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Livestock Update

Beef - Horse - Poultry - Sheep - Swine

May 2016

This LIVESTOCK UPDATE contains timely subject matter on beef cattle, horses, poultry, sheep, swine, and related junior work. Use this material as you see fit for local newspapers, radio programs, newsletters, and for the formulation of recommendations.

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Invent the Future



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Dates to Remember

July 18-20, 2016

Virginia Tech Livestock Judging Camp- Virginia Tech Campus, Blacksburg VA - 3day, 2-night event- Contact: Bain Wilson- <u>tbwilson@vt.edu</u> or David Roper-<u>droper1@vt.edu</u>.

May Herd Advisor

Scott P. Greiner Extension Beef Specialist, Virginia Tech

May signals the beginning of the forage harvest season. The impact of weather on forage production and harvest is typically the concern that predominates; however, other items warrant close attention. Each ton of harvested forage removes about 50 lbs. of nitrogen, 50 lbs. of potash and 15 lbs. of phosphate per acre. As a result, hay from unfertilized fields is effectively mining your soil resources. Another common problem when applying fertilizer is not adding the correct proportion of each element. Field fertilized repeatedly with 15-15-15 or 10-10-10 likely need no additional phosphorus. Poultry litter and animal manures also supply more phosphorus than grasses can utilize. Soil samples and test results are the only way to know the nutrient and pH status of your fields. Your local Extension office should have soil probes and sampling instructions you can utilize. Using these results to match fertilizer application to soil needs will enhance both the productivity and quality of your forage crop, and be costeffective. Lastly, remember that forage testing at harvest is an excellent way to determine your success at making quality hay, and also provides the basis for making supplement decisions next winter.

Spring Calving Herds (January-March)

<u>General</u>

- Calving season winding down. Continue to observe late calving cows frequently.
- Calving records should be complete and up to date.

Nutrition and Forages

- Continue to offer a high magnesium mineral to prevent grass tetany. Monitor intake to insure cows are consuming the recommended amount. No other source of salt or minerals should be available.
- This is the time to put into place a rotational grazing management system which will provide a rest period for pastures. During rapid growth move more quickly to the next paddock and leave some residue.
- Make plans to store your high quality hay in the dry.
- Collect and submit forage samples for nutrient analysis.

Herd Health

- Consult with your veterinarian concerning pre-breeding vaccination schedule for cow herd, yearling heifers, and bulls. Plan early to allow 30-day vaccination window prior to breeding season.
- Plan parasite and fly control program for herd, and begin planning vaccination and preconditioning protocol to be used for calf crop.

Reproduction

- Finalize plans and protocols for breeding season. Establish calendar with dates and timing of synchronization program to be used during breeding season. Have supplies and semen on hand.
- Breed heifers 2-4 weeks ahead of mature cows to allow longer post-partum interval prior to second breeding season.
- Schedule and conduct breeding soundness exams on herd sires, including annual vaccinations.
- Manage bulls properly during the breeding season. Observe frequently to confirm breeding activity and soundness, and monitor cows for repeat estrus. Avoid commingling mature and young bulls, as older bulls will be dominant. As rule of thumb, yearling bulls should be exposed to number of cows equal to their age in months (ie. 18 month old bull with ~18 cows).

Fall Calving Herds (September-November)

<u>General</u>

- Schedule and conduct pregnancy diagnosis with veterinarian following breeding season. Plan a marketing strategy for open cows. Cull cow prices typically peak mid-spring through mid-summer, and prices generally stronger for cows in good body condition vs. thin cows (evaluate forage availability and potential feed and management costs to increase BCS of cull cows if warranted).
- Evaluate potential options for marketing of calf crop. Match weaning date and calf management with operational goals. Calculate break-evens on various marketing options and consider risk management strategies.
- Reimplant commercial calves.

Nutrition and Forages

- As calves are weaned move cows to poorer quality pastures.
- Use palatable feeds during the weaning period to bunk train calves and minimize weight loss.
- Reserve high quality hay and a pasture area for calves post-weaning.

