cow numbers were estimated to have grown by 1% from 2018. This is a lower rate than was seen last year, but growth nonetheless. Going back to 2014, the beef cow herd has grown by almost 10%. Heifer retention estimates provide further evidence that herd growth is slowing as the number of heifers held for beef cow replacement was down by 3%.

My preferred way to consider heifer retention is to look at it as a percentage of beef cow inventory. Based on these most recent estimates, heifer retention is running at 18.7% of beef cow inventory, which is slightly above the average going back to 1973 (see figure 1). Figure 1 really illustrates how high heifer retention was during the 2015-2017 time period, running above 20% in each of those three years. When one considers recent cow slaughter volume, and the likely age of this cow herd, it is my opinion that this level of heifer retention is probably about at replacement level for the current level of beef cow inventory.

Figure 1: Jan 1 Beef Heifer Retention as a % of Beef Cow Inventory (1973 to 2019)



Source: USDA-NASS, Livestock Marketing Information Center, Author Calculations

Last year's report was a bit of an oddity as total cattle-on-feed numbers were estimated to be up 7% from 2017. Much of this was due to poor winter grazing conditions, which led to unusually high feedlot placements in fall 2017. The 2% increase in cattle-on-feed seen in the 2019 report is largely in-line with the increase in the size of the 2018 calf crop. There was also a sizeable increase (+27%) in cattle grazing small grains in Kansas, Oklahoma, and Texas, which serves as a gauge of winter grazing programs. While this percent increase looks incredibly high, it is really just a return to normal, after the huge drop last winter.

It is also interesting to look at Kentucky beef cattle numbers as compared to the national average. USDA estimated Kentucky beef cow inventory down 1.5% from 2018, placing our cowherd at just over 1 million head. There is no question that calf prices have not encouraged expansion in Kentucky, but I really feel like weather challenges are the primary factor behind this decrease. It was a very challenging fall / early winter and we also know that things haven't improved since January 1st. I would not be at all surprised to see more cows move if weather conditions improve and cull cow prices increase this spring. At this same time, weather has led to higher than usually mortality of cows and calves this winter.

Thinking ahead, I expect US beef cow inventory to remain pretty stable during 2019. Obviously, weather can completely change this and some will argue that cow-calf returns are too low and producers should be running fewer cows. I can't argue with this logic, other than to say that producer profit perception drives inventory decisions and we are still seeing growth in a lot of major cattle producing states. Texas, Oklahoma, Nebraska, South Dakota, and Kansas, (five of the top seven cow-calf states in the US) saw increases in beef cow numbers during 2018. My guess would be that expansion will slow in these areas and some liquidation will be seen in other areas such that the size of the cowherd is roughly the same when the 2020 estimates come out.

The USDA report is summarized in table 1 and the full report can be accessed at: https://downloads.usda.library.cornell.edu/usda-esmis/files/h702q636h/765377121/bc386r54d/catl0219.pdf

Table 1: USDA January 1, 2019 Cattle Inventory Estimates

	2018 (1,000 hd)	2019 (1,000 hd)	2019 as % of 2018
All Cattle and Calves	94,298.0	94,759.7	100
Cows and Heifers That Have Calved	40,898.3	41,119.1	101
Beef Cows	31,466.2	31,765.7	101
Milk Cows	9,432.1	9,353.4	99
Heifers 500 Pounds and Over	20,217.8	20,230.0	100
For Beef Cow Replacement	6,108.2	5,924.9	97
For Milk Cow Replacement	4,768.3	4,701.5	99
Other Heifers	9,341.3	9,603.6	103
Steers 500 Pounds and Over	16,528.2	16,632.7	101
Bulls 500 Pounds and Over	2,252.3	2,263.0	100
Calves Under 500 Pounds	14,401.4	14,514.9	101
Cattle on Feed	14,146.0	14,370.9	102
	2017 (1,000 hd)	2018 (1,000 hd)	2018 as % of 2017
Calf Crop	35,758.2	36,402.7	102

Source: NASS, USDA

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Maximizing Value: Spring Application of Broiler Litter for Grain Crop Production

Jordan Shockley

Spring is here and grain producers across the state are gearing up for planting. One of the many decisions producers have to make before planting is in regard to their nutrient management plan. Broiler litter provides a great opportunity as a complete fertilizer and is being produced and used throughout the state in grain production. However, the value of broiler litter can vary greatly depending on the management practices, nutrient content of the litter, soil test data and commercial fertilizer prices.

Spring application of broiler litter maximizes plant available nitrogen resulting in the maximum economic value of broiler litter. As mentioned in previous issues, the average nutrient content of a ton of broiler litter in Kentucky (as received) is 50 lbs of nitrogen, 56 lbs of phosphorous, and 47 lbs of potassium. In addition to three macronutrients, broiler litter contains other beneficial elements such as micronutrients (zinc and copper), other secondary macronutrients (calcium, magnesium, and sulfur), and organic matter which are difficult to quantify in value. For this analysis, the three primary macronutrients (N, P_2O_5, and K_2O) will be used to determine the value of broiler litter. If your soil test recommendations supported the application of broiler litter and you applied or plan on applying this spring, that is equivalent to 40% commercial nitrogen, 80% commercial phosphorous and 100% commercial potassium per ton of broiler litter (as received). Therefore, the nutrients that would be available to the crop from an average ton of broiler litter in Kentucky would be 20 lbs of nitrogen, 45 lbs of phosphorous, and 47 lbs of potassium. With current fertilizer prices of $596/ton for anhydrous ($0.36/lb N), $510/ton for DAP ($0.41/lb P_2O_5) and $386/ton for potash ($0.32/lb K_2O), the average expected value of broiler litter is $42/ton. This value will vary day to day depending on the price of commercial fertilizer. In addition, this is using the average nutrient content of broiler litter. Each load of broiler litter can vary in nutrient content and should be measured to include into the overall nutrient management plan and supplemented with commercial fertilizer as needed.

Incorporating (disking or rain) broiler litter after application this spring can increase the commercial nitrogen equivalent by reducing nitrogen loss into the air by ammonia volatilization but depends on the time between incorporation and application. Rainfall of ½ inch can reduce loss by moving nitrogen through the soil but too much rainfall can cause runoff or leaching. If incorporated 2 days or less after application, commercial nitrogen equivalent increases to 60% resulting in an increase in the value of broiler litter to $46/ton. Commercial nitrogen equivalents decreases 5% for every 2 days incorporation is delayed due to ammonia volatilization (3-4 days = 55% commercial N equivalent & $45/ton value; 5-6 days = 50% commercial N equivalent $44/ton value). If you wait over 7 days, the value of broiler litter is similar to if you did not incorporate ($43/ton). If you are in a no-till system and applying broiler litter, it is not recommended to incorporate broiler litter just to gain the extra value.

Since the value of broiler litter is dynamic and always changing, a decision tool is available so grain producers can enter soil test data, nutrient content of measured litter, commercial fertilizer prices, and management practices to determine the value of boiler litter. Look for the "Economic Value of Poultry Litter: Grain Crops" on my website: (http://www.uky.edu/Ag/AgEcon/shockley_jordan.php).

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