Proceedings

2025 Virtual Shepherd's Symposium

Tuesday & Wednesday
February 25 & 26, 2025
7-9 PM Eastern

virginia sheep PRODUCERS ASSOCIATION

Virginia Cooperative Extension
Virginia Tech • Virginia State University

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2025 Sponsors

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SPEAKER BIOGRAPHIES

Kelsey Bentley, Ph.D.
Assistant Professor/Extension Specialist
Kansas State University
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Dr. Kelsey Bentley, originally from Micro, North Carolina, grew up in a family deeply involved in youth livestock programs. She completed her bachelor's degree in Animal Science at North Carolina State University, where she was actively involved in the livestock judging team and served as a flock technician for the NC State Small Ruminant Unit. Kelsey pursued a master's in Animal Physiology at West Virginia University and coached the livestock judging team. Her research efforts utilized the Katahdin flock at the Southwest Agricultural Research and Extension Center in collaboration with Virginia Tech. Her master's work focused on Katahdin lambs' response to CD&T vaccination and remains a cornerstone of her research. She was the recipient of the Distinguished Ruby Doctoral Fellowship and earned her Ph.D. from West Virginia University in 2024. Her doctoral research examined the multifaceted immune outcomes influenced by selection for parasite resistance in Katahdin sheep, encompassing the exploration of antibodies in ewe colostrum and milk, and the evaluation of differential lipopolysaccharide-induced behavioral, immune, and plasma metabolome responses. Kelsey is currently the Small Ruminant Extension Specialist, with responsibilities divided into 60% extension, 25% research, and 15% teaching. She is dedicated to improving the sheep industry and supporting youth involvement in this sector. Her research now centers on animal health and well-being, shifting focus from Katahdin hair sheep to the Polypay flock at Kansas State University. Outside of work, Kelsey enjoys gardening and cooking with her husband, Cooper. They have a beloved dog named Sage and manage a small flock of club lambs marketed to local youth back in North Carolina.

Tom Stanley
Extension Agent, Farm Business Management
Virginia Cooperative Extension, Rockbridge County, Lexington, VA
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Tom grew up in Southwest Virginia and was an active member of both 4-H and FFA. He worked in livestock production from his 4-H sheep project at an early age. He has degrees from Virginia Tech and Kansas State. Tom joined Virginia Cooperative Extension in 1996 as Extension Agent headquartered in Augusta County. In 2010, Tom assumed the role of Unit Coordinator for the Rockbridge Unit. Tom's area of specialization as an Extension Agent is Farm Business Management. Tom is part of a team of Agriculture Extension Agents that serve Augusta, Bath, Highland, Rockbridge, and Rockingham Counties. Their areas of specialization include Crop and Soil Science, Animal Science, Commercial Horticulture, and Farm Business Management. Tom and his family have a flock of sheep, and Tom has been a shearer for a number of years. Tom serves as Chair of VSPA's Wool Council where he provides leadership to state wool marketing programs and educational programs including shearing schools.

Scott P. Greiner, Ph.D.
Professor and Extension Animal Scientist
School of Animal Sciences, Virginia Tech, Blacksburg, VA
540-231-9159, sgreiner@vt.edu

Scott Greiner is a Professor and Extension Animal Scientist in the School of Animal Sciences at Virginia Tech. Dr. Greiner was raised on a diversified livestock farm in Eastern Iowa, and attended Iowa State University where he earned a B.S. in Animal Science. His graduate studies included an M.S. from Michigan State University and a Ph.D. from Iowa State. He serves at Extension Department Leader for the department as well as chair of the interdisciplinary college Animal Production Program Team. As an Extension Animal Scientist, he designs and delivers educational programs in beef cattle and sheep to adults and youth, and conducts applied research. Greiner also teaches an Advanced Livestock Enterprise course, and provides numerous guest lectures in livestock production/management topics. He resides outside Christiansburg, VA. Along with his wife Lori and daughters Kaylee and Leah, the family is very involved in 4-H youth livestock activities.

John Ignosh
Senior Extension Specialist, Agricultural Byproduct Utilization
Virginia Cooperative Extension, Harrisonburg, VA
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John serves as an Extension Specialist in VT's Department of Biological Systems Engineering based in Harrisonburg, VA. His current extension program work focuses on the development and implementation of best management practices related to energy efficiency, renewable energy, and related technologies.

Andrew Weaver, Ph.D.
Extension Specialist, Small Ruminants
North Carolina State University
989-708-2557, arweave3@ncsu.edu

Dr. Andrew Weaver is the Extension Small Ruminant Specialist at North Carolina State University. Dr. Weaver grew up in central Michigan and attended Michigan State University where he earned his B.S. in Animal Science in 2015. He completed his M.S. at Virginia Tech in 2017 studying terminal sire options for hair sheep producers. That research led him to West Virginia University where he completed his Ph.D. studying immune mechanisms related to parasite resistance. Dr. Weaver's research and extension interests focus on utilization of genetic tools and other management practices to improve parasite resistance, production efficiency, and end-product value of small ruminants in the Southeast US.

Nicole Valliere-Kopetzky
Graduate Research Assistant, PhD Student
School of Animal Sciences, Virginia Tech, Blacksburg, VA
919-696-5369, nvalliere@vt.edu

Nicole was raised on a small cow-calf operation in Mocksville, North Carolina. She attended North Carolina State University for her B.S and M.S. degrees in Animal Science. During her undergraduate degree, Nicole began working at the Small Ruminant Educational Unit on campus and quickly realized her passion for the sheep industry. Nicole's M.S. degree focused on evaluating selection and management systems to reduce parasite burden and improve Katahdin sheep performance and profitability. Her current research interest includes the interplay of genetics and nutrition as they relate to sheep management systems. Nicole has a deep interest in collaborating directly with sheep producers through Virginia Cooperative Extension and beyond to improve small ruminant management state and nationwide.

Chris Fletcher, DVM
Regional Veterinary Supervisor, Office of Veterinary Services
Virginia Department of Agriculture and Consumer Services, Wytheville, VA
276-228-5501, christopher.fletcher@vdacs.virginia.gov

Chris Fletcher, DVM is a Regional Field Veterinarian for the Virginia Department of Agriculture and is part of the team in the Scrapie Eradication Program for Virginia. He was in large animal practice in Southwest Virginia for 15+ years before joining the State Veterinarian's office. Dr. Fletcher and his wife Mandy operate Beyond Blessed Farm, a registered Katahdin operation located outside Abingdon, VA.

Lisa Weeks
Triple L Farms, Waynesboro, VA
Past Region II ASI Director
lweeks.lpw@gmail.com

Lisa along with husband, Larry, and daughters, Lexi and Laryn are first-generation shepherds raising Katahdins since 1990. Growing up on a crop farm in Dighton, KS., agriculture was something that simply could not be left behind. After graduating from Kansas State University in 1988 with a bachelor's degree in Textile Science, Lisa moved to Waynesboro, VA, to begin a career in quality assurance and eventually supply chain and data analyst at a company that manufactures polypropylene nonwoven roll goods. She and her husband purchased a 30-acre farm and manage a 50-ewe flock while continuing to work full time off the farm. The Weeks' have been members and supporters of ASI since 1994 and Lisa has served as the Virginia director at the ASI Annual Convention and as a producer member of the Production, Education and Research Council for numerous years. She and her husband have been long time members of the Virginia Sheep Producers Association and were awarded the Roy A. Meek Outstanding Sheep Producer Award in 2016. At the local level, their farm annually hosts students from the veterinary technician program of Blue Ridge Community College for some hands-on field trips for first- and second-year students. The family flock has been enrolled in the National Sheep Improvement Program since 2001 and Lisa is currently serving as NSIP secretary. She is also serving as a board member to the newly formed Eastern Alliance for Production Katahdins.

How Genetics Shape Immunity from the First Sip

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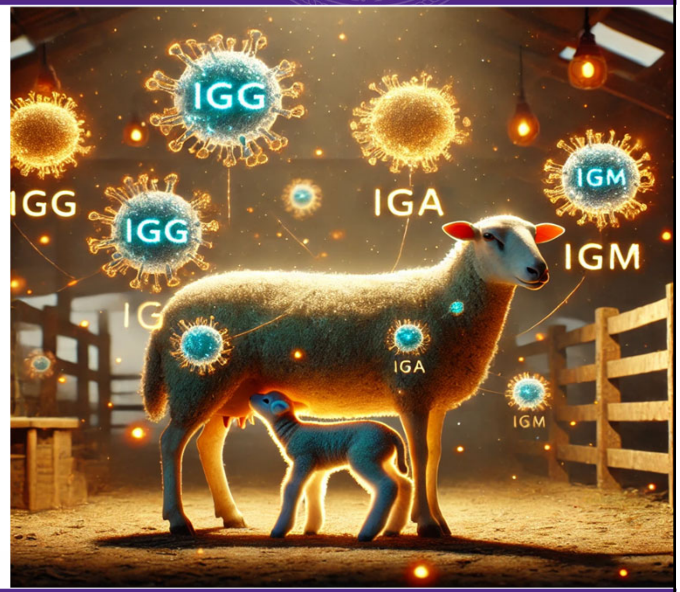
https://www.facebook.com/ksugoatandsheep



Kansas State University

Sheep and Goat Research and Extension

My Research Background

- **EBV** - Estimated Breeding Value is a science based and industry tested measurements or heritable traits of individuals
- **PFEC** – type of EBV that evaluates genetic merit for parasite resistance based on worm egg counts recorded at postweaning age. Reported in ***percent reduction*** so negative values are favorable.

