The 38th Annual Kentucky Alfalfa and Stored Forages Conference

Presented by:

Kentucky Forage and Grassland Council University of Kentucky College of Agriculture, Food, and Environment

> Thursday, February 21st, 2019 Lexington, KY

> Proceedings Editor: Rehanon Pampell and Ray Smith





Schedule of Events

8:00 (EST)	Registration and Exhibits
8:45	Welcome and Introductions
	Ray Smith, University of Kentucky
9:00	Fixed Costs in Hay Production
	Greg Halich, University of Kentucky
9:40	Hay Prices and Trends
	David Knopf, USDA, National Agricultural Statistics Service
10:00	Break, visit sponsors and silent auction
10:30	Update on Hay Making Equipment and Technology
	Josh Jackson, University of Kentucky
11:00	Barn Considerations for Cash Hay Operations
	Morgan Hayes, University of Kentucky
11:30	Evolution of Mechanization and Transport in My Hay Operation
	Ron Tombaugh, Dart Hay Service, Ink., Streator, IL
12:15	Lunch
1:00	Alfalfa Awards and Silent Auction Results
	Ray Smith, University of Kentucky
1:15	Farmer Panel: Baleage—How it Works on My Farm
	Todd Clark, Lexington, KY; Tom Wright, Shelbyville, KY; and Tom Greathouse, Midway, KY
	Moderated by Chris D. Teutsch, University of Kentucky
2:30	How Good is our Kentucky Haylage? A Summary of Farm Results
	Jimmy Henning, University of Kentucky
3:00	Survey and Adjourn

Forward

Thanks to the leadership of Dr. Garry Lacefield, the Kentucky Alfalfa Conference was initiated 38 years ago. The University of Kentucky and the Kentucky Forage and Grassland Council are excited to continue this tradition and we have now expanded the conference to include all stored forages. Our priority is to continue to provide a high-quality educational event each year; we challenge you to consider the content of the proceedings and the discussions of the day in light of your overall forage program. It is our hope you will go away with at least one idea or practice that you can implement to improve your overall program.

On behalf of the program committee, I want to thank the Kentucky Forage and Grassland Council for their continued support of this program. Special thanks the speakers for providing their presentations and papers for the proceedings. This meeting would not be possible without the support of the many exhibitors as well; please take a moment to visit with them during the breaks.

Special thanks are extended to Mrs. Rehanon Pampell for editing the proceedings and Mrs. Krista Lea for program planning.

I would encourage you to stay up-to-date with the latest forage research in Kentucky by subscribing to our online newsletter, Forage News, by visiting <u>http://forages.ca.uky.edu/</u> and signing up. In addition, you will find a wealth of publications and other resources to improve your forage management.

bay Mith

Dr. Ray Smith Program Committee

Dr. Jimmy Henning, Program Committee Dr. Chris Teutsch, Program Committee KFGC Board, Program Assistance

Table of Contents

Forward 3
Fixed Costs in Hay Production6
Hay Prices and Trends 12
Update on Hay Making Equipment and Technology16
Barn Considerations for Cash Hay Operations 20
Evolution of Mechanization and Transport in My Hay Operation
Farmer Panel: Baleage – How it Works on My Farm
How Good is our Kentucky Haylage? A Summary of 2017-18 Farm Results 38
Save the Date! 43

Fixed Costs in Hay Production

Greg Halich, PhD | Extension Specialist | University of Kentucky

When hay producers estimate cost of production they often focus exclusively on "cash costs" or variable cost of production such as fuel, repairs, supplies, fertilizer, labor (if hired), and rent (if leased). They all too often ignore their "fixed costs" of production such as depreciation, interest, labor (if family), insurance, and certain taxes. Although there are legitimate reasons to concentrate on cash costs in the short-run, it is a mistake in the long-run, as these are real costs. Fixed costs for equipment are often ignored because they are generally paid in lump sums, and thus there is a disconnect between equipment use and these costs. For example, each time you fill up the fuel tank you have a good estimate on the fuel cost for the running the tractor for the last ten hours. The same is not true for depreciation or interest on that tractor. You probably have no idea what that costs you.

These fixed costs add up. For hay operations that are overcapitalized (too much equipment for their level of production), the combined depreciation and interest costs for equipment are sometimes higher than all their cash costs combined. These hay operations will never be profitable and unfortunately, it may take them years to realize this. The high fixed costs will be a drag on the hay enterprise regardless of how efficient they are with the rest of the operation. In this article, I'm going to help you understand the magnitude of these fixed costs by focusing exclusively on depreciation and interest on equipment. These are by far the biggest and most important fixed costs, but the same concepts can be applied for the other fixed costs as well.

Most people have a baseline understanding of depreciation. However, there are two common misconceptions related to depreciation that must be addressed before we can move forward. The first is the belief that depreciation for tax purposes is real depreciation. It is not. IRS, or tax depreciation, is there for one purpose only: to determine what depreciation you can deduct for tax purposes. According to the IRS, a tractor is fully depreciated after seven years. Real depreciation is the difference between what you bought that tractor for and what you could sell it for today. Hopefully that tractor is still worth more than half of its original value after seven years. The rest of this article assumes real depreciation.

The second misconception is that all depreciation is a "fixed" cost, and this has been perpetuated by agricultural economists like myself. It is true that part, and potentially most of depreciation is fixed, but part of depreciation is also variable. To help understand this dynamic, imagine buying two identical new tractors. One you work hard for a year putting 500 hours on the tachometer. The other you park in the barn and never use. At the end of that first year you sell both tractors. Even though you didn't use the second tractor, will it bring as much as you paid for it a year ago? Definitely not in a normal situation. This drop-in value is the "fixed" depreciation. It doesn't matter if you use that piece of equipment or not, it will drop in value. You now sell the tractor that you ran for 500 hours. Will this tractor bring as much as the one you parked in the barn? Again, in a normal situation the answer is a definite no, it will be worth less. The difference in value between these two tractors is the "variable" depreciation: the more equipment is used, the steeper the drop-in value.

Interest on equipment is the other major fixed cost we will examine. If you have a loan on your equipment, interest is an obvious cost (although one you are still likely to forget about in the short-run). If, however, you self-financed a piece of equipment, it probably isn't an obvious cost, but I will argue it is still real a cost. For example, if you have a loan on your farm for 6%, with a balance of \$100,000 and your self-finance a piece of equipment for \$25,000, you could have taken that \$25,000 and paid off part of your farm mortgage. In general, the cost you allocate for self-financed capital should be the highest interest rate you have outstanding on your farming enterprise. If you are one of the fortunate few that have no loans on their farming operation you should charge yourself a reasonable interest rate based on what you could earn on that capital in a relatively risk-free investment elsewhere. This will likely be a lower rate compared to the rate for borrowed money. Technically, we should adjust the interest rate by the inflation rate to come up with a real interest rate. If the inflation rate was 2%, we would adjust that 6% mortgage down to a 4% real rate of capital. That would be an appropriate interest rate to use for that piece of equipment.