Herd Health

- Consult with veterinarian on vaccination protocol for calf crop. Design vaccination and weaning program around marketing goals and objectives.
- Plan parasite and fly control program for cows and calves.

Genetics

• Collect weaning weights on calf crop at optimum time (age range 120-280 days), along with cow weights, hip heights and body condition scores (cow mature size data taken within 45 days of calf weaning measure).

Youth Events Popular at 2016 Junior Beef Roundup

The 2016 Virginia Beef Expo and Junior Beef Roundup show were held at the Rockingham County Fairgrounds in Harrisonburg, VA, April 15-17, 2016.

The Youth State Stockmen's Contest started off the youth events on Friday, April 15th. The 2016 Junior Stockmen's Contest consisted of 104 junior and 126 senior competitors that are in the 4-H or FFA programs. The contest consists of a livestock specific guiz, identification of livestock equipment, breeds, feeds, and meat, judging of live sheep, live cattle, meats, and hays. This year the contest featured a keep/cull class, guestions on meats and hays, and a judging scenario judged solely on data. The winning Senior 4-H team will go on to compete at the National 4-H Stockmen's Contest that will be held later this fall in Louisville, KY. This year's winners are from Rockingham County 4-H. Team members include: Paul Craun, Hannah Craun, Carley Carpenter, and Seth Diehl. In addition to Rockingham, congratulations go out the top 5 Senior teams: Sherando FFA, Riverheads FFA, Frederick County 4-H, and Washington County 4-H. The top 5 Senior Individuals were: 1st Place – Paul Craun (Rockingham County) 2nd Place- Hannah Craun (Rockingham County), 3rd Place- Ryan Sensabaugh (Riverheads FFA), 4th place-Kaylee Greiner (Montgomery County), and 5th Place- Jacob Coffey (Shenandoah County). Top honors were also awarded in the junior division, which consists of youth ages 9 - 13. The top five teams were (in descending order) -Montgomery County 4-H, J. Frank Hillyard FFA, Frederick County 4-H, Rockbridge County 4-H, and Rockingham County 4-H. The top 5 junior individuals were: 1st Place – Ethan Clouse (Montgomery County), 2nd Place- Jacob Craun (Rockingham County) 3rd Place- Ella Warns (J. Frank Hillyard FFA), 4th Place- Quinna Molden (Frederick County), and 5th Place- Sidnie Saville (Montgomery County).

Friday also featured a contest new to the Junior Beef Roundup, The first Virginia Beef Challenge Contest. This contest, sponsored by Virginia Beef Industry Council, challenged teams of youth members to create a dish using only a predetermined set of ingredients including beef. From these ingredients, team members had to identify and prepare the dish, then make a presentation about it to a panel of judges. Team members had to exhibit and communicate knowledge of cooking beef, the beef industry and topics regarding beef and the consumer. Five teams participated in this inaugural event, representing counties from across the state. Awards were provided to the top three teams courtesy of Virginia Cattlemen's. The team from Augusta County (Augusta Food Works) won the event. Team members included Ryan Sensabaugh, Luke Jennings, Jake McCall, Jacob Lewis and Nathan Zullig.

The State Youth Cattle Working Contest was held on Saturday, April 16th. Earlier this spring, five regional contests were held in various locations across the state to determine the Top 10 teams that would be represented at the 2016 State Youth Cattle Working Contest. A total of 77 teams competed at the regional levels. The State Youth Cattle Working Contest, as well as the regional contests, begins with teams completing a cattle processing map. This processing map is judged and returned to the team with any corrections prior to the team working the cattle. The teams then

work a total of three head of cattle and are judged on the preparation and administration of a growth implant, a 7-way clostridial vaccination, a respiratory complex, ear tags, dewormer, and any other products that are deemed appropriate. In addition, the teams are also judged on the safety and handling of the cattle, as well as the time it takes to work all three head. For the 2016 State Youth Cattle Working Contest, first place was awarded to James River FFA, which consisted of Davis Fenster, Eli Stevens, and Morgan Curry. Orange County Team A (Blake Hopkins, Garrett Hopkins, and Marlaina Johnson) took home second place honors. Third place honors were awarded to Randolph Henry FFA (Cassie Long, Hannah Adams, and Conner White). Congratulations to all those teams that made it to the state level.