NSIP National Sheep Improvement Program

Data retrieved from NSIP Katahdin Percentile Report – *March 2023*

Range of PFEC

-102.59 vs. +891.52

Ram A	Ram B
PFEC = -99	PFEC = +150

Parasite *Resistant*	Parasite *Susceptible*
or	or
Low Katahdin	High Katahdin
(LoKAT)	(HiKAT)

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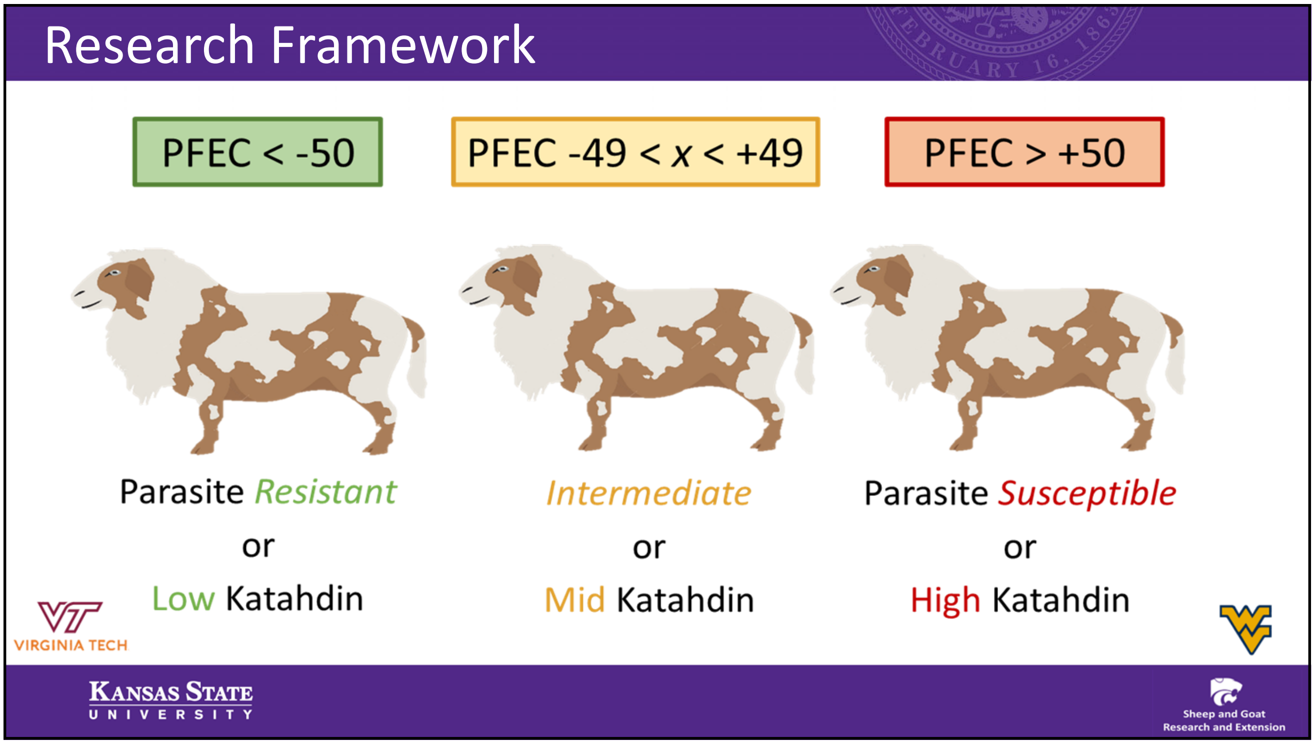
Sheep and Goat Research and Extension


Research Framework
PFEC < -50
PFEC -49 < x < +49
PFEC > +50
Parasite Resistant
or
Low Katahdin
Intermediate
or
Mid Katahdin
Parasite Susceptible
or
High Katahdin
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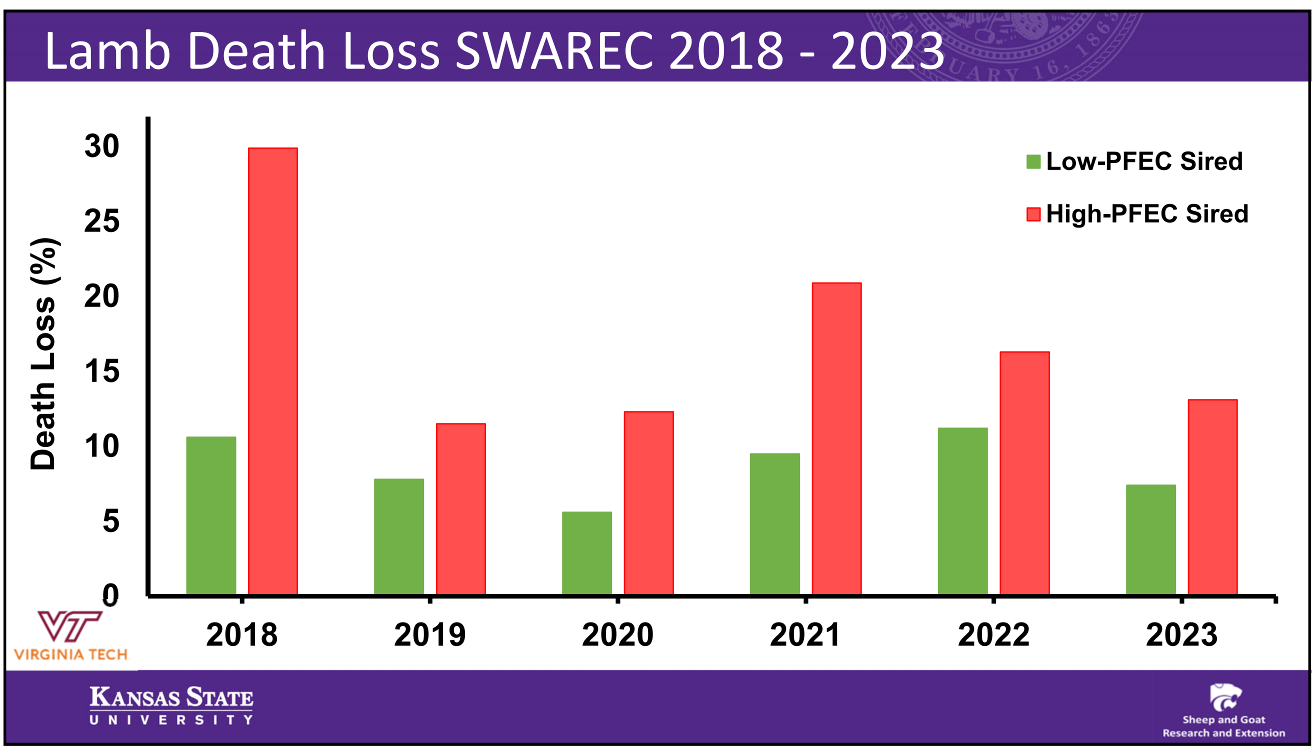
Lamb Death Loss SWAREC 2018 - 2023
Death Loss (%)
0
5
10
15
20
25
30
2018
2019
2020
2021
2022
2023
Low-PFEC Sired
High-PFEC Sired
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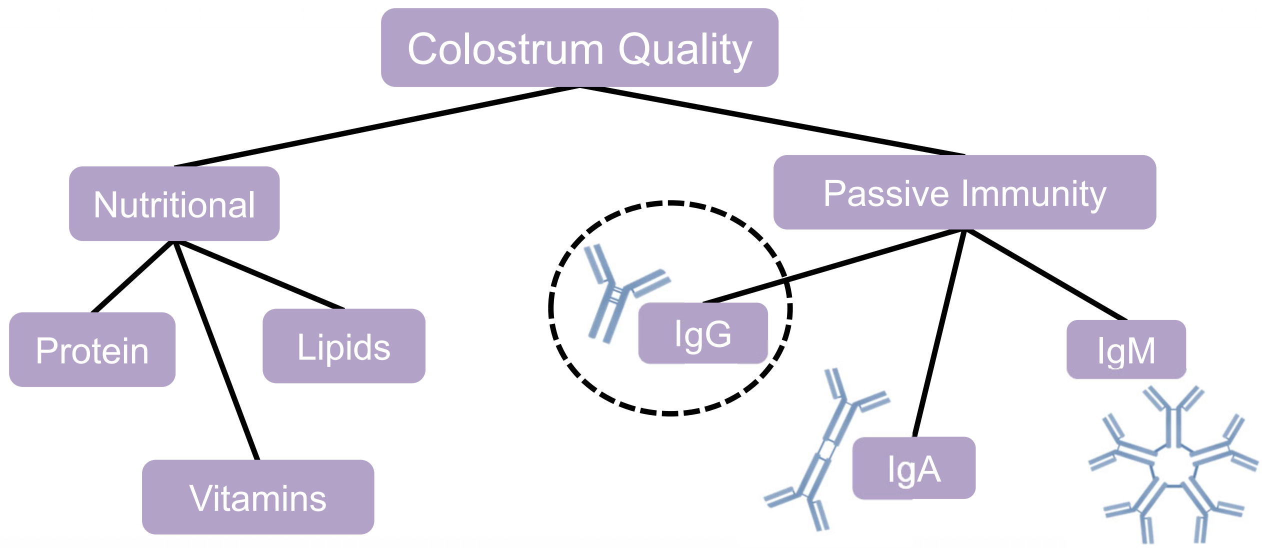
What is the Value of Colostrum?



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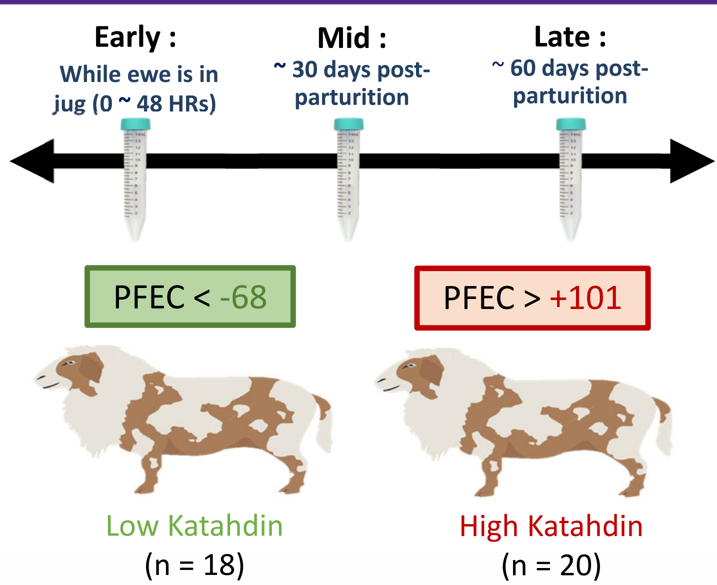
Milk Breeding Scheme – Year 1



Ewe Criteria

1. **Age –** Between 2 and 6 years old
2. **Index –** Hair Index > 104
3. **Lambing –** Twin bearing/rearing
4. **PFEC –** LoKAT Range -68 : -99
   – HiKAT Range +101 : +374