Now that you have a fundamental understanding of depreciation and interest we can look at some examples to help understand the extent of these fixed costs. Table 1 shows two capital investment scenarios for a hay operation, one with a total capital of \$250,000, and one at \$100,000. Note that for the tractors, it is assumed that they are also used for other farming enterprises (examples: grain, cattle), and thus we will pro-rate this capital by the relative amount of time they are used for each enterprise. In these examples, we are assuming they are used 70% of the time for the hay operation. The rest of the equipment is used only for the hay operation and thus we allocate the full value of that equipment to the hay operation. In the \$250K scenario, we have three tractors and have a large package square baler. In the \$100K scenario, we have two tractors and a small sized square baler. Some of this equipment may be purchased new, and some used. Obviously, most or all of the equipment in the \$100K scenarios. Don't worry so much about the exact line of equipment in these two examples, think about the value of your equipment when purchased (new or used), and adjusting those values for other enterprise use where appropriate.

The actual rate at which equipment loses value is highly variable based on the original value of the equipment, age, type of equipment, brand of equipment, and specific market conditions. For example, newer equipment will lose value quicker than older equipment, and balers will lose value quicker than tractors. The approach taken here was to try to calibrate the \$250K, \$150K, \$100K, and \$50K hay capital scenarios so that values after 5 years of use is realistic based on total usage per year (0, 500, 1000, and 2000 tons of hay produced each year).

	Table 1: Ha	ay Produc	tion Capital	Cost Sce	narios	
	\$25	0,000 Sce	nario	\$1	00,000 Sc	enario
Equipment	Initial Value	Percent Hay	Hay Capital (Initial)	Initial Value	Percent Hay	Hay Capital (Initial)
Tractor 1	\$65,000	70%	\$45,500	\$35,000	70%	\$24,500
Tractor 2	\$35,000	70%	\$24,500	\$20,000	70%	\$14,000
Tractor 3	\$20,000	70%	\$14,000			
Baler	\$100,000	100%	\$100,000	\$20,000	100%	\$20,000
Mower	\$30,000	100%	\$30,000	\$15,000	100%	\$15,000
Rake/Tedder	\$15,000	100%	\$15,000	\$10,000	100%	\$10,000
Accumulator	\$10,000	100%	\$10,000	\$8,000	100%	\$8,000
Wagon/Trailer	\$10,000	100%	\$10,000	\$7,500	100%	\$7,500
Miscellaneous	\$1,000	100%	\$1,000	\$1,000	100%	\$1,000
TOTALS			\$250,000			\$100,000

Table 2 shows the values of the four hay capital scenarios based on these production levels for five years. These values can be compared against each other to see how well they match with real world conditions. For example, with the \$250K initial hay capital scenario, the final value after 5 years if this equipment was parked in the barn without any production would be \$225K, which is a loss of 10% in overall value. This same 10% loss in value was applied to all the scenarios. While it is the same percentage, it will result in very different levels of overall value loss ranging from \$25K for the highest cost scenario to \$5K for the lowest cost scenario.

Think about this loss in value within the context of inflation. If, for example, the equipment in the \$250K scenario was actually worth \$237K five years from now in future dollars, it would be worth less than this in today's dollars. At a 1% annual inflation rate, this \$238K value would adjust downward to approximately \$225K. Thus in nominal values what may have looked like only \$13K in depreciation over five years was in reality \$25K in depreciation in today's dollars. Inflation tends to mask the true extent of depreciation.

Variable depreciation based on total hay production is assumed to be \$4/ton per year. Thus producing 500 tons of hay each year brought the value of the equipment down from \$225K (no production) to \$215K based on this production level. A production level of 1000 tons of hay each year would bring the value down to \$205K after five years.

Table 2: Equipment	Values by '	Various Hay	y Productio	n Levels
Tons Hay per Year	0	500	1000	2000
Acres (4 tons/acre)	0	125	250	500
Initial Value	\$250,000			
Final Value (5 Years)	\$225,000	\$215,000	\$205,000	\$185,000
Initial Value		\$150),000	
Final Value (5 Years)	\$135,000	\$125,000	\$115,000	\$95,000
Initial Value	\$100,000			
Final Value (5 Years)	\$90,000	\$80,000	\$70,000	-
Initial Value		\$50,	,000	
Final Value (5 Years)	\$45,000	\$35,000	-	-
<u>Note</u> : Fixed depreciation years; Variable deprec	on assumed iation assun	at 10% of ir ned at \$4/to	nitial value a n of hay pro	fter 5 duced.

The fixed and variable depreciation used here are rough estimates: they may be accurate for one farm with a particular equipment arrangement and may be off a moderate amount for another farm. However, the general concepts that you will see regarding how the combined fixed costs change as production changes, will be valid. A general understanding of how these fixed costs change based on production is the primary objective of this article. I am trying to keep your eye on the forest and not get you lost in the trees.

The real interest rate used (actual interest minus inflation) was assumed to be 4.5%. The resulting interest cost along with the fixed and variable depreciation previously detailed are combined to determine the total fixed costs (depreciation and interest) on a per ton of hay produced basis. Figure 1 summarizes these overall fixed costs of production with the four capital cost scenarios. For example, if you were using the \$150K hay capital scenario and produced 750 tons of hay per year, you would draw a line straight up from 750 tons until you hit the \$150K scenario (2nd curve from the right), then draw a horizontal line from that point to the left until you intersect the left axis, and read the result which would be \$15. This means that your estimated fixed costs (fixed depreciation, variable depreciation, and interest) are estimated at \$15/ton if you have \$150K of hay capital and produce 750 tons of hay per year. If you produced 500 tons of hay per year your fixed costs would decrease to about \$20/ton, and if you produced 1000 tons of hay per year your fixed costs would decrease to about \$12/ton.



Notice how, at relatively low production levels for each capital investment scenario, fixed costs are high and decrease rapidly with small increases in production (the fixed cost curve is steep). Also notice that at higher relative production levels each fixed cost curve starts to level out. Ideally, you want to be at or near that production level where it starts to level out to justify your capital investment.

For example, with the \$150K hay capital scenario, fixed costs per ton of hay produced are \$37/ton at a production level of 250 tons/year and drop quickly to \$12/ton at a production level of 1000 tons/year. The main reason for this dramatic decrease is that even though our total fixed costs are going up as we increase production from 250 to 1000 tons/year, it is only the variable depreciation cost that is increasing, the fixed portion of depreciation and interest stay the same. The total fixed costs increased 27% going from 250 tons/year to 1000 tons/year, but the production level increased four-fold. Dividing a small increase in total costs by a large increase in overall production results in a rapidly decreasing fixed cost curve.

What is an appropriate fixed cost for a hay operation? Well, you want it as low as possible, but you also must consider the tradeoff between reducing your fixed costs and potentially having higher labor and repair costs. Keeping labor costs in check is particularly important with small square bales so investing in capital equipment that reduces labor costs more than the increase in fixed costs would make sense. Cutting equipment costs beyond a point will be counterproductive. In the end, you need to strike a balance.