The Youth Meat Quality Assurance (YMQA) Program hosted youth training in conjunction with the Junior Beef Roundup. The youth learned proper animal management, husbandry, and handling techniques while at the training. By attending the classroom portion of the training, youth were certified in the Youth Pork Quality Assurance Plus program; youth who participated in both the classroom and a chuteside training were Beef Quality Assurance certified. Both YPQA Plus and BQA certifications are recognized as national certifications through the Virginia Department of Education and are both part of the YMQA certification program that is administered through Virginia Cooperative Extension. All youth participating in these trainings will be fully eligible to compete at the State Fair of Virginia held in October.

The 2016 State Cattle Sales Contest was held Saturday morning, April 16th, of the Junior Beef Roundup. The objective of this contest is to gain a working understanding of performance and pedigree information. Competing teams were to take pedigree information, marketing materials, and an animal to a panel of judges and attempt to sell the judges that animal, based on a pre-chosen scenario. Top Junior honors went to a team consisting of Ashley Hostetter, Ella Warns, and Sidnie Saville. The Senior Division was won by Shenandoa County 4-H, a team consisting of Tiffany Heishman, Jesse Zirkle, and Kennedy Whetzel. Rockbridge County 4-H (Olivia Willliams, Jenna Hamilton, and Sarah Harris) took home second place honors.

The 2016 State Cattle Fitting Contest began Saturday afternoon. This contest was open to exhibitors at the Junior Beef Roundup and encourages youth to gain the ability to work with a team to enhance the showing performance of a groomed animal. Top honors in the 2016 contest went to the Virginia Junior Angus Association (Jake McCall, Zach McCall, Caleb Boden, and Suter Clark. Second place went to Rockbridge/Pittsylvania County (Olivia Williams, Gordon Clark, Ruth Alexander, and Evan Lineweaver). Thank you to Showtimes Magazine for supporting the 2016 Youth Cattle Fitting Contest.

The Junior Beef Roundup hosted nearly 180 exhibitors, 34 commercial heifers, 89 prospect steers, and 124 breed entries, making for a grand total of 247 head shown throughout the weekend. The youth beef shows started off with the Showmanship division, held Saturday evening. Top honors went to Phyllis Hope in Collegiate Showmanship, Olivia Williams in Senior Showmanship, Zach McCall in Intermediate

Showmanship, Suter Clark in Junior Showmanship, and Blake Keppel in Novice Showmanship. Reserve champion showman was awarded to: Hannah Cox in Senior Showmanship, Samantha Moore in Intermediate Showmanship, Lianna Durrer in Junior Showmanship, and Hannah Smith in Novice Showmanship.

Sunday featured the youth registered breed shows, as well as the commercial heifer and prospect steer shows. The Youth Angus Show saw a very strong showing of 55 head of Angus cattle. The Overall Grand Champion Angus Heifer was exhibited by Zachary McCall of Greenville, VA. The Overall Reserve Champion Angus Heifer was awarded to John Michael Knight of Montpelier Station, VA. Other Angus honors included: Grand Champion Bred & Owned Angus Heifer – Callie Eastin; Reserve Champion Bred & Owned Angus Heifer – Henry Alexander; Grand Champion Owned Heifer – Zach McCall; Reserve Grand Champion Owned Heifer – John Michael Knight.

The youth Hereford show followed the Angus show. The Hereford show featured 22 head of cattle. The Overall Grand Champion Hereford Heifer was awarded to Olivia Williams of Fairfield, VA. Olivia Williams also exhibited the Overall Reserve Grand Champion Hereford Heifer. Other honors included: Grand Champion Bred & Owned Hereford – Olivia Williams; and Reserve Champion Bred & Owned Hereford – Kelly Richardson.

The Red Angus cattle were shown next, with 11 head exhibited. The Overall Grand Champion Red Angus Heifer was exhibited by Jolene Davis of Montpelier Station, VA. Jolene also owned the Reserve Champion Red Angus Heifer. Other top awards in the Red Angus show included- Grand Champion Bred & Owned Red Angus – Jolene Davis; Reserve Champion Bred & Owned Red Angus – Emily Yowell.