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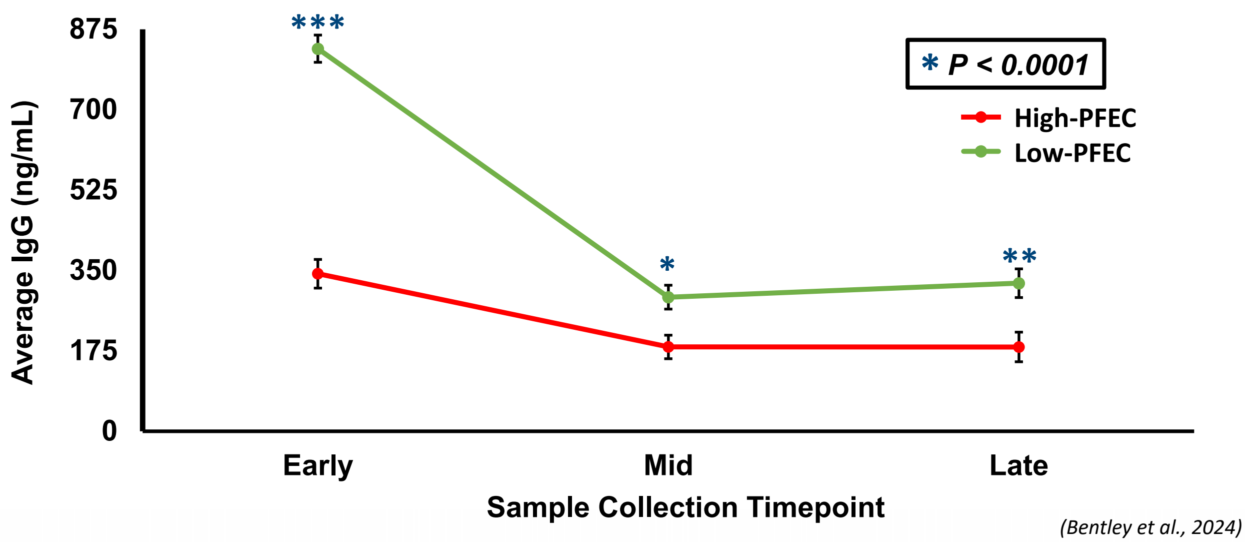
Average IgG in Dialyzed Milk by Timepoint – Year 1



(Bentley et al., 2024)

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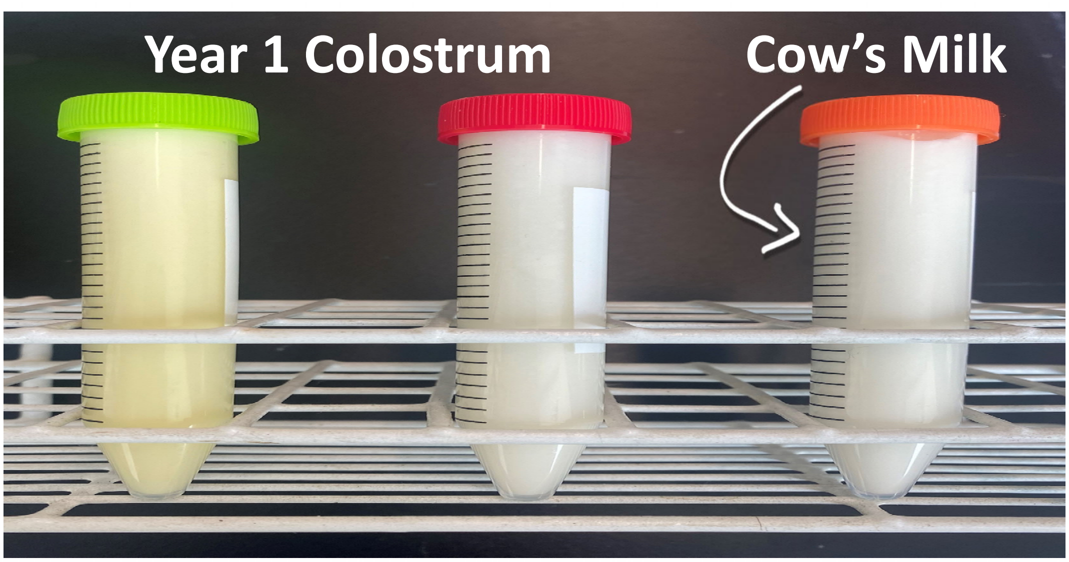
What's different about these colostrum samples?



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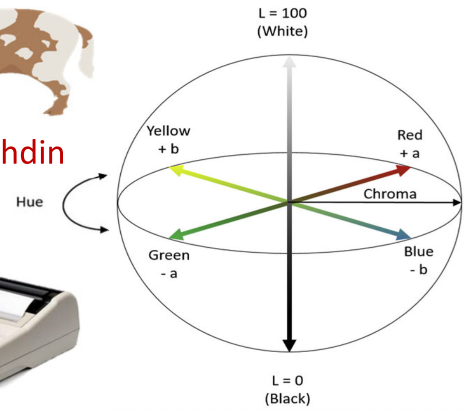
Milk Breeding Scheme – Year 2

PFEC < -50 | PFEC -49 < *x* < +50 | PFEC > +50

Low Katahdin | Mid Katahdin | High Katahdin

Chroma Measured

- ***L****** value** (White to Black)
- ***a****** value** (Red to Green)
- ***b****** value** (Yellow to Blue)



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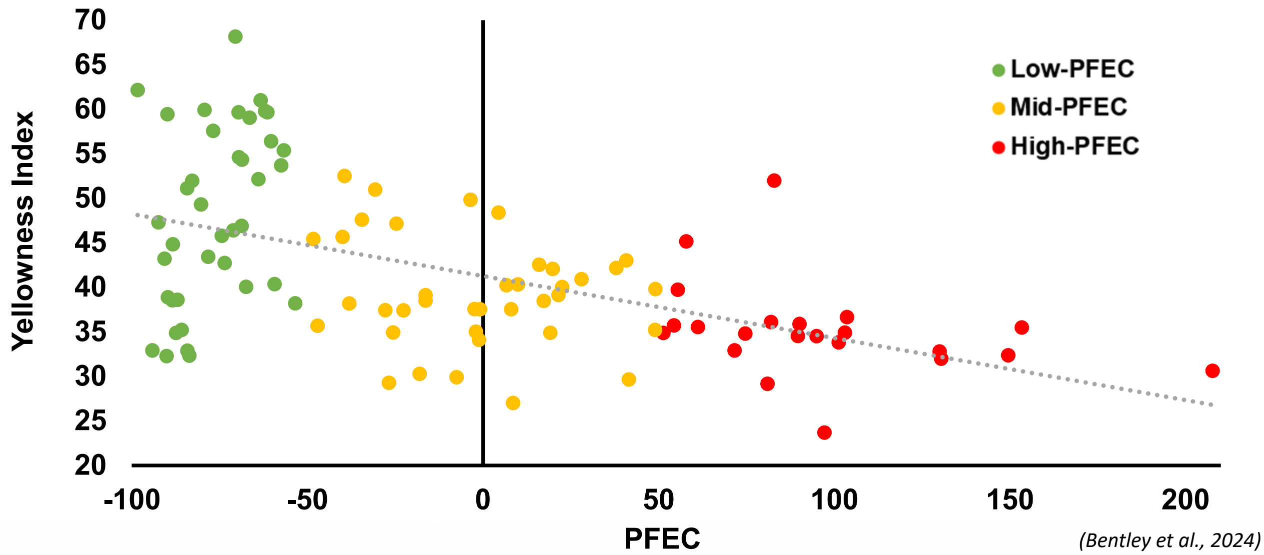
Colorimeter Measurements of Colostrum Year 2



(Bentley et al., 2024)

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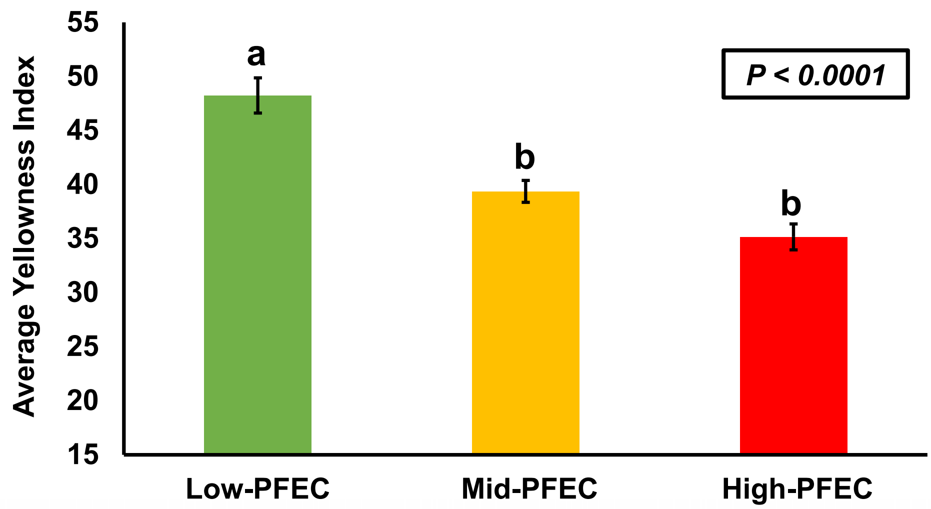
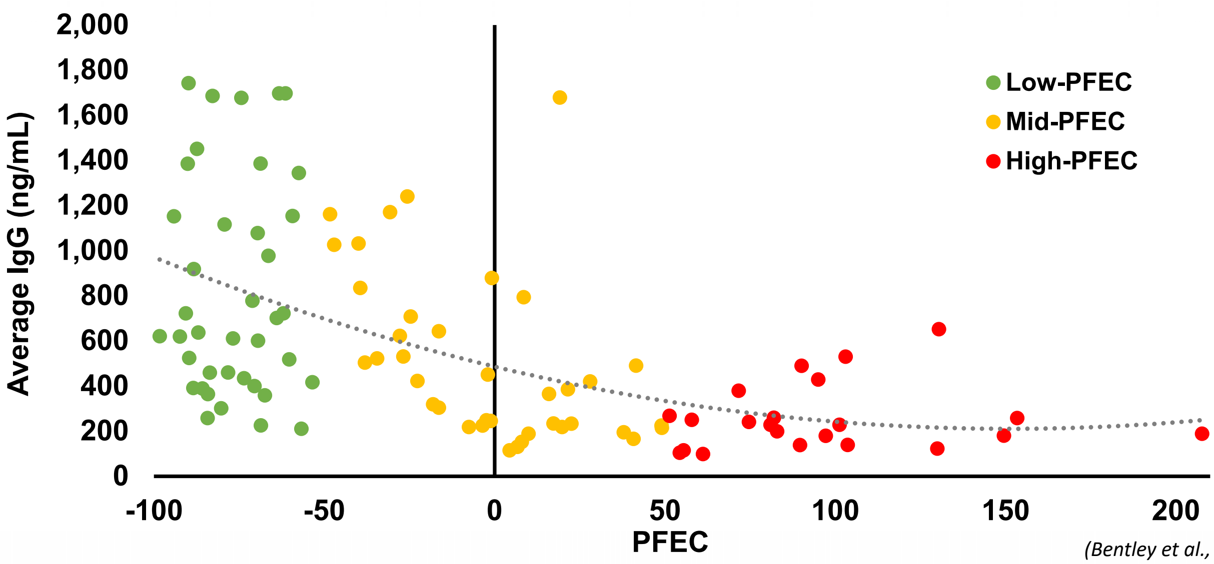
Colorimeter Measurements of Colostrum - Year 2