What is too high of a fixed cost for hay production? For cow-quality round bales I routinely tell producers that they need to get these fixed costs under 15/ton. This is because their hay is usually only worth 60-75/ton on the open market. You simply will not have a chance at making a profit when you are approaching 1/3 - 1/2 the value of the hay just on fixed costs before accounting for your cash



production costs. However, with more valuable hay, and particularly where you are making small square bales and large square bales that are dairy-quality, this target level for a reasonable fixed cost will go up. I would say at least to \$25/ton for large squares and maybe as high as \$35/ton for small square bales as long as you are correspondingly decreasing your labor costs. I have not done enough work related to fixed costs with these high-valued hays to know for sure, so use your best judgement.

If you have specific equipment-depreciation-interest scenarios that you would like to analyze, I would be glad to work with you on this. Contact me at <u>Greg.Halich@uky.edu</u> or at 859-257-8841.

Hay Prices and Trends

David Knopf | Regional Director | USDA, National Agricultural Statistics Service

Kentucky's large cattle and horse populations require considerable forage, and hay is one of the primary feed sources. The state ranks eighth nationally in the production of dry hay. This paper will look at this important sector of Kentucky's agriculture production, specifically at the available sources of hay prices and recent price trends.

Dry hay production in Kentucky during 2018 totaled 5.1 million tons, two percent lower than 2017, and the smallest crop since 2014. Figure 1 charts Kentucky's historic hay production. Average yields have been rising over time and reached a record high of 2.68 tons per acre in 2018. Harvested acreage has been trending lower and was at the lowest level since 1986. Much of this was a result of the plentiful precipitation, which boosted tonnage, but limited opportunities to harvest hay and overall forage quality.



Figure 1. Historic Kentucky dry hay production

Sources of hay prices include USDA's Agriculture Marketing Service (AMS) Market News and National Agricultural Statistics Service (NASS). AMS reports publish current market prices, while NASS reports are prepared for the primary purpose of estimating income farmers receive from hay sales. They also serve as an opportunity to view prices across time, made possible by an online database of prices.

Market News publishes reports on a periodic basis in several states, but is dependent on adequate funding and availability of data. Current hay market prices are a difficult piece of information to gather, due to the predominant practice of buying and selling hay in private transactions. Some examples of reports are Pennsylvania (see Figure 2.), a weekly report based on sales at hay auctions. Missouri, on the other hand, publishes a weekly report based on information primarily gathered from individuals



involved in private sales. The Kentucky Department of Agriculture publishes weekly information on sales of hay reported by auctions, but they are not USDA reports. AMS hay Market News is published at www.ams.usda.gov/market-news/hay-reports.

Market News reports prices by hay class, bale size and quality characteristics. Price units may be tons or per bale depending on regional sales practices. Bale weights are not precisely defined, but are labeled by size descriptions, such as small square and large round. Quality and nutritional characteristics are defined in guidelines and hay is categorized by one of five quality descriptions, superior, premium, good, fair, or utility. Designations are made by visual observation.





NASS publishes average hay prices received by farmers each month, and a marketing year average price. For Kentucky, an alfalfa price and all other hay prices are published. Prices are gathered from a sample of dairy farmers and from AMS Market News. Prices are weighted by type of hay and by sales volume. NASS reports are available at

<u>https://usda.library.cornell.edu/concern/publications/c821gj76b?locale=en#release-items</u>. Other USDA agencies use the price data in farm programs, such as the dairy Margin Protection Program, and farm income calculations.

Figure 3 charts the historic Kentucky hay prices over the last ten years. Prices for alfalfa hay moved to higher price levels in 2011 and 2015, in response to tighter hay supplies. Average prices reached \$225 per ton before backing off in 2017 and then rebounding across 2018. Acreage is not expected to expand much if any with declining dairy herds, and if supply remains tight look for prices to stay between \$210 and \$220.

Other hay prices have increased over the last ten years, but at a slower pace than alfalfa until 2018 when prices dramatically increased. Expanding beef herds starting in 2015 pushed hay demand and two consecutive wet growing seasons in 2017 and 2018 has the supply of good quality hay very tight. Livestock feeders have been seeking hay with the nutritional value that their animals need and are willing to pay a premium for it. History would suggest these prices will pull back to the \$100 to \$110 level if 2019 offers a better hay growing season.





Update on Hay Making Equipment and Technology

Josh Jackson | UK Extension Specialist | Biosystems & Agricultural Engineering

Introduction:

Precision agriculture has focused on optimizing efficiency. For crop production, yields can be obtained from the combine and integrated with soil nutrient data to characterize the response to changes in management strategies (spraying, harvesting, nutrient application, irrigation, etc). Currently the highest resolution for yield, for the majority of farms raising alfalfa in Kentucky, is based upon the field level of data. Specifically, most farmers could specify the bales per field. From this and a dry matter (DM) analysis, we can derive the following: bales per acre, tons per acre, total tons of DM, and nutrients removed. Soil characteristics can be assessed in an alfalfa field; while, site specific yield <u>within</u> a field cannot. As a farmer, difference in the potential of some areas of the field can be observed qualitatively but not quantified.

Drones, also called unmanned aerial vehicles (UAVs) or unmanned aerial systems (UAS) are one way in which the variation in yield and quality of alfalfa could be measured. The commercial operations of drones require the remote pilot to obtain a license from the FAA and also register the UAV with the FAA as well.

Two main methods exist for us to quantify yield:

- Photogrammetry
- LiDAR (Light Detection and Ranging)

Photogrammetry uses pictures from multiple angles, camera orientation parameters, GPS, and unique aspects of each photo to stitch the images together into a 2-D image or 3-D surface (Figure 1). From the 3-D point cloud, the surface area and volume of material can be estimated.

Figure 1. We are flying around 1 cubic meter 3D structures to help us quantify the yield using photogrammetry on the left. A representation of Lidar is shown on the right.





LiDAR uses the light from lasers to determine the distance to an object (Figure 1). The pulsed lasers are emitted from the unit and the time it takes to return is used to quantify the distance. Lidar data is used to create digital elevation models which is of interest to agriculture. When estimating yields, the canopy height models would provide information of everything that is above the ground's surface. This data is used to create a volume and a surface area to measure.

How much spatial resolution is good enough?

For photogrammetry and LiDAR, precision and accuracy can be limited by a number of factors: GPS quality, analytical variation, flight duration, time, flight altitude, coverage, flight speed, and wind speed to name a few. Field efficiency is still important to the operation of a UAV as battery life and other factors will dictate how many acres can be covered within a specified time.

For photogrammetry, overlap of the photographs is essential for proper stitching. For the sides and front overlap, 60% overlap is generally the minimum utilized. As the amount of overlap increases, the duration required for each acre will increase. The flight altitude will also influence the time required for obtaining images. As flight altitude is elevated, each image will represent a larger area. Thus, it would take less images to cover a field. This increase in altitude would inherently lead to less processing time but a lower resolution. The current flights for evaluating alfalfa yield were conducted with at a flight altitude of 30 ft above ground level. The goal was to create a detailed surface feature for developing regressions.