The Simmental and Percentage Simmental divisions followed with 9 head each. Overall Grand Champion Purebred Simmental Heifer honors were awarded to Carlee Taylor of Saltville, VA. Reserve Champion Simmental Heifer was exhibited by Savanna Cline of Wytheville, VA. The Overall Grand Ghampion Percentage Simmental was exhibited by Lianna Durrer of Ruckersville, VA. Jenna Kibler from Edinburg, VA exhibited the Overall Reserve Champion Percentage Simmental.

The All Other Breeds division saw breeds such as Braunvieh, LimFlex, Shorthorn, Chianina, Maintainer, Charolais, and Chi-Maine compete for top honors. Samantha Moore of Raphine won the AOB Grand Champion Heifer with a Lim-Flex Junior Yearling heifer. Samantha also exhibited the AOB Reserve Champion Heifer, a Limflex Senior Yearling heifer.

Sunday morning also featured with the Youth Commercial Heifer show and was followed by the Youth Prospect Steer Show. Bailey Talley of Craigsville, VA won the Grand Champion Commercial Heifer and Aaron Locke from Remington, VA was the exhibitor of the Reserve Champion Commercial Heifer. The Youth Prospect Steer Show Awards were as follows: Grand Champion Angus Steer— Jake Snyder; Reserve Champion Angus Steer—Suter Clark; Grand Champion AOB Steer – Jenna Kibler; Reserve Champion AOB Steer – Aaron Locke; Grand Champion Crossbred Steer – Gordon Clark; and Reserve Champion Crossbred Steer – Blake Hopkins.

The Overall Supreme Champion Heifer and Overall Supreme Champion Steer drives rounded out a great weekend of events. These supreme drives saw the overall champions from all the shows compete for top honors. Zach McCall from Greenville, VA exhibited the Overall Supreme Champion Heifer, the winner of the Angus show. The Reserve Supreme Champion Heifer was exhibited by Samantha Moore of Raphine, VA with her LimFlex AOB heifer. In the steer champion drive, Gordon Clark of Gretna, VA took home Supreme Champion Steer honors. The Reserve Champion Steer was exhibited by Blake Hopkins of Louisa, VA.

2016 Virginia Poultry Federation Youth Convention Hosted at Virginia Tech

The 2016 Virginia Poultry Federation Youth Convention was held on April 29th, 2016 at the Alphin Stuart Livestock Arena in Blacksburg, Virginia. The event was a full day of activity, featuring the State Poultry Judging Contest in the morning, and presentations and educational activities in the afternoon. The day concluded with and awards ceremony for the contest.

The Poultry Judging Contest was a state level contest for both 4-H and FFA teams, as the top teams from each division earned the right to compete at a national level. Contestants placed classes of hens, broilers and carcasses, and gave several sets of reasons. In addition, contestants graded poultry meat products, graded eggs for both exterior and interior quality, and also had to identify ready to cook broiler parts. The contest hosted over 150 contestants consisting of both 4-H and FFA teams.

In the 4-H Senior division, Caley Ellington from Rockingham County took home top honors. 2nd place was awarded to Zach Morris (Clarke County), 3rd to Paul Craun (Rockingham County), 4th to Jacob Shifflett (Rockingham County) and 5th to Brennan Miller (Rockingham County). The Rockingham senior team consisting of Caley Ellington, Jacob Shifflet, and Brennan Miller took home the High Senior Team award, and will represent Virginia at the National Poultry Judging Contest. In the 4-H Junior division, Mackenzie Cather from Clarke County received first place. 2nd was Eve Wilke (Clarke County), 3rd was Charles Casey (Clarke County), 4th was Adam Hawins (Frederick County), and 5th place was Jacob Craun (Rockingham County). The high point junior team hailed from Clarke County, and consisted of Mackenzie Cather, Eve Wilke, Charles Casey and Harrison Casey. Congratulations to all of our 4-H winners.