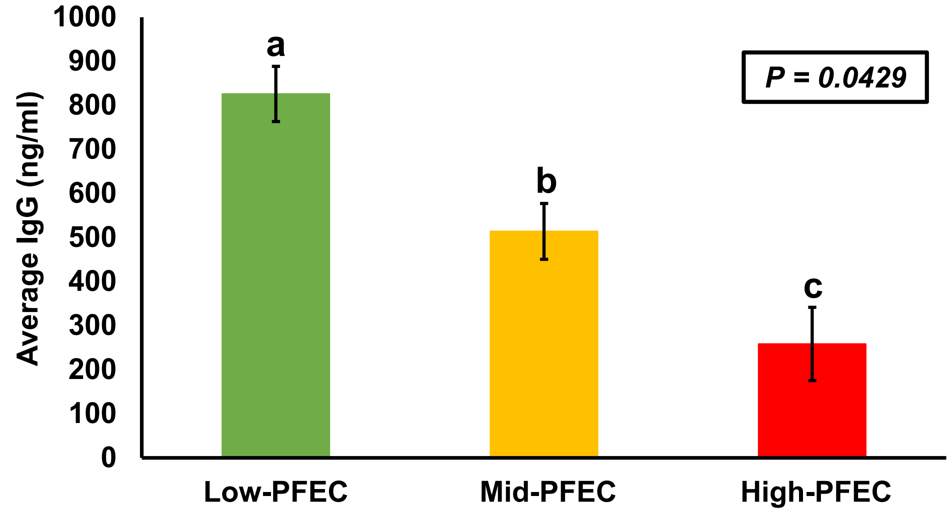
(Bentley et al., 2024)

IgG Measurements of Colostrum Year 2



(Bentley et al., 2024)

IgG Measurements of Colostrum - Year 2



(Bentley et al., 2024)

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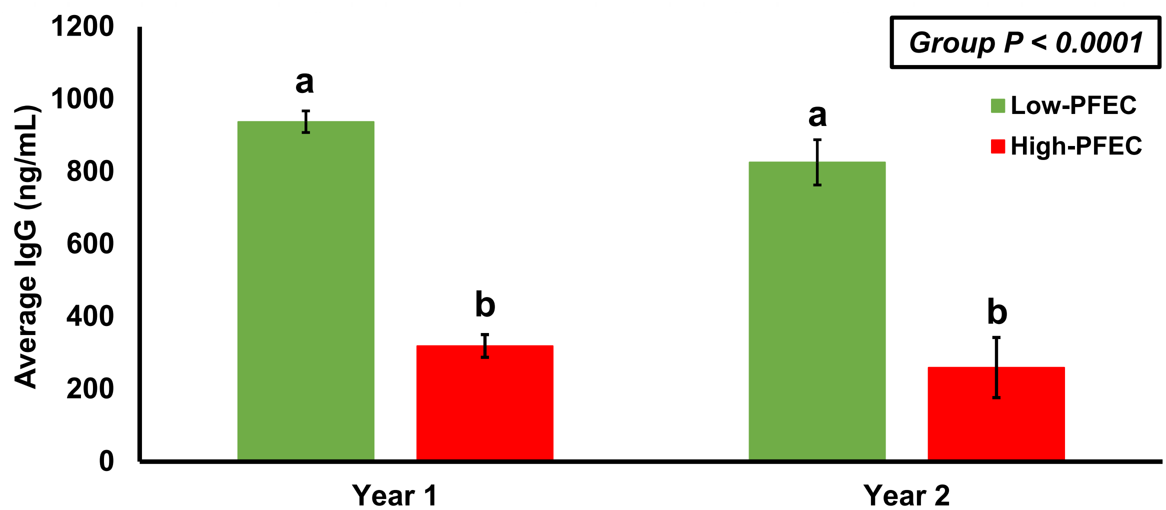
IgG Measurements of Colostrum Across Multiple Years



(Bentley et al., 2024)

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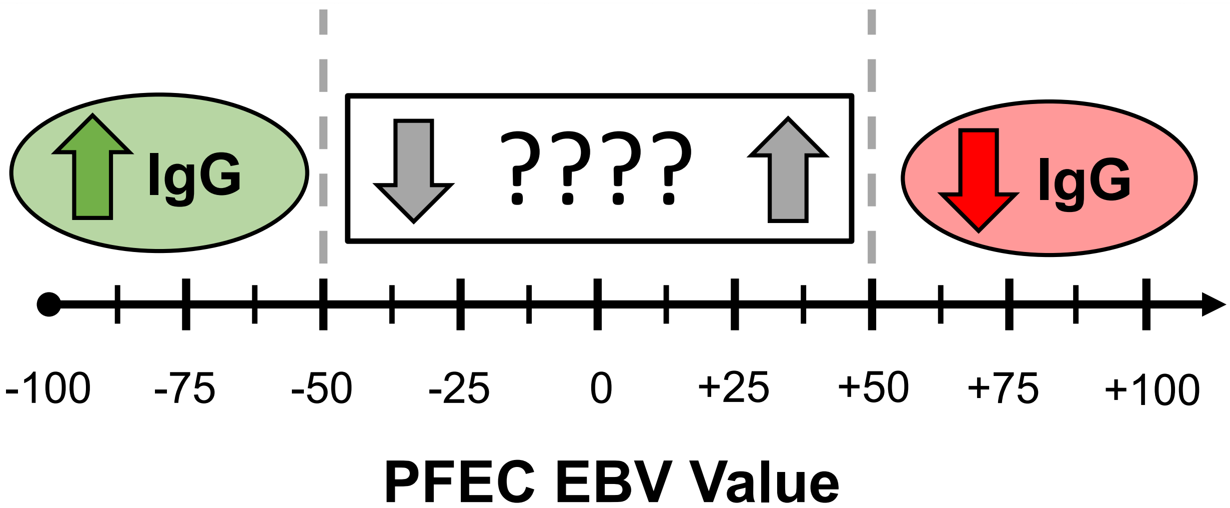
Average IgG based on PFEC genotype?



Questions?

K-State Research & Extension

Small Ruminants

The little changes that make a big difference in Profitability

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Factors Impacting Profitability for Virginia Sheep and Goat Flocks

- Infrastructure and Labor Efficiency
- Feed Pricing
- Production System
- Factors within the production system.

Infrastructure and Labor Efficiency

Handling Facilities = Safety for Shepherd and Sheep!

Facility needs change with sheep numbers (and the age of the shepherd!):

5 sheep

25 sheep

105 sheep

1,005 sheep

Infrastructure and Labor Efficiency

Feed Delivery

Little things can make life a lot easier . . . .

5 minutes saved per day is 30 hours per year . . .

Infrastructure and Labor Efficiency:

Feed Handling

Feed Sourcing Options Change with Flock Size . . .And Production System

5 sheep — 25 sheep — 105 sheep — 1,005 sheep

Feed Pricing: Be a good shopper!

Feed	COST per Ton	% Dry Matter	%TDN*	$/lb of TDN	% Crude Protein	$/lb of Crude Protein	Value Relative to Corn & Soy Meal	Advantage over Purchased Corn & Soy Meal
Pasture	**$24**	**100%**	**60%**	**$0.02**	**25%**	**$0.05**	**$249**	**$225**
Cultivated Pasture (Orchardgrass,Alfalfa,or other)	**$48**	**100%**	**68%**	**$0.04**	**25%**	**$0.10**	**$267**	**$219**
Corn Gluten	$260	90%	83%	$0.17	22%	$0.66	$289	$29
Corn	$225	90%	90%	$0.14	9%	$1.39	$225	$0
14% Commodity Pellet	$270	90%	83%	$0.18	14%	$1.07	$254	($16)
Soyhull Pellets	$260	80%	77%	$0.21	12%	$1.35	$245	($15)
Soybean Meal	$385	90%	88%	$0.24	40%	$0.53	$385	$0
Low Quality First Cutting Hay	$125	85%	50%	$0.15	10%	$0.74	$160	$35
Good First Cutting Hay	**$160**	**85%**	**57%**	**$0.17**	**11%**	**$0.86**	**$180**	**$20**
Good First Cutting Hay	**$213**	**85%**	**57%**	**$0.22**	**11%**	**$1.14**	**$180**	**($33)**
Good Second Cutting Hay Rd Bales	$200	85%	62%	$0.19	14%	$0.84	$206	$6
Textured Sheep Feed (Bagged)	$543	85%	87%	$0.37	12%	$2.66	$254	($289)
2nd Cutting Hay (Small Square Bales)	$400	85%	60%	$0.39	12%	$1.96	$192	($208)

*TDN = Total Digestible Nutrients, similar to our measure of calories in human foods

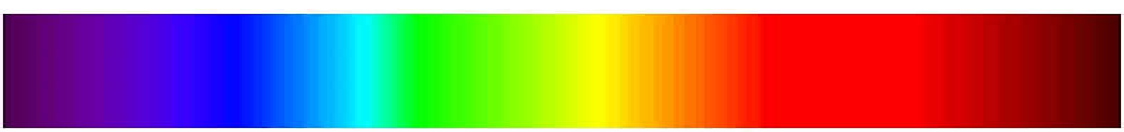
**All Prices are dollars per bulk ton unless otherwise indicated

Points to consider for lowering feed costs:

- Energy and Protein are the primary determinants of feed value but are not the sole determinants. *If utilizing bulk commodities, be sure to consider Calcium to Phosphorus ratio, other mineral content, and vitamin needs.*
- Ruminants have a requirement for 'effective fiber' to maintain rumen function.
- Ruminants do not <u>require</u> 'free-choice access' to hay or pasture, consider limit feeding hay
- Values in Table 1. assume 100% consumption.
- **If hay cost $160 per ton and the animals waste 30% of it, the actual cost of the hay consumed is $213 per ton.**

Production Systems

Low Input | Medium Input | High Input



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Sheep Production

*this is a budget template tool. User must update/confirm values

Blue Numbers are variables user can change to customize the budget to their situation, changing other numbers will destroy formulas and compromise spreadsheet functionality.