For the lidar system used, distance measurements are collected at a constant rate. Therefore, as speed increases, the point density of the LiDAR system decreases. Point density follows a power series and will be directly proportional to 1/velocity. The current LiDAR system we are testing can measure 320,000 points a second in a static position. As the flying speed increases, these points will be spread over a greater area. Increasing flight speed results in less spatial resolution, but also decreases the computational complexity of the data resulting in a faster processing time. With the Lidar system, there are many different ways to measure volume - block method, octree method, alpha shape method, and cube method. As the speed increased, the alpha shape method provided the least change in volume measured. Similar to photogrammetry, as altitude increases, the coverage area for the LiDAR scan also increases, but again resolution goes down.

Comparison

LiDAR focuses more on the geometric relationships: distance, angle, and reflectance measurements. This data is then transformed from spherical coordinates to Cartesian coordinates (x, y, and z) for use. Photogrammetry utilizes spectral data associated with red, green, and blue to create one related dataset. Photogrammetry is easier to visually understand and analyze as you can infer from the images what is visually represented.

The histograms from both the LiDAR at steady state and photogrammetry were similar but offset by 100 mm in height. More data will have to be analyzed to determine which would be preferred.

A challenge for both is lodging. It is hard to predict how much crop is there when the material is logged as the actual height is greater than the measured height of a crop. With the ample rainfall last year, harvesting windows were greater than typically expected. Therefore, the apparent height measured in both cases was less than the true height of the plant. In terms of our return on investment, both systems are going to need further analysis to determine which system is going to be the most cost effective. Both require significant post processing. For each there are different apps or programs which could be used to analyze the data. Photogrammetry lends itself to currently available drones as most commercially available drones are used to collect images. Photogrammetry provides a more turnkey solution at the present time; however, issues with accuracy are expected. At the present, LiDAR is going to inherently require more investment as larger drones are required to carry the LiDAR system. Also, the LiDAR system is an additional purchase. The actual ROI will be dependent upon what management decisions can be ascertain from the data obtained. From the yield maps and variable rate equipment, cost saving or improvement in the resource allocation would have to be realized to make the drone a practical purchase.

Future

At the present time, there is no system which gives us a simple push button solution for determining yield. Some systems will create a map with pretty colors. However, due diligence must be used to ascertain how their data was obtained and validated. Post-processing is still a major obstacle, but this challenge is being addressed by other advances.

Sources

Dasika, Surya Saket, "ASSESSING THE SPATIAL ACCURACY AND PRECISION OF LIDAR FOR REMOTE SENSING IN AGRICULTURE" (2018). *Theses and Dissertations--Biosystems and Agricultural Engineering*. 56. <u>https://uknowledge.uky.edu/bae_etds/56</u>

Barn Considerations for Cash Hay Operations

Morgan Hayes | University of Kentucky | Biosystems & Agricultural Engineering

A well designed and built a barn can be invaluable for cash hay operation. Barn provide opportunity to reduce losses in dry matter and help maintain quality throughout the winter. There are numerous styles of barns that hay producers can purchase or build themselves. Wood frame structures, often with metal roofs and metal sides, are fairly common. You can also build barns with a steel structure with or without metal siding on the walls. Hoop barns are another common hay storage structure - particularly common with round bale storage. All, however, provide valuable storage for hay. There are four areas of consideration for ensuring the barn style chosen will be effective on a specific hay operation: site selection, barn sizing, construction approaches, and ventilation.

Site Selection

Site selection can make a huge difference in how effective a barn can protect hay from weather as well as impact accessibility, safety, and security. A barn should not be placed in a low-lying or wet area, and any excavation done prior to construction should intentionally shed water <u>away</u> from the barn. Barns should be accessible for easy storage and retrieval of hay as well as for your hay buyers in all weather conditions. Consider a large staging area and turning area for trucks and trailers – remember, not all customers are highly proficient at maneuvering their trucks and trailers! If you ever plan to expand and add more barns, it is recommended to have 75 feet or more between barns for fire safety. And, unfortunately, consider the security of your barn and install security lights to deter someone from potentially stealing your hay.

Barn Sizing

One of the real challenges in considering hay barns, is choosing the right size and footprint for the barn. The size of bales produced will influence the necessary dimensions of the barn. As a general rule, square bales will need a footprint of 10 to 15 square-feet for every ton of hay and for round bales 16 to 24 square-feet will be required for every ton of hay. The barn should be wide enough to allow for the hay to be stacked with a 2-foot buffer between the edge of the haystack and the wall. In addition, there should be at least 2-feet between the top of the haystack and the bottom of the truss. The capacity of the barn should be determined based upon how you stack your hay. Some producers stack square bales the full depth of the barn, while others leave space between stacks to allow the hay to breathe better. The round bales pyramid stacking or barrel stacking the bottom row in a barn will affect storage capacity. One philosophical consideration each producer must determine for themselves is if they want to grade their hay and if so how many different products do they want to market. Some producers may prioritize a first-in/first-out approach with one product while others may choose to sell hay based upon cutting and/or field. An important consideration in barns with closed walls is that there are less access points to the hay stacks making grading and sorting more difficult. Adding additional doors may be helpful or constructing the barn with one side completely open.

Barn Construction

When constructing a barn there are some strategies to improve the performance of the barn. First, choose the right flooring. The purpose of the barn is to reduce the breakdown of bales. Typically, condensation on the floor is one of the most challenging management points in a barn. Concrete wears

well with equipment loads and is easy to clean at the end of the season; however due to its conductivity, it is susceptible to condensation. Pallets are often used in order to allow the floor to breathe thereby reducing condensation and potential mold on floor bales. Unfortunately, the labor in moving pallets does make them a less desirable material. A well-built elevated gravel pad in the barn is a strategy to improve floor bale quality. A second tip for barn performance is to ensure that bales are not leaning against the walls in the barn.

Typically, the sidewalls are not designed to handle a load pushing on the post. This pressure on the posts can damage the structure prematurely. The final tip on the construction of a hay barn is to remember that open sided barns are susceptible to wind loads. Most hay barns are at least partially open and therefore susceptible to wind loads trying to lift posts. A properly embedded post set at least 4 feet in the ground with a concrete anchor at the base of the post should keep your hay barn from needing repairs due to typical winds.

Ventilation

The final consideration in developing at hay barn is ventilation. A barn that is completely sealed on all sides will have moisture issues. During the initial heat cycle and throughout the storage period, hay will be releasing moisture. In addition, here in Kentucky, our climate swings in temperature that often have condensation occurring on metal roofs and sidewalls. If barns are not well ventilated, all this moisture will reenter the hay bales. No drip coatings on metal siding can reduce water dripping within a barn; however without ventilation, the moisture does not leave the barn and can still be reabsorbed by the bales. Barns that are less than 70 feet and have open end walls can potentially be ventilated through the end walls alone. However, for barns with a length greater then seventy feet, the barns should have openings at the eaves and bottom of the sidewalls as well as a vent in the peak of the roofline.

