In the FFA Division, Gracie Bailey from Central High School was the champion Senior. 2nd place was awarded to Robert George (Riverheads High School), 3rd to Davis Fenster (James River High School), 4th to Jacob French (Central High School), and 5th to Chelsey Isles (Highland High School). The first place Senior team was Central High School, at team consisting of Gracie Bailey, Jacob French, Isaac Rhodes, and Jacob Coffey. The top FFA junior was Peyton Fravel from J. Frank Hillyard Middle School. 2nd place was Alison Frank (Elkton Middle School), 3rd to Colton Allison (East Rockingham), 4th to Kevin May (Elkton Middle School), and 5th to Will Thomas (Highland High School). The first place Junior team came from Elkton Middle School. Team members include: Alison Frank, Kevin May, William Meadows, and Jamison Meadows. Congratulations to all of the FFA winners.

The afternoon activities included several tracks available to the contestants. These tracks offered educational activities in multiple areas. These tracks included a Food Challenge, a Live Bird Production track, a Post-Harvest production track, and a Consumer Advocacy track. Contestants participated in these workshops for the afternoon, learning more about that facet of the industry, and getting some hands-on learning experience with things such as cooking, sausage production, and HACCP training.



July 18-20, 2016 VT Campus Blacksburg, VA



VirginiaTech

Join us for the 1st annual VT Livestock Judging Camp. A 3-day, 2-night event with detailed instruction in all species and reasons.

Campers will be housed on VT campus and the \$250 camp registration fee includes housing, meals, materials, tshirt, and activity fees.

Camp is open to youth entering the 6th grade to High School Seniors.

To register fill out the attached form and return along with registration fee. Camp is limited to the fist 60 youth registrations.

Two male & female chaperones are required. Please indicate your willingness to serve this role. Additional adults are welcome and will be charged \$175 registration fee (meals/lodging).

> For more information contact: Bain Wilson: tbwilson@vt.edu David Roper: droper1@vt.edu



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VT Livestock Judging Camp Registration Form

Name
Parent ChaperoneYesNo
Youth Age Adult Gender
Address
City, ST, Zip
Email address
Phone #
Roommate preference
T-shirt size
If attending with team list members:
Deadline: June 15, 2016

Return form and Payment to: VT Livestock Judging Camp C/O Bain Wilson 378 Litton Reaves (0306) Blacksburg VA 24061

If you are a person with a disability and desire assistance or accommodation, please notify Bain Wilson, 378 Litton Reaves at 540-231-5253/TDD*) during business hours of 8a.m. and 5 p.m. *TDD number is (800) 828-1120.

The Cost of Round Bale Storage Losses

Dr. Bain Wilson Extension Animal Scientist Virginia Tech

Whether you look forward to it or not, hay season is rapidly approaching. Virginia Cooperative Extension has several publications that provide helpful information for harvesting hay and its incorporation into a beef operation: *Management tips for round bale hay harvesting, moving, and storage* and *Hay as part of a cowherd production system*. It is a great challenge to fight weather and mechanical issues to put up high quality hay; however, ensuring cattle will be provided with quality forage later in the year does not end when bales are rolled up in the field. Development of a cost-effective storage method that preserves nutritional quality and reduces the hidden costs of storage and feeding losses is another step in successfully using round baled hay in a beef operation.

Several studies have researched storage methods for large round bales aimed at reducing storage losses caused by weathering. In a study conducted in Iowa, Brasche and Russell (1988) observed DM losses of large round bales of 9.7% when stored on the ground and left uncovered relative to DM losses of less than 1% when bales were elevated off the ground and covered with tarps during a storage period of 5 to 7 months. In a study conducted in western North Carolina, Turner et al. (2007) measured storage losses of large round bales of hav that were stored for either 7 or 15 months using 1 0f 5 storage systems: on the ground uncovered, on pallets uncovered, on the ground covered with tarps, on pallets covered with tarps, and on pallets in a barn (Table 1). Storage losses after 7 months were 22.7% when hay was left uncovered (either on the ground or on pallets), 10.0% when covered (either on the ground or on pallets), and 2.7% when stored in a barn. Storage losses after 15 months were 30.7% when hay was left uncovered (either on the ground or on pallets), 19.3% when covered on the ground, and 11.1% when covered and stored on pallets or in a barn. An economic analysis of the Turner et al. (2007) study concluded that for a storage period of 7 months, storing hay on the ground covered had the lowest cost and storing hay uncovered on pallets was most expensive. For a storage period of 15 months, storing hay covered on pallets had the lowest cost and storing hay uncovered on pallets was still the most expensive storage system. Thus, if hay is to be stored for a period of approximately 7 months, placing bales end-to-end on the ground in a well-drained area while covered with tarps is the most effective storage method. If bales are to be stored longer than 1 year, covering bales while also breaking ground contact are is more economic storage method that reduces spoilage losses.