		100	EWES		
165%	LAMB CROP	4	RAMS	100%	OF LAMBS ENTER FEEDLOT (2 PHASE)
13%	LAMB Death Loss	16%	CULLS	70	LBS. AVERAGE WEIGHT ENTERING FEEDLOT
1.44	= Lambs Raised per Ewe	0.80	ADG	7.0	TO 1 POST WEANING FEED CONVERSION
15%	= % of lambs unthrifty			$1.72	Cost / lb or lamb s

ITEM	HEAD	CWT	UNIT	PRICE		QUANTITY	TOTAL	NOTES
1. GROSS RECEIPTS						Lbs of lamb marketed per ewe:		140.80
Lambs	110 @	1.15	Cwt	$230.00		126.10	$29,002.43	
Unthrify Lambs	19 @	0.76	Cwt	$210.00		14.71	$3,088.26	
Cull Ewes	12 @	1.35	Cwt	$90.00		16.20	$1,458.00	
Cull Ram	15 @	1.75	Cwt	$90.00		26.25	$2,362.50	
Wool		6.50	Lbs/Head	$0.00		669.50	$0.00	
2. TOTAL GROSS RECEIPTS					$359.11	Per Ewe	$35,911.19	
3. VARIABLE COSTS								
	Feed Loss							
Alfalfa Hay, Bloom	5.0%		Ton	$275.00		6.00	$1,649.66	
Mixed Hay, 2nd Cutting	5.0%		Ton	$180.00		4.73	$850.50	
Grass Hay, Average	5.0%		Ton	$130.00		11.81	$1,535.63	
Pelleted Supplement	2.0%		Ton	$425.00		6.44	$2,738.79	
Corn Grain	2.0%		Bushel	$6.50		658.89	$4,282.81	
Bulk Commodity	2.0%		Ton	235.00		12.27	$2,882.39	Total Feed Costs
Pasture Dry Matter	65.0%		Ton	$0.00		85.40	$0.00	$15,250.69
Dical	2.0%		Cwt	$13.50		0.00	$0.00	Feed Costs / Ewe
Grinding & Mixing		Cwt	Cwt	$1.40		368.98	$516.57	$152.51
Salt & Mineral		Lbs per Ewe	Cwt	$22.00		36.11	$794.34	Vet&Med/Ewe
Vet & Medicine		$/Head	Head	$18.44		100	$1,843.70	$18.44
Shearing			Head	$0.00		200	$0.00	
Supplies			Head	$4.00		100	$400.00	
Replacement Ram			Head	$700.00		1	$700.00	Land Maintenance & Rental
Land Rental	0.30	Acres per Ewe	Acre	$20.00		30	$600.00	$2,400.00
Pasture	0.30	Acres per Ewe	Acre	$60.00		30	$1,800.00	$24.00
Haul Cull Sheep			Head	$5.20		27	$140.40	
Market Cull Sheep		$/Head	Head	$7.25		27	$195.62	All Other Costs, Not Labor
Haul Sheep			Head	$3.75		109.65	$411.19	$4,751.47
Market Sheep		$/Head	Head	$10.94		109.65	$1,199.02	All Other Costs Not Labor/Ewe
Virginia Check-off			Head	$0.50		156	$78.00	$47.51
Building & Fence Repairs			Head	$9.00		100	$900.00	
Utilities			Head	$0.90		100	$90.00	
Bedding	50	Lbs per Ewe	Ton	$0.00		2.5	$0.00	
Machinery (Non-Crop)			Head	$2.00		100	$200.00	Labor/Ewe
Labor	3	Hours per Ewe	Hours	$0.00		300	$0.00	0.00
Operating Interest	6	Months	Dollars	4.00%		$ 21,862	$437.24	
4. TOTAL VARIABLE COSTS					$242.46	Per Ewe	$24,245.86	
Retention of ewe lambs for expansion: No. Head:		0.00	Value/hd		$264.60		$0.00	
5. ANNUAL DEBT PAYMENTS							$0.00	
6. PROJECTED NET RETURN TO EQUITY, MANAGEMENT, & FAMILY LABOR					$116.86	Per Ewe	$11,665.33	

7. Price Sensitivity Analysis

		Percent Change in Total Gross Receipts						
		-25%	-10%	-5%	0%	5%	10%	25%
		--- Net Cash Return over Total Variable Costs per Ewe ---						
	-10%	$51.12	$104.99	$122.94	$140.90	$158.85	$176.81	$230.68
Percent	-5%	$39.00	$92.87	$110.82	$128.78	$146.73	$164.69	$218.55
Change in	0%	$26.88	$80.74	$98.70	**$116.86**	$134.61	$152.56	$206.43
Total Variable	5%	$14.75	$68.62	$86.57	$104.53	$122.49	$140.44	$194.31
Costs	10%	$2.63	$56.50	$74.45	$92.41	$110.36	$128.32	$182.19

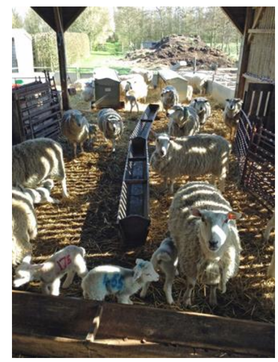
Low Input Production System

150% lamb crop, 18% death loss, 25% lambs unthrifty; 73 lbs mkt lamb/ewe
Total Costs $152/ewe, Feed costs: $51/ewe (0% feed costs for lambs)
Total Costs: $1.72 per lb. of lamb weaned (not including labor)

Ewes stocked at 2 ewes per acre.
Lambing: low labor input; probably on pasture; very limited assistance.
75% of market lambs weigh 73 lbs.
25% of market lambs weigh 50 lbs. (due to unthriftiness).
Lambs sold straight from pasture with no supplemental feeding.
Feed costs: 43% hay for ewes, 42% commodity pellets for ewes, 15% in mineral.
Pasture costs: $40 per acre annually, $20 for rental and $20 for once annual mowing.

Medium Input Production System:

165% Lamb Crop, 13% Death Loss, 15% lambs unthrifty, 141 lbs mkt lamb/ewe
Total Costs $242 /ewe, Feed Costs $152/ewe (50% of this is to feed lambs)
<u>Total Costs $1.72/lb of lamb marketed (not including labor)</u>
Ewes stocked at 3 ewes per acre.
Lambing takes place with shelter and jugs available; considerable assistance.
85% of market lambs weigh 115 lbs.
15% weigh 76 lbs. (due to unthriftiness)
Lambs weaned at <100 days of age and placed on feed.
Feed costs, hay=26%, concentrate=65%, mineral & feed grinding 9%.
50% of feed costs go to feeding lambs.
Pasture costs: $80/acre
$20=rental, $20=mowing, $40=soil fertility and weed control



High Input Production System:

195% Lamb Crop, 10% Death Loss, 10% lambs unthrifty; 194 lbs mkt lamb / ewe
Total Costs are $333/ewe; Feed Costs $224/ewe (56% of feed cost is for lambs)
<u>Total Costs: $1.72/lb of lamb marketed (not including labor);</u>
Ewes stocked at 3 ewes per acre.
Lambing takes place with shelter, all ewes are jugged; considerable assistance.
90% of market lambs weigh 125 lbs.
10% weigh 83 lbs. (due to unthriftiness)
Lambs: creep fed, weaned < 100 days and placed on feed.
Feed costs: hay= 30%, concentrate= 63%, mineral & feed grinding 7%. 56% of feed costs go to lambs.
Pasture costs: $100/acre =
$20 rental, $20 mowing, $60 soil fertility & weed control.

Production Systems: Low, Medium, & High Input
(labor costs not included)

Low, Medium, and High Input Systems with equal Cost per Pound of Lamb Marketed

	Lambing Percent Born Alive	Lamb Percent Death Loss	Percent Lambs Unthrifty	Lambs Marketed per Ewe	Feed Cost Per Ewe	Vet&Med per Ewe	Pasture Cost per Ewe	Other Costs per Ewe	Total Cost per Ewe
Low	150.0%	18.0%	25.0%	1.23	$51.30	$15.37	$20.00	$38.75	$125.42
Medium	165.0%	13.0%	15.0%	1.44	$152.51	$18.44	$24.00	$47.51	$242.46
High	195.0%	10.0%	10.0%	1.76	$223.69	$24.41	$30.00	$55.52	$333.61

Low, Medium, and High Input Systems with equal Cost per Pound of Lamb Marketed

	Cost per Pound of Lamb Marketed	Pounds of Lamb sold per Ewe	# Ewes to NET $1,000 w/ lambs at $2.40/lb.	# Ewes to NET $10,000 w/lambs at $2.40/lb
Low	**$1.72**	**72.9**	**20**	**202**
Medium	**$1.72**	**140.8**	**10**	**105**
High	**$1.72**	**194.5**	**8**	**75**

10% Change in Lambing Percentage

Low, Medium, and High Input Systems with equal Cost per Pound of Lamb Marketed

	Lambing Percent Born Alive	Lambs Marketed per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed to generate $1,000 in net income w/ lambs at $2.40/lb.**
Low	**150.0%**	1.23	$125.42	**$1.72**	72.9	**202**	**20**
Medium	**165.0%**	1.44	$242.46	**$1.72**	140.8	**105**	**10**
High	**195.0%**	1.76	$333.61	**$1.72**	194.5	**75**	**8**

Low, Medium, and High Input Systems with 10% drop in Lambing Percentage

	Lambing Percent Born Alive	Lambs Marketed per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed to net $1,000 w/ lambs at $2.40/lb.**
Low Input	**135.0%**	1.11	$123.73	**$1.93**	64.2	**329**	**33**
Medium Input	**148.5%**	1.29	$231.60	**$1.85**	125.5	**144**	**14**
High Input	**175.5%**	1.58	$317.04	**$1.84**	172.7	**103**	**10**

Low, Medium, and High Input Systems with 10% improvement in Lambing Percentage

	Lambing Percent Born Alive	Lambs Marketed per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed to net $1,000 w/ lamb at $2.40/lb.**
Low Input	**165.0%**	1.35	$126.99	**$1.57**	80.9	**149**	**15**
Medium Input	**181.5%**	1.58	$253.29	**$1.62**	156.1	**82**	**8**
High Input	**214.5%**	1.93	$350.15	**$1.62**	216.2	**59**	**6**