5x5	Bale	Storage	Capacity
-----	------	---------	----------

Barn Dimensions	Floor Area sq. ft.	End Access	Side Access
32 x 64	2048	180	198
36 x 64	2304	216	231
42 x 64	2688	2.52	264
48 x 64	3072	288	297



































see blue.

Evolution of Mechanization and Transport in My Hay Operation

Ron Tombaugh | Dart Hay Service, Inc | Streator, IL

Good morning! My name is Ron Tombaugh. I was born and raised on a dairy farm near Streator, IL. Streator is about 100 miles southwest of Chicago. Our farm was in the northwest corner of Livingston county, one of the largest counties in IL. To give you an idea of the crops grown there, Livingston County along with 4 surrounding counties produce more corn than the neighboring state of Missouri! Dairy farms were not real common in our area then, and are almost non-existent in the area now.

I started my business of Dart Hay Service in 1983. In this presentation, I'll share with you how this business has evolved, and the changes in the machinery that have evolved with it.

Our farm consisted of 600 acres in 3 parcels. The 'home farm', where we lived and did the milking, consisted of 240 acres. We milked approximately 100 head of Holsteins until we dispersed the herd in August of 1977. Besides the milk heard, we raised all the heifers and most of the bull calves. So we usually had about 250 mouths to feed and maintain. I had 2 older brothers, and along with 1 fulltime hired man, we spent a lot of time producing and feeding forages for the whole herd.

My first memories are baling small bales! We bought a New Holland 271 baler in 1965 to bale all the hay and straw. It had a bale thrower on it, so my oldest brother could do the baling and load the 'basket' racks by himself. Early on, my job was to transport the wagons to and from the field and help unload the wagons. We didn't stack the bales in the mow, just let them fall off the hay conveyor, the same fashion they fell in the hay racks. So, nobody was needed in the mow until the pile grew up to the level of the conveyor. Then either my other brothers or I would go up and just throw the bales off a little to allow more to fill the mow. It would take 2 guys in the mow to finish filling the mow. After that section of the mow was filled, we would move the conveyor to another section of the mow and start the process over!

In 1973, the first major change came along! A New Holland 850 round baler! My oldest brother and I purchased it to reduce the labor needed to bale the hay for the dairy herd. Dad provided us a tractor to run on it, and I was able to do custom baling for neighbors after we got all our hay baled. This was a big labor-saving device. And, could bale faster. The third benefit was it made it less critical to get the hay under cover than the small bales. To maintain the desired dairy quality hay, we still made every effort to get the hay inside before bad weather hit but didn't have the same pressure. We continued to fill the mows with small bales, just not as full.

1976 brought a big change to our operation. We were approached by New Holland to be a 'farmerdealer'! At that time, we owned 12 pieces of New Holland equipment; combine with both heads, skidloader, small baler, round baler, haybine, hay conveyor, running gear, grinder mixer, hay rake, and manure spreader! My Dad and I ran the dealership. We had a bookkeeper, parts man, and a couple mechanics. Dad and I did the selling. The mechanics and I attended service schools, and did the service work. 1977 brought some more change. Our milking parlor was 22 years old and in need of an 'upgrade'! I was more into the machinery side of things, and my oldest brother was working with our Dad's uncle in the farm management business. So in August, we dispersed the dairy herd. Was awfully lonely around the farm for a while, after being so vibrant for so long!

In 1983, I purchased a new New Holland 326 small square wire tie baler and a New Holland 1034 bale wagon. My experience with the bale wagon was short lived. Between 1st and second cutting, a man approached me about buying the bale wagon. So, I upgraded to a 1049 self-propelled bale wagon. This allowed me to travel roads at 40-50 mph, instead of 18 mph with a tractor pulling the wagon. It also allowed me to transport 160 small bales, instead of 104 bales. A win-win!

At the end of the first year, I converted the baler to twine. Having to change the twister stack to knotters and change the needles. Wire was getting harder to find, and plastic twine was getting more popular!

With the self-propelled wagon, I was able to keep up with two high capacity balers in straw, if I was stacking in the same field. It also allowed me to transport hay longer distances, back to my storage shed. The only real obstacle to the SP wagon was the tipping height. The stacks were 9 bales high on edge, so about 13'6" when in place. But were about 17' when tipping up. So I usually took the last 3 bales off while putting the bales in the stack inside the shed!

This system worked well for several years! Then in 1988, a friend of mine was using the SP bale wagon to transport hay I had sold him for his bull stud. He was involved in an accident, and the bale wagon was destroyed. I then replaced it with a FarmHand accumulator. It was an 8-bale unit. This allowed us to load the trucks with 1 person on a tractor with accumulator fork, and 1 man on the truck putting the bales in place. The accumulator worked fairly well but didn't work fast enough for the higher capacity baler. So, the next year I attached a newer Hoelscher accumulator. This held 10 bales on edge, and worked much better, letting the baler be more efficient. At that time, between my Dad and I, we were doing 4 cuttings on 300 acres of alfalfa.

Along with our own, I was buying hay from neighbors through the winter to haul to Wisconsin, as they had just had a severe drought. I had an acquaintance that ran a feed business in central WI. He had been a rep for Purina in his prior career, have been to our farm when I was younger. He was a great resource for selling dairy quality hay. He basically 'pre-qualified' the buyers and sent me their names from his 275-customer list. At that time, I would get up in the morning, be loading hay by 7am, taking about 2 hours. Then drive 4 hours to WI to unload. Usually take 2 hours to unload, and then drive 4 hours home. Handling 630 small square bales on, and off the trailer was an extensive workout. I was hauling 5-6 loads per week. That went from late October to early spring. I was in the best physical shape of my life!

In 1991, I started hearing about 'big square' balers! Hearing about them to the extent that I was buying 'big bales' in WI, and delivering them to western KY. The bales I was buying were 2x3x8 square bales out of a NH D1000 baler, weighing about 600 pounds. Could get a good load on! The only problem was loading the bales 3 wide, made the load 9'. After more experience, decided to flip the center bale on edge, and make the load legal width, but giving up couple bales in the process.

In 1992, I purchased one of these balers to run in my own operation, along with my small baler and my round baler. After running the 'big square' baler, for 1 year, I decided to get rid of the small baler and the round baler. It made so much easier to decide which baler to use, if I only had 1 option which baler to use, instead of 3! I had expanded up to 720 acres of hay.

I still view 1994 as my 'Gold Standard'! My father passed away in March of 1994. I was up to 640 acres of hay. I had 2 helpers. We did 1st cutting in 10 days, start to finish, and only had a stack of checks to show for it. One helper lived in the haybine, cutting 80 acres/day. The other helper serviced equipment, while I raked 80 acres of hay. Then when we started baling, I ran the baler and he loaded trucks. All the hay was baled and loaded on outside trucks for delivery. No hay went into the barn!

In that year with 3 balers, I even experimented with baelage, wrapping high moisture hay! It was a way to beat the weather but was new enough that buyers did not want to buy the extra moisture. Also, buyers wanted to see the product under the plastic wrapping. Times have changed now, and baleage if better accepted as a viable feed. Transporting extra water is still a costly expense.