Protecting hay by with tarps or through storage in a barn leads to bales that are less weathered and have greater nutritional value. Protected bales generally have increased DM and decreased NDF and ADF concentrations when compared to bales left unprotected during storage (Brasche and Russell, 1988; Turner et al., 2007). Crude protein concentrations were not consistently affected when bales were protected or left unprotected for a storage period of 7 or 15 months in (Turner et al., 2007). Bales with

decreased fiber concentrations would theoretically lead to greater forage DMI and digestibility; however, this has not always been observed experimentally. Despite differences in the nutritive value due to storage method, Brasche and Russell (1988) observed no differences in cow DMI or BW change when cows were fed hay that was either protected or left unprotected during storage. Storage method of large round bales can also affect feeding losses through decreased palatability and greater feed refusals. In a Missouri study, Belyea et al. (1985) observed feeding losses of 24.7% and 12.4% when large round bales were stored outside and left uncovered or stored inside a barn, respectively. When comparing different hay storage methods, these studies indicate that differences in spoilage loss, both storage and feeding losses, come at a greater cost than the potential for reduced animal performance associated with decreased nutritional quality from weathering of hay.

		7 months			15	5 montl	าร
		Hay			Hay		
	Hay	cost in	%	Usable	cost in	%	Usable
	cost in	storag	Hay	hay	storag	Hay	hay
Storage Method	field	е	loss	cost	е	loss	cost
Ground Uncovered	133.86	135.18	22.7	174.87	135.18	30.7	195.07
Pallets Uncovered	133.86	147.42	22.7	190.71	147.42	30.7	212.72
Ground Covered	133.86	138.04	10.0	153.38	138.04	19.3	171.06
Pallets Covered	133.86	144.16	10.0	160.18	144.16	11.1	162.16
Barn	133.86	172.93	2.7	177.73	188.26	11.1	211.77

Table 1. Estimates of the cost of stored for 7 or 15 months under 5 storage systems^{1,2}

¹Adapted from Turner et al., 2007

²Cost expressed in \$/ton DM

References

- Belyea, R. L., F. A. Martz, and S. Bell. 1985. Storage and feeding losses of large round bales. J. Dairy. Sci. 68: 3371-3375. doi:10.3168/jds.S0022-0302(85)81250-9
- Brasche, M. R., and J. R. Russell. 1988. Influence of storage methods on the utilization of large round hay bales by beef cows. J. Anim. Sci. 66: 3218-3226. doi:10.2134/jas1988.66123218x
- Grisso, R., J. Fike, D. Ohanehi, and J. Perumpral. 2014. Management tips for round bale hay harvesting, moving, and storage. Pub. No. 442-454. Virginia. Coop. Ext., Blacksburg, VA. Accessed at: https://pubs.ext.vt.edu/442/442-454/442-454_pdf.pdf.
- Turner, J. E., M. H. Poore, and G. A. Benson. 2007. Dry matter recovery, nutritive value, and economics of cool-season grass hay stored for seven or fifteen months in the southern Appalachian mountains. Prof. Anim. Sci. 23: 686-695.
- Wahlberg, M. L. 2009. Hay as Part of a Cowherd Production System. Pub. No. 400-002. Virginia. Coop. Ext., Blacksburg, VA. Accessed at: <u>https://pubs.ext.vt.edu/400/400-002/400-002.html</u>.