10% Change in Lamb Death Loss

Low, Medium, and High Input Systems with equal Cost per Pound of Lamb Marketed

	Lambing Percent Born Alive	**Lamb Percent Death Loss**	Lambs Marketed per Ewe	Feed Cost Per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed net $1,000 w/ lambs at $2.40/lb.**
Low	150.0%	**18.0%**	1.23	$51.30	$125.42	**$1.72**	72.9	**202**	**20**
Medium	165.0%	**13.0%**	1.44	$152.51	$242.46	**$1.72**	140.8	**105**	**10**
High	195.0%	**10.0%**	1.76	$223.69	$333.61	**$1.72**	194.5	**75**	**8**

Low, Medium, and High Input Systems with 10% increase in lamb death loss

	Lambing Percent Born Alive	**Lamb Percent Death Loss**	Lambs Marketed per Ewe	Feed Cost Per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed net $1,000 w/ lambs at $2.40/lb.**
Low	150.0%	**19.8%**	1.20	$51.29	$125.07	**$1.76**	70.9	**222**	**22**
Medium	165.0%	**14.3%**	1.41	$151.32	$240.93	**$1.74**	138.6	**109**	**11**
High	195.0%	**11.0%**	1.74	$222.31	$331.89	**$1.73**	192.1	**77**	**8**

Low, Medium, and High Input Systems with 10% decrease in lamb death loss

	Lambing Percent Born Alive	**Lamb Percent Death Loss**	Lambs Marketed per Ewe	Feed Cost Per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed net $1,000 w/ lambs at $2.40/lb.**
Low	150.0%	**16.2%**	1.26	$51.30	$125.65	**$1.69**	74.2	**190**	**19**
Medium	165.0%	**11.7%**	1.46	$153.69	$243.96	**$1.71**	143.0	**101**	**10**
High	195.0%	**9.0%**	1.77	$225.06	$335.30	**$1.70**	196.9	**73**	**7**

10% Change in Feed Cost

Low, Medium, and High Input Systems with equal Cost per Pound of Lamb Marketed

	Lambing Percent Born Alive	Lamb Percent Death Loss	Percent Lambs Unthrifty	Lambs Marketed per Ewe	**Feed Cost Per Ewe**	Vet&Med per Ewe	Pasture Cost per Ewe	Other Costs per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed to net $1,000 w/ lambs at $2.40/lb.**
Low	150.0%	18.0%	25.0%	1.23	**$51.30**	$15.37	$20.00	$38.75	$125.42	**$1.72**	72.9	**202**	**20**
Medium	165.0%	13.0%	15.0%	1.44	**$152.51**	$18.44	$24.00	$47.51	$242.46	**$1.72**	140.8	**105**	**10**
High	195.0%	10.0%	10.0%	1.76	**$223.69**	$24.41	$30.00	$55.52	$333.61	**$1.72**	194.5	**75**	**8**

Low, Medium, and High Input Systems with 10% Increase in Feed Cost

	Lambing Percent Born Alive	Lamb Percent Death Loss	Percent Lambs Unthrifty	Lambs Marketed per Ewe	**Feed Cost Per Ewe**	Vet&Med per Ewe	Pasture Cost per Ewe	Other Costs per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed to net $1,000 w/ lambs at $2.40/lb.**
Low	150.0%	18.0%	25.0%	1.23	**$56.43**	$15.37	$20.00	$38.86	$130.66	**$1.79**	72.9	**226**	**23**
Medium	165.0%	13.0%	15.0%	1.44	**$167.76**	$18.44	$24.00	$47.82	$258.01	**$1.83**	140.8	**125**	**13**
High	195.0%	10.0%	10.0%	1.76	**$246.05**	$24.41	$30.00	$55.96	$356.43	**$1.83**	194.5	**91**	**9**

Low, Medium, and High Input Systems with 10% Decrease in Feed Cost

	Lambing Percent Born Alive	Lamb Percent Death Loss	Percent Lambs Unthrifty	Lambs Marketed per Ewe	**Feed Cost Per Ewe**	Vet&Med per Ewe	Pasture Cost per Ewe	Other Costs per Ewe	Total Cost per Ewe	**Cost per Pound of Lamb Marketed**	Pounds of Lamb sold per Ewe	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed to net $1,000 w/ lambs at $2.40/lb.**
Low	150.0%	18.0%	25.0%	1.23	**$46.17**	$15.37	$20.00	$38.65	$120.19	**$1.65**	72.9	**183**	**18**
Medium	165.0%	13.0%	15.0%	1.44	**$137.26**	$18.44	$24.00	$47.21	$226.90	**$1.61**	140.8	**90**	**9**
High	195.0%	10.0%	10.0%	1.76	**$201.32**	$24.41	$30.00	$55.07	$310.79	**$1.60**	194.5	**64**	**6**

- Unthrifty Lambs
  - Parasitized
  - Bottle Babies
  - Triplets
  - Sick early in life

50% Reduction in Unthriftiness

Low, Medium, and High Input Systems with equal Cost per Pound of Lamb Marketed

	Lambing Percent Born Alive	Lamb Percent Death Loss	**Percent Lambs Unthrifty**	Lambs Marketed per Ewe	Feed Cost Per Ewe	Vet&Med per Ewe	Pasture Cost per Ewe	Other Costs per Ewe	Total Cost per Ewe	Cost per Pound of Lamb Marketed	**Pounds of Lamb sold per Ewe**	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed to net $1,000 w/ lambs at $2.40/lb.**
Low	150.0%	18.0%	**25.0%**	1.23	$51.30	$15.37	$20.00	$38.75	$125.42	$1.72	**72.9**	**202**	**20**
Medium	165.0%	13.0%	**15.0%**	1.44	$152.51	$18.44	$24.00	$47.51	$242.46	$1.72	**140.8**	**105**	**10**
High	195.0%	10.0%	**10.0%**	1.76	$223.69	$24.41	$30.00	$55.52	$333.61	$1.72	**194.5**	**75**	**8**

Low, Medium, and High Input System with 50% Decrease in Unthrifty Lambs

	Lambing Percent Born Alive	Lamb Percent Death Loss	**Percent Lambs Unthrifty**	Lambs Marketed per Ewe	Feed Cost Per Ewe	Vet&Med per Ewe	Pasture Cost per Ewe	Other Costs per Ewe	Total Cost per Ewe	Cost per Pound of Lamb Marketed	**Pounds of Lamb sold per Ewe**	**# Ewes Needed to net $10,000 w/lambs at $2.40/lb**	**# Ewes Needed to net $1,000 w/ lambs at $2.40/lb.**
Low Input	150.0%	18.0%	**12.5%**	1.23	$51.30	$15.37	$20.00	$40.35	$127.03	$1.67	**76.0**	**181**	**18**
Medium Input	165.0%	13.0%	**7.5%**	1.44	$152.51	$18.44	$24.00	$48.94	$243.88	$1.69	**144.6**	**97**	**10**
High Input	195.0%	10.0%	**5.0%**	1.76	$223.69	$24.41	$30.00	$56.75	$334.85	$1.69	**197.9**	**71**	**7**

Conclusions

- The production system that is most profitable is a function of available land, labor, and capital resources available to the shepherd.
- **Within any given production system, feed costs (and feed efficiency) is the leading cash cost that impacts profitability**, especially when pasture maintenance costs are included with other feed costs.
- Once the flock size has reached a sufficient size, the cost of other production inputs (costs of veterinary inputs, expenditures for replacement rams or bucks, breeding soundness exams, ultrasound pregnancy testing . . .) are not impediments to profitability and are usually good investments.

Conclusions (contd.)

- Market for live lambs and kids on the East Coast is a niche market.
- Price received, preferences of a particular buyer, and seasonal price patterns can impact decisions within a production system.
- **Within any production system, management practices that increase fertility, number of lambs born alive, and number of lambs marketed per ewe, total pounds of lamb marketed per ewe will have the greatest impact on profitability. Cost control focused on reducing feed costs and/or improving feed efficiency are the most likely to impact profitability.**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Management Tips that Make Cents

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Factors Impacting Your Bottom Line

INCOME

- Number lambs marketed per ewe
  - Number lambs born (prolificacy)
  - % lambs saved
- Lamb sale weights
- Lamb grade/type
- Lamb prices
- Cull prices

EXPENSES

- Feed Costs
- Vet/health costs
- Fertilizer, seed costs
- Fuel
- Fence/facility repairs
- Labor
- Fixed/overhead costs

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Factors Impacting Your Bottom Line

INCOME

- Number lambs marketed per ewe
  - Number lambs born (prolificacy)
  - % lambs saved
- Lamb sale weights
- Lamb grade/type
- Lamb prices
- Cull prices

EXPENSES

- Feed Costs
- Vet/health costs
- Fertilizer, seed costs
- Fuel
- Fence/facility repairs
- Labor
- Fixed/overhead costs

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Number Lambs Born: Key Considerations

- When is our lambing season?
- What determines our breeding/lambing season?
  - Ewe productivity? (number born, number weaned)
  - Marketing program (age, weight of lambs)?
  - Breed?
  - Management ?
    - Facilities
    - Forages/nutrition
    - Health (parasites)
  - Convenience?
  - Habit?
  - Whenever we feel like turning rams out?
  - No defined breeding/lambing season?

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Factors impacting lambing season

- Breed/genetics
  - Seasonality
- Management strategies
  - Ram effect
  - Flushing
  - Forage quality/quantity, nutrition
- Technology
  - CIDRs
  - Estrus synchronization

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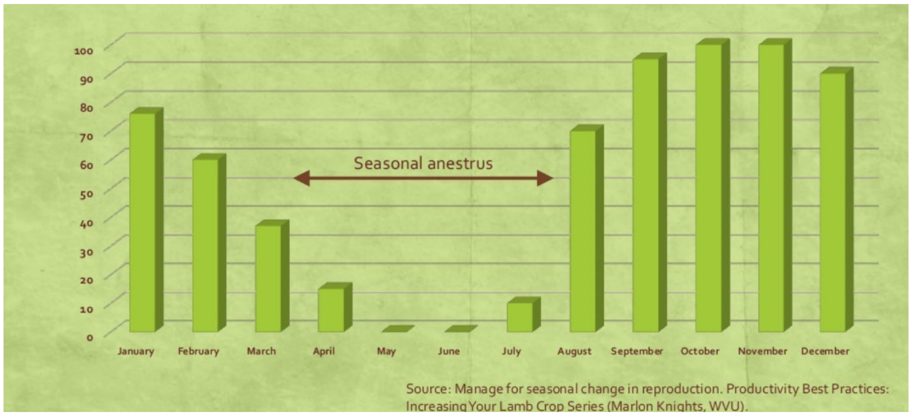
Managing seasonal breeding in sheep