I ran the New Holland D1000 for 6 years, putting over 56,000 bales through it. It was a good baler. I had even put a Hoelscher accumulator behind it. Even went as far as expanding the accumulator to hold 5 bales, instead of 3. I had put wings on the tables and had them fold hydraulically. By using a bale accumulator, the baler operator can group the bales in the field. He can obviously dump the bales close to the headland of the field and can group the bales in 1 area of the field, and can even group them partially across the field, instead of having to travel to the 'far end'! This also eliminates having to run trucks all over the field to load the bales.

In 1998, I replaced the NH with a Hesston 4755, 3x3 baler. This baler produced a bale that was easier to load. I was able to max out the truck with weight, sometimes a little too much. I still buy a lot of bales this size today. It's probably the most popular size bale here in the Midwest.

In 2003, I was offered a large amount of straw from a local farmer, 2000 acres. I found a buyer for it. But instead of baling it myself, I came across a custom operator from Colorado who was in the middle of a drought. He had balers and stackers and was looking for work! We agreed on a deal, and he brought couple balers to Illinois, and baled my straw. He used Hesston 4900, 4x4 balers. They made a 1400-1500 pound bale! It worked out so well, I bought a Hesston 4900 baler for the 2004 season to bale straw. I never did bale hay with the 4x4. It didn't have a preservative applicator on it. So the 2 balers had their specific crops to bale, 3x3 in hay, 4x4 in straw!

The straw enterprise grew faster than the hay. I had contracts with the local mushroom farm. I had expanded to 5-6000 acres of straw, while still doing 2-300 acres of hay. I also included a couple of self-propelled swathers. Some of the straw I was buying was out of International/Case combines. The mushroom farm wanted "long" straw. So the combines cut the wheat just below the heads, and then we came through with the swathers to cut the straw stubble to the ground. At my peak, I was running 3 swathers, 3 4x4 balers and 2 loader tractors. A lot of the straw was being hauled 60-90 miles. A lot of days, we were baling and shipping 25-30 or more loads of straw, covering 300+ acres per day.

That all changed on Easter of 2007! A Freeze came through and killed all of the wheat. So my operation changed! I was forced to move further away to find wheat to bale the straw. I was able to supply a

portion of what I had done in the past. But in the meantime, the mushroom farm also found other sources of straw.

In 2010, I converted my 4x4 balers into 3x4 balers. Sort of a combination between the 2 previous sizes. The 3x4 has been a good decision. It makes a 1000# straw bale and a 13-1500 # hay bale. So I can get a 20-22 ton load of straw, and can't fill the trailer with hay for a legal load. I ran 2 Hesston 4790 3x4's for several years. Only one of them had a preservative kit, so it did hay. Then I ran both in straw. I ended up trading both of the 4790's to a straw source in Canada in the fall of 2015, for straw. That deal hasn't been all consummated yet. There have been some health issues and weather issues to contend with. But in the meantime, I moved up to a New Holland Big Baler 340. It was a used unit. But has performed really well for me.

I have expanded into baling corn stalks this past 2 years. I felt this year straw was going be short, so the corn stalks would make good bedding. I even have a couple guys feeding the stalks, adding it to their TMR rations. Some of the stalks were from a chopping corn head. These stalks were a bit shorter than the other stalks that were 'mowed' with a batwing. All the stalks were raked into a double windrow, and then baled. These bales were heavier than the straw bales, running about 1100 pounds.

A couple other machines that I've seen around but have limited experience are the 'Bale Bandit' and the 'Bale Baron"! Both units collect small bales in 21 bale bundles. This give the operators the advantage of handling a larger package of hay, but still having small bale control at feeding time! The 2 separate 'bundling' machines hold the small bales together w strapping for the Bandit, and bigger twine for the Baron. Then these 21 bale bundles can be handled with tines on a fork, or a grapple!

I have always been partial to NH when it comes to mowing machines. I grew up with them. I've worked on them and getting to know them pretty well in 45 years. I like the intermeshing Chevron rolls! I feel they are aggressive to pull the crop through, and gentle enough not to knock off leaves in the process! I like seeing the stems cracked every 2.5-3", to get consistent drying.

Right now, I am using a 15.5' self-propelled NH HW340. I leave the windrows as wide as possible, without running on any of the windrow. Then come through with a NH 216 Twin Rake to put 2 windrows into one. I have to leave about 8 feet between windrows, so the tractor fits between the 2 windrows when raking. On first cutting, it makes for a good-sized windrow. It works best to rake at a speed that puts the 2 windrows side by side, instead of actually touching. This allows for better continued drying!

Farmer Panel: Baleage – How it Works on My Farm

Todd Clark | Clark Family Farms | 4101 Georgetown Road, Lexington, KY 40511

My Farm's Experience with Baleage

Scope of Operation

115 Brood cows (late Spring calves)
300 + Finishers (Whole Foods final destination)
Raise and purchase replacement heifers
Red and Black Angus/Charolois/Simmental/and South Poll genetics
Red Angus and SimAngus Bulls
2000 acres total operation

All acres in forage less 20 acres of tobacco and 17 acres of Hemp 20,000 Broiler Chickens produced in Pasture based system 1000 Laying Hens maintained in Pasture based System 60 Katahdin Ewes producing 90 Lambs

Hay production exclusively on 400 acres Hay production 2018 (20,000 small squares and 2000 rounds)

Baleage 2018 (750) Forage base of OG, BG, Fescue, white and red clover, and various forbs Alfalfa OG mix on 120 acres

Why Balage

Easier to navigate weather Less Waste Higher quality Better Palatability Easier to maintain condition of cattle Ability to get forage off field when other methods wouldn't work

Current System

Tubeline X2 inline wrapper McHale V660 baler with chopper net wrap Kuhn V Rake Kuhn Mower Conditioner Krone Tedder Hay is cut every 4"in center of bale but not outside 8" of either side 3 wraps of net due to chopping and small pieces

Same guidelines for making hay are followed (stubble height, conditioning, density) Density of bales can be controlled through baler monitor. Feed Haylage by end of first year 50% to 60% moisture range (some fluctuations)

Lessons Learned and Preferences

Less plastic used per bale in an inline system vs individual bale Harder to sell inline bales other than at feeding time Chopped bales can be consumed easier (especially when density is high) by livestock Prepare silage as if it will be dry hay (condition if possible, ted, etc) Net is superior to twine (both speed of baling and smoothness of bale for wrapping) Net is hard to remove when frozen during single digit weather Junk in - Junk out (Ensiling does not improve bad forage) Baleage can be carried over to following year but not ideal Wrapping at night can increase bugs wrapped in plastic to later be picked out by raccoons and birds, which break the air tight seal. Can't skimp on number of wraps of plastic and succeed.

Easier to retain Alfalfa leaves and Clover leaves with some moisture (baleage system)

Tom Wright | Shelbyville, KY

Why and How? My experience with Inline Bale Haylage in Shelby Co.

Size of operation in Shelby co.