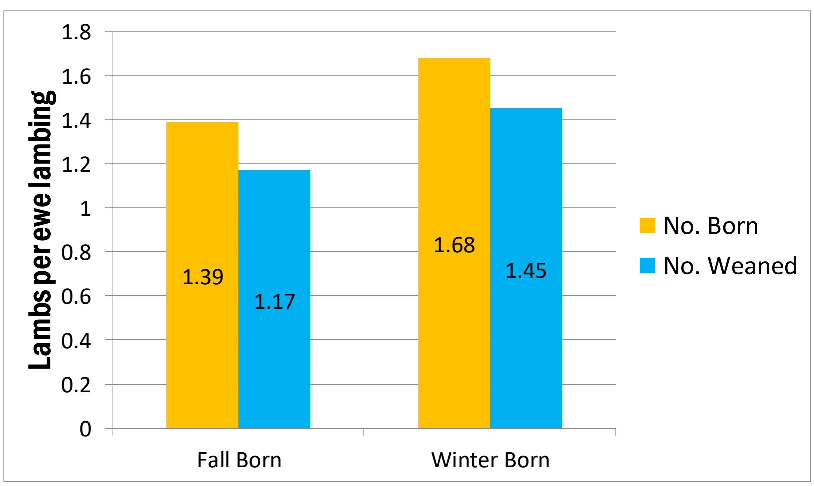
- Sheep are seasonally polyestrus (seasonal anestrus period)
- Reproduction cued by photoperiod (day length); short day breeders
- Gestation = 5 mo → potential lambing intervals of 7-8 mo, yet we struggle to achieve >1 lambing/year
- Seasonality impacted by several factors
  - Breed
  - Genetics- variation within breeds
  - Lactational anestrus

Sheep Seasonality



Fall (Oct-Nov) vs. Winter Lambing (Jan-Feb)

5 yr, 323 mature ewes



Seasonality: Breeds

- Long-season
  - Dorset
  - Finnsheep
  - Rambouillet
  - Hair breeds (?)
- Short-season
  - Suffolk
  - Hampshire

- ***Tremendous within breed variation!***

Lambing Rates of Crossbred Ewes

	% Breed Contribution			
Rambouillet	25	50	50	25
Dorset	50	0	25	25
Suffolk	25	50	0	0
Finn	0	0	25	50
Lambing rate	1.76	1.78	2.13	2.32

From Leymaster, U.S. MARC

Using Maternal EBVs

Scenario

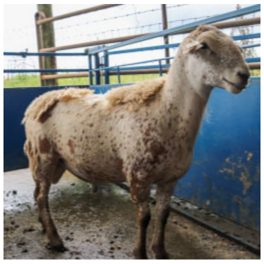
Ram A

Number of lambs weaned EPD = +0.0 %

Compare to:

Ram B

Number of lambs weaned EPD = +5.0%



Using Maternal EBVs

Scenario

- Ram mated to 50 ewes for 2 years (**100 total**)
- Number of lambs weaned/ewe = **1.50 lambs**
- Total lambs weaned/sire = **150 lambs**
- Number of ewe lamb replacements (25%) = **38 replacement ewe lambs**
- Replacements average 5 lambing events = **190 lambings by replacement ewes**
- Average weaning weight **50 lb.**

Using Maternal EBVs

Daughters of Ram A

- NLW EPD = +0%
- 190 lambings
- 150% lamb crop weaned
- 285 lambs weaned x 50 lb. = 14,250 lb. lamb

Daughters of Ram B

- NLW EPD = +5.0%
- 190 lambings
- 155% lamb crop weaned
- 295 lambs weaned X 50 lb. =14,950 lb. lamb

500 more pounds of lamb weaned ($3/lb.) = $1500

(from additional 10 lambs weaned/sold)

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So when should I lamb?

- What is my market?
  - Marketing date
  - Market weight/type
- How will my lambing date impact my bottom line?
  - Number of lambs born/marketed
  - Cost of production (ewes and lambs)
- What are my resources?
  - Facilities
  - Labor
  - Forages

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Factors impacting lambing season

- Breed/genetics
  - Seasonality
- **Management strategies**
  - **Ram effect**
  - **Flushing**
  - **Forage quality/quantity, nutrition**
- Technology
  - CIDRs
  - Estrus synchronization

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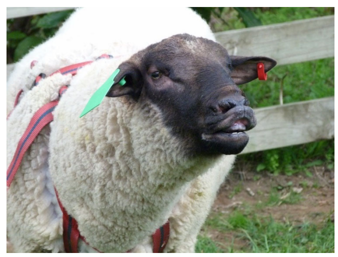
Ram Effect



- Method (applicable all seasons)
  - Isolate ewes from rams for 4 to 6 weeks. Shorter periods may work but less reliable.
  - *No* fence-line contact; one-half mile or so is better. No shared pens, chutes, etc.
  - Join rams and ewes ~ 2 wks before you want to start getting ewes pregnant
  - Can use teaser (vasectomized) rams to tighten up lambing. Or just introduce breeding rams 2 wks early; will get a few early lambs.

Ram Effect

- Expect:
  - 50 to 90% of ewes ovulate within 2 to 7 days after ram introduction, *but*
  - Less than 20% of ewes in heat within 7 days (first ovulation is *silent* – no estrus)
  - 50 to 80% of ewes in heat 16 to 25 days after ram introduction.
  - Two peaks of estrus: 1st at 16 to 20 days and 2nd at 22 to 26 days.
  - 35 to 60% of ewes pregnant after the 2nd estrus peak
  - Most effective in summer as breeding season is approaching. Less effective in the spring as ewe becoming anestrus.

Ram Effect

- How does it work:
  - The smell of the ram (a pheromone) can act directly on the ewe's brain to cause an LH surge and ovulation
  - The exact pheromone has not been isolated (no "ram in a can")
  - The presence of ewes in heat (ie. cycling ewes) also can help to induce anestrous ewes to cycle. Can be an important effect.
  - Ram + cycling ewes provide an optimal social environment for getting ewes to cycle.

Nutritional Management- Breeding Season

- Positive (increasing) plane of nutrition (not thin or fat)
- Health
- Favorable environment- shade, shelter (minimize stress)

Flushing

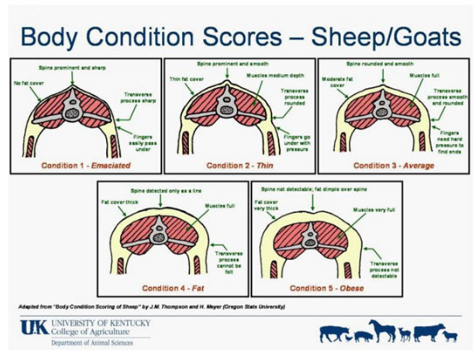
- Providing supplemental energy to ewes at breeding to increase ovulation rates
- 1-2 pounds corn starting 2 weeks prior to breeding and continuing 2-3 weeks into breeding season (high quality forage may also be effective)
- Ewes in below average body condition most responsive
- 10-20% improvement in lambing rate (influenced by season and other factors)

Baby Lamb Mortality

• Dystocia - Stillborns	20.0%
• Starvation	19.1%
• Abortion	16.5%
• Pneumonia	17.0%

Preventing Lamb Losses Starts with Gestation Nutrition

- Optimum nutrition particularly in 3rd trimester
- Condition at parturition is important determinant of lamb/kid survival (effect on birth weight)
- Newborns need high quality colostrum
  - First source of energy
  - Utilized to produce heat
  - Ewe/Doe must have adequate BCS and mineral supplementation



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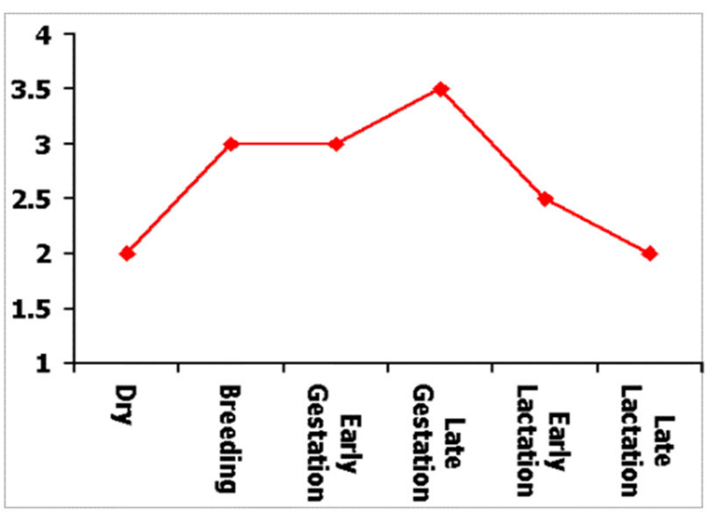
Ewe body condition over production Cycle



Body Condition Scoring

Group	Stage of Production	Ideal BCS
Breeding Ewes	Pre-Breeding	3
	Mid-pregnancy	2.5-3
	Pre-Lambing **Lambing**	3 **3+**
	Weaning/Drying off	2+
Rams	Pre-Breeding	3-3.5
	Summer	2+


BCS 1


BCS 3


BCS 5

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Body Condition Scoring

- At lambing 3-3.5 BCS
- Positive plane of nutrition during late gestation (even fat ewes)
- Increase BCS, if necessary, starting early/mid gestation


BCS 1


BCS 3


BCS 5

Fat and Thin Females
Reasons and Consequences

- Why are females too thin?
  - Inadequate nutrition, parasitism, inadequate bunk space, inadequate grouping of animals, wasting diseases, chronic diseases, genetics, high milk production (multiple lambs), old (need to be culled)
  - This sets them up for: failure to conceive, less lbs kid weaned, pregnancy toxemia, parasitism and disease

- Why are females too fat?
  - Were not culled, poor milk production (low wean wt), overfed in early-midgestation, dominant ewes
  - This sets them up for: pregnancy toxemia, dystocia, vaginal prolapse

Consequences of Underfeeding

- Weak, small lambs/kids with high mortality
- Reduced colostrum quality and quantity
- Retarded weight gain both pre & post weaning
- Reduced peak milk yield and less total production
- Decreased re-breeding success

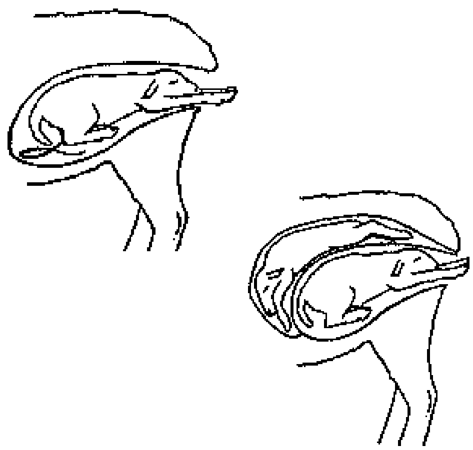
Lambing Season- Be Ready!