70 brood cows Split calving - 45spring/25fall Background all heifers for around 5 mo. Raise all replacements Most are Angus cows 2 registered Angus bulls 1 registered Hereford on 1st calf heifers 300 acres rolling farm land

Rent another 35 acres across from farm Row crop approximately 112 acres per year All row crop land will get wheat,rye or oats for cover crop I triple cropped 13 acres in 2018 with rye for cover crop, spring oats for second, soybeans for third crop 53 acres in designated clover, orchard grass, fescue Row crops are rotated to clover and orchard grass I frost seed all clovers and grasses Remainder of farm in pasture and woods

Why Balage?

Difficult to get hay up dry (especially early cutting) Unable to harvest crop before mature To improve quality Cutting often helps control weeds Have a full time job in addition to farming Ability to plan for additional labor Window of opportunity can be controlled Can do cereal grains (cover crops) and still have no-till row crops The cover crops really help with the no-till weed control Leaf loss - like tobacco, you wouldn't strip it when leaves are really dry Quality has greatly improved No need for protein supplement to brood cows Flesh scores on spring and fall cows remain good

In The Beginning

I purchased a used Anderson type wrapper in winter of 2008 It used 20 inch plastic and was all hand operated I had a Gehl baler from 1980s, great for its time, string tie only High moisture hay was about all it could handle, density was fair, productivity was poor

What I have learned

Did not use enough layers of plastic wrap initially. Baled at too high moisture String tie caused stems to punch holes in plastic leading to alot of rot and animal damage Very slow process with older baler and wrapper Much of Haylage molded and rotted A percentage did turn out well This gave me some hope I could make this process work

Current Process

I do a lot of cereal grains now I do 7 to 9 wraps (layers) of plastic per bale I net wrap all bales I currently use a John Deere 567 baler (regular not a silage special) I drive a lot slower in high moisture hay to get density as high as I can I use a 12 wheel V rake I still use same Gehl disk mower (non- conditioner) I use a Anderson NWX-660 x tractor wrapper; it uses 2 -30 inch rolls of plastic I learned - do not wrap going down grade (downhill) with wrapper (can't compress rolls, air gaps) 54 inch diameter bales Cut 2 1/2 to 3 inches height Try to keep dirt out of windrow Cut early boot stage 50% to 60% moisture range Feed all Haylage within one year Handle rolls gently to not loosen them up My wrapper is pretty automated, but you still need to watch for bales that don't align well and add extra plastic at joints (where bales come together)

Tom Greathouse | Midway, KY

Tom Greathouse farms in Midway, Kentucky with his brother, wife, and 3 of his children. They raise a multitude of crops including corn for grain and silage, soybeans, wheat, burley tobacco, alfalfa hay, grass hay, and a variety of specialty crops and vegetables across 1,200 acres. In addition to the crops, the Greathouses also raise 310 head of commercial cows/calves. Calves are often weaned and backgrounded to approximately 850 pounds or sold as finished animals to local outlets.

Haylage plays an integral role in feeding cattle across farms. It allows us the opportunity to put up a large amount of hay quickly and timely, then provides time for other farm tasks including planting other crops or setting tobacco. Most is made from small grains, alfalfa/grass mixtures, or clover/grass mixtures.

All of these crops are cut with a mower conditioner. Tedding and raking are usually dependent upon conditions. Most fields are cut one day and baled/wrapped the following. Round hay bales are wrapped with an inline wrapper and covered with 6-7 layers of plastic.

Haylage is fed quickly, trying to keep fresh haylage available to animals at all times. Sometimes the haylage is supplemented with corn silage, distillers' grains, or other commodity feeds dependent upon the class of cattle it is being fed to.

How Good is our Kentucky Haylage? A Summary of 2017-18 Farm Results

Jimmy Henning, PhD | Forage Extension Specialist | University of Kentucky Coauthors: Jeff Lehmkuhler, Levi Berg, April Wilhoit, and Corinne Belton and Tommy Yankey

The ability to harvest moist forage as hay gives Kentucky producers many advantages, including timely harvest, higher forage quality, and less weathering loss over hay systems. The baleage system allows producers to utilize commonly available forage equipment (mowers, rakes, balers) rather than requiring choppers and silo structures or bags. Making high quality baleage requires timely access to bale wrappers.

To make high quality baleage, producers should:

- Cut at the proper stage of maturity.
- Bale when the wilted forage is between 40 and 65% moisture content (MC).
- Bales should be as tight as possible to help exclude oxygen and accelerate the ensiling process.
- Wrap bales within 24 hours, and ideally the same day.
- Move bales to the wrapping/storage site.
- Wrap bales with a minimum of four and ideally six to eight layers of UV-stabilized, stretch wrap plastic.
- Periodically check the wrapped bales and plug any holes present in the bales.

Inline bale wrappers speed up the baleage operation and saves plastic over implements that wrap bales individually. The popularity and expanding availability of inline bale wrappers has resulted in greater application of the technology among Kentucky producers. Most producers have had excellent results in making and feeding and even selling baleage. However, some producers have had animal performance problems and even deaths from feeding baleage. In nearly all cases, feeding problems with baleage are caused by poor quality arising from excessive moisture, inadequate or punctured plastic wrap. These problem instances are few but are often cited as a barrier for adoption of the technology.

To better understand the haylage system, and to possibly predict when problems will occur with baleage, a project was initiated to sample a wide variety of farmer-produced baleage. Samples were collected in Anderson, Estill, Fleming, Henry and Shelby counties from haylage made in 2017-18. In all, a total of 44 samples were analyzed. These samples included soybeans, small grains, grasses, grass-legume and alfalfa. Cutting dates ranged from late spring to late November.

Results

In general, all but one lot of haylage had good visual and odor characteristics. Producers have reported no feeding issues to date. The one problematic sample contained high levels of butyric acid and the producer was advised that it could be a problem. Forage nutritive value was high, with crude protein, total digestible nutrients (TDN) and relative feed value (RFV) averaging 15%, 56% and 100, respectively.

The stability of baled silage can be measured by the total amount of volatile fatty acids (VFA) produced as well as the VFA profiles. Total VFA across all samples averaged 6.0% which is on the low end of the

recommended range of 5.0 to 10.0 (Dairy One Forage Laboratory). The average lactic acid value for these samples was 2.4%, slightly below the recommended value of 3%.

Discussion

Moisture content had the greatest impact on total acidity, explaining 76% of the variation (the high butyric acid sample was omitted from this analysis). Interestingly, for baleage with MC between 40 and 60% (a commonly recommended accepted range), lactic acid concentrations failed to exceed the desired level of 3% in 14 of 16 samples. In this sample set, recommended lactic acid concentrations were met more frequently when MC were between 60 and 75%.

As mentioned before, only one sample had an 'off' VFA profile, having a butyric acid content of 4.5%. In good baleage, butyric acid should be less than 0.1%. The average across all samples was just above that value at 0.2%. Fifteen out of 44 samples had butyric acid values above 0.1%, but all but one of those were 0.4% or less. The excessive amounts of butyric acid are most likely due to the very high MC when baled (80% measured as baleage).

Conclusion

Baleage is a system which can readily produce high quality forage in Kentucky. VFA profiles were variable, and very highly correlated to MC. Baling at MC on the wetter end of the recommended range (60% or above) produced higher levels of 'good' VFAs in these samples. Very wet baleage (80%) leads to high levels of 'off-type' VFAs.









see blue.

Save the Date!

Novel Tall Fescue Renovation Workshop

March 20, 2019 Princeton, KY

Kentucky Fencing School

April 9, 2019 – Lexington, KY April 11, 2019 – Burkesville, KY May 30, 2019 – Russellville, KY

Kentucky Grazing School

April 23-24, 2019 Princeton, KY



Novel Tall Fescue Renovation Workshop

Wednesday, March 20, 2019

8:30 am-5pm CDT

Toxic tall fescue reduces livestock weight gains and lowers reproductive performance. This one day workshop will give you the tools and information needed to remove toxic tall fescue and replace it with novel tall fescue varieties. Speakers include local producers, company representatives and researchers from across the country.







Organized and Sponsored by the Kentucky Forage and Grassland Council, UK Cooperative Extension Service, and the Master Grazer Program

helping producers learn the newest fencing methods and sound fencing construction with classroom and hands-on learning

- WHEN: April 9, 2019 in Lexington, KY April 11, 2019 in Burkesville, KY May 30, 2019 in Russellville, KY
- WHERE: Pirri Equine Teaching Pavilion UK Maine Chance Farm 2815 Newtown Pike Lexington, KY 40511

Cumberland County Extension Office 90 Smith Grove Road Burkesville, KY 42717

Logan County Extension Office 255 John Paul Road Russellville, KY 42276



2019 Kentucky F

COST: \$30/participant -- includes notebook, refreshments, and lunch

Lexington, KY	Burkesville, KY	Russellville, KY
Registration by U.S. Mail:	Rehanon Pampell UK Research and Education Center 1205 Hopkinsville St. Princeton, KY 42445	LIMITED TO 30 PARTICIPANTS!
Name:		
Street:		
City:	State:	Zip code:
Email:		
Cell Phone:		
Number of participants	x \$30 per participant =	Total Amount to Enclose
Make CHECKS payable to	: KFGC	

More information is available at http://forages.ca.uky.edu or Rehanon.Pampell@uky.edu

2019 Kentucky Fencing School Agenda

7:30	Registration and Refreshments
8:15	Welcome and Overview of the Day
8:30	Fencing Types and Costs - Morgan Hayes, UK
9:00	 Fence Construction Basics - Clay Brewer, Stay-Tuff Perimeter fences vs. cross fences Fencing options on rented farms Proper brace construction Line posts and fence construction
9:45	Break - visit with sponsors and presenters
10:15	Overview of Kentucky Fence Law - Clint Quarles, KDA
11:00	 Electric Fencing Basics - Jeremy McGill, Gallagher Proper energizer selection and grounding Proper high tensile fence construction and wire insulation Electric offset wires for non-electric fences Underground wires and jumper wires
11:45	Innovations in Fencing Technologies - Josh Jackson, UK wireless fences, fence monitoring
12:15	Catered Lunch - visit with sponsors
1:00	 Hands-on Fence Building - Clay Brewer, Stay-Tuff; Jeremy McGill, Gallagher; and Jody Watson, ACI Safety, fence layout, and post driving demo, Jody Watson, ACI H-brace construction, Jeremy McGill, Gallagher and Clay Brewer, Stay-Tuff Knot tying, splices, and insulator installation, Jeremy McGill and Clay Brewer, Stay-Tuff Installation of Stay-Tuff Fixed Knot Fence, Clay Brewer, Stay-Tuff Installation of High Tensile Fencing, Jeremy McGill,









 Cooperative Extension Service
 Educational programs of a religion, political blefs, tes status, genetic information Kentucky State University Community and Economic Development
 Educational programs of a religion, political blefs, tes status, genetic information Kentucky State University LEXINGTON, KY 40546

Educational programs of Kentucky Cooperative Extension serve all people regardless of accanosis or social status and will not discriminute on the basis of race, color, ethnic origin, national origin, creed, religion, political beller, sex, sexual orientation, gender identify, gender expression, pregnancy, mental status, genetic information, age, veteran status, or physical or mental disability. Linevesity of Kentucky, Kentucky, Statu University, U.S. Department of Agriculture, and Kentucky Clauriles, Cooperating, LEXINGTON, KY 40546





More information is available at http://forages.ca.uky.edu or Rehanon.Pampell@uky.edu

Spring 2019 Kentucky Grazing School

helping producers learn the newest grazing methods with classroom and hands-on learning

Emphasis on ruminants - beef, dairy, sheep, & goats

Tuesday April 23, 2019

7:30 Registration & Refreshments

- 8:00 Introduction of staff and participants
- 8:15 Benefits of Rotational Grazing Dr. Ray Smith
- 8:35 Meeting Nutritional Needs on Pasture-Dr. Donna Amaral-Phillips
- 9:05 Grazing Math Concepts/ Introduce Field Exercise-Dr. Jeff Lehmkuhler
- 9:45 Break & Travel to Field Demonstration Area
- 10:10 Introduction to Temporary Fence- Jeremy McGill
- 10:30 Portable/Seasonal Water Systems- Dr. Jeff Lehmkuhler
- 10:50 Methods to Assess Pasture Production and Determine Stocking Rate- Dr. Ray Smith
- 11:30 Hands-on Building a Rotational Grazing System in the Field: Setting up Small Paddocks- Drs Ray Smith, Jeff Lehmkuhler, & Chris Teutsch
- 12:20 Lunch
- 1:00 Fence building: Understanding How to Build and Use Temporary Fencing and High Tensile Fencing – Jeremy McGill
- 2:30 Break and Travel to Teaching Facility
- 3:00 Growth of Grasses and Legumes with Response to Grazing- Dr. Ray Smith
- 3:45 Making Tall Fescue Work on Your Farm-Dr. Jimmy Henning
- 4:15 Economics of Grazing- Dr. Jeff Lehmkuhler

Wednesday April 24, 2019

- 7:30 Refreshments
- 8:00 Forage Species for a Comprehensive Grazing System-Dr. Chris Teutsch
- 8:45 General Management Considerations for Grazing Livestock- Dr. Donna Amaral-Phillips
- 9:15 Using KY GRAZE to plan your Grazing Program -Adam Jones

10:00 Break

- 10:30 Fundamentals of Laying out a Grazing System -Kevin Laurent
- 11:00 Case Study: Design an on Farm Grazing System (Group Project)
- 11:45 Case Study Presentations
- 12:30 Lunch
- 1:15 How I made grazing work on the farm- Producer Speaker
- 1:45 Rejuvenating Run down Pastures Dr. Chris Teutsch
- 2:30 Evaluation- All Participants
- 2:45 Break & Travel to Field Demo Area
- 3:10 Field Exercise. Observe grazed paddocks and hear reports of each group. Tour demonstration plots showing warm and cool season annual to extend the grazing season, renovation options and the effects of rotational grazing.
- 5:00 Adjourn



see blue.