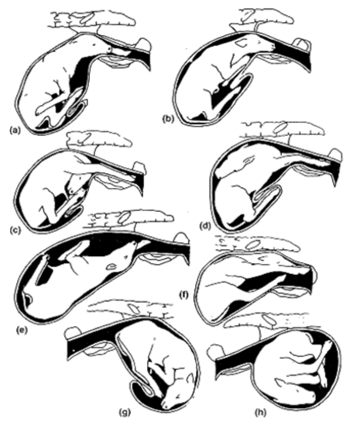
- Predict lambing dates
  - Ram marking harness- record dates
  - Ultrasound (due date, fetal number)
- Visits to lambing barn
  - Efficient labor
  - Feeding management
- Vet relationship

Lambing Supplies

- Stomach tubes
- Thermometer
- Prolapse retainer
- Towels/rags
- OB lube, sleeves
- Disinfectant
- Iodine
- Needles, syringes
- Bo-Se
- Ear tags
- Record book
- Milk replacer, supplies
- Propylene glycol
- Docking, castration equipment
- Antibiotics

Normal vs. Abnormal Presentation





Colostrum Intake

- Colostrum
  - Antibodies
  - Energy
- Colostrum intake:
  - ~10% Body Wt. in 24 hrs
  - 10 lb. lamb = 16 oz (30 ml = 1 oz.)
  - Start with 60-120 ml, followed by several oz every 3 hours

Sources of Colostrum

- Ewe
- Flock-mate
- Frozen
- Goat
- Cow
- Artificial

Lamb Hypothermia

Indicators
- Hunched posture
- Hollowed out sides
- No suckle reflex
- Excessive calling
- Down or lethargic
- Unresponsive

- Mouth feel
- Rectal temp

- Normal temperature 102-103
  - Hypothermia 100-101
  - Severe hypothermia <99

- Newborns
  - chilling, exposure
  - premature birth, weakness, trauma
  - insufficient energy intake
- Older lambs
  - starvation
  - disease

Hypothermia Treatment
after determining temp

Temp >99 and can stand
- Collect milk or colostrum from dam and feed (use altenative source if necessary)
- stomach tube
- Put in warming box or warm up until temp reaches 101
- Return to mother

- If temp is <99, still standing
- Warm up first to 99 F and then feed by stomach tube

Temp <99 and can not stand/suckle
- Put in warming box (checking temp every 20 mins)
- Tube feed at 99
- Warm to 101
- Return to Mother if bright and standing well

Young Lamb Management

- Use jugs
- Mixing and monitoring
- Identify ewe and her lambs
  - eartag
  - paint brands
- Dock and castrate early

VIRGINIA TECH.

Ewe/Young Lamb Management

- Monitor closely upon leaving jugs, first 2 wk of life critical
- Potential lamb issues:
  - Starvation (rejection, ewe mastitis)
  - Pneumonia
  - Scours
    - E. coli
    - Cryptosporidiosis
    - Rota virus
    - Salmonella
- Potential ewe issues
  - Mastitis
  - Orf/soremouth on udder/teats

VIRGINIA TECH.

Feed Costs

- ❑ Know requirements (avoid overfeeding, underfeeding)
- ❑ Use condition scoring
- ❑ Test hays
- ❑ Buy feeds on nutrient cost basis
- ❑ Control waste
- ❑ Extend grazing season by improved management

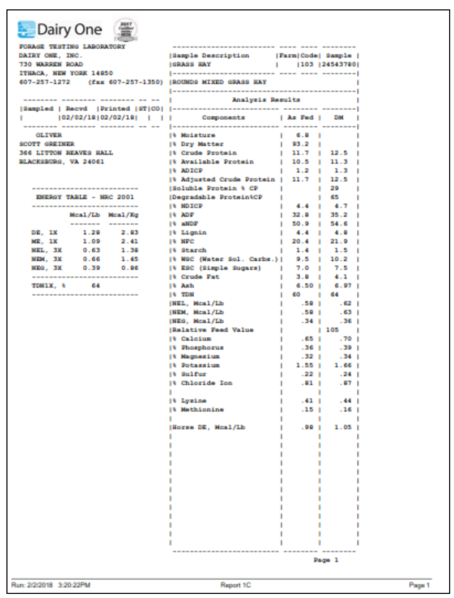
Forage Testing

- Results only as good as sample
  - Representative sample
  - Core best
- Send to lab
  - Identify: grass vs grass/legume
- Analyze and implement results

Forage Testing

- TDN
  - >60%: Excellent for lactation
  - 55-60%: Good for late gestation, lactation
  - 50-55%: Caution for late gestation and lactation, intake critical
  - <50%: Maintenance only

Forage TDN	DMI, % BW
≤ 50%	1.5
51 – 54%	2.0
55-59%	2.5
≥ 60%	3.0



Dairy One

FORAGE TESTING LABORATORY
DAIRY ONE, INC.
730 WARREN ROAD
ITHACA, NEW YORK 14850
607-257-1272 (fax 607-257-1350)

Sampled	Recvd	Printed	ST	CO
	02/02/18	02/02/18		

OLIVER
SCOTT GREINER
366 LITTON REAVES HALL
BLACKSBURG, VA 24061

ENERGY TABLE - NRC 2001

	Mcal/Lb	Mcal/Kg
DE, 1X	1.28	2.83
ME, 1X	1.09	2.41
NEL, 3X	0.63	1.38
NEM, 3X	0.66	1.45
NEG, 3X	0.39	0.86
TDN1X, %	64	

Sample Description	Farm	Code	Sample
GRASS HAY		103	24543780

ROUNDS MIXED GRASS HAY

Analysis Results

Components	As Fed	DM
% Moisture	6.8	
% Dry Matter	93.2	
% Crude Protein	11.7	12.5
% Available Protein	10.5	11.3
% ADICP	1.2	1.3
% Adjusted Crude Protein	11.7	12.5
Soluble Protein % CP		29
Degradable Protein%CP		65
% NDICP	4.4	4.7
% ADF	32.8	35.2
% aNDF	50.9	54.6
% Lignin	4.4	4.8
% NFC	20.4	21.9
% Starch	1.4	1.5
% WSC (Water Sol. Carbs.)	9.5	10.2
% ESC (Simple Sugars)	7.0	7.5
% Crude Fat	3.8	4.1
% Ash	6.50	6.97
% TDN	60	64
NEL, Mcal/Lb	.58	.62
NEM, Mcal/Lb	.58	.63
NEG, Mcal/Lb	.34	.36
Relative Feed Value		105
% Calcium	.65	.70
% Phosphorus	.36	.39
% Magnesium	.32	.34
% Potassium	1.55	1.66
% Sulfur	.22	.24
% Chloride Ion	.81	.87
% Lysine	.41	.44
% Methionine	.15	.16
Horse DE, Mcal/Lb	.98	1.05

Page 1

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Cost Per Unit Nutrient

- Calculate price of feed per pound of nutrient on a DM basis
  - Cost per lb. of TDN or CP (DM Basis)

- Steps:
  1) Calculate cost per lb. of feedstuffs on As-Fed basis (ie. convert cost per ton to cost per lb., or cost per bushel to cost per lb., or cost per bag to cost per lb.)
  2) Divide cost per lb. As-Fed by %DM to get cost per lb. DM
  3) Divide cost per lb DM by nutrient content (DM basis) to get cost per lb. nutrient on DM basis

Cost Per Unit TDN Example

Corn:

1) $6.50 / 50 = $0.130 / lb. AF
2) $0.130 / 0.90 = $0.144 / lb. DM
3) $0.144 / 0.88 = $0.164 / lb. TDN

CGF:

1) $6.95 / 50 = $0.139 / lb. AF
2) $0.139 / 0.90 = $0.154 / lb. DM
3) $0.154 / 0.80 = $0.193 / lb. TDN

	Corn	CGF
Unit Price	$6.50 / bag	$6.95 / bag
Lb. / Unit	50 lb. bag	50 lb. bag
DM, %	90	90
TDN, %	88	80

VIRGINIA TECH.

Cost Per Unit CP Example

Corn:

1) $6.50 / 50 = $0.130 / lb. AF
2) $0.130 / 0.90 = $0.144 / lb. DM
3) $0.144 / 0.09 = $1.60 / lb. CP

CGF:

1) $6.95 / 50 = $0.139 / lb. AF
2) $0.139 / 0.90 = $0.154 / lb. DM
3) $0.154 / 0.23 = $0.670 / lb. CP

	Corn	CGF
Unit Price	$6.50 / bag	$6.95 / bag
Lb. / Unit	50 lb. bag	50 lb. bag
DM, %	90	90
CP, %	9	23

VIRGINIA TECH.

Reduce Hay Waste

- Feeder design (Kishel et al., 2019)
  - Prevent forage from dropping on ground
    - Floor
    - Bars to prevent pulling forage out
    - Basket/platform < movable panels < diagonal bars < vertical bars
- Hay quality impact
- Hay storage impact

Developing a Nutrition Program

- Know forage quality- Don't Guess, Forage Test!!
- Use BCS as guide
- Feed to requirements
- Supplements
  - Match to balance forage quality and stage production
  - Price on per unit basis for energy and/or protein
  - Commercial feeds need to be formulated for sheep or goats
  - Energy and Mineral balance to match forage
- Minerals critical (free choice trace mineral formulated for sheep)
- Proper nutrition has favorable impact on health, lamb survival, etc.
- Effective nutritional program usually requires more than one management group/pen

Factors Impacting Your Bottom Line

INCOME

- Number lambs marketed per ewe
  - Number lambs born (prolificacy)
  - % lambs saved
- Lamb sale weights
- Lamb grade/type
- Lamb prices
- Cull prices

EXPENSES

- Feed Costs
- Vet/health costs
- Fertilizer, seed costs
- Fuel
- Fence/facility repairs
- Labor
- Fixed/overhead costs

Have a great lambing season!

Solar in Virginia

February 26, 2025

Sheperd's Symposium

Via Recording & ZOOM

John Ignosh

Extension Specialist

Dept. Biological Systems Engineering

Virginia Tech & Extension

Harrisonburg, VA 22801

Outline

- Introduction
- Scales of Solar – “Small, Medium & Large”
- Utility-scale Solar in Virginia
- Dual-use Solar/ “Agrivoltaics”
- Discussion

Solar can potentially be incorporated across a variety of scales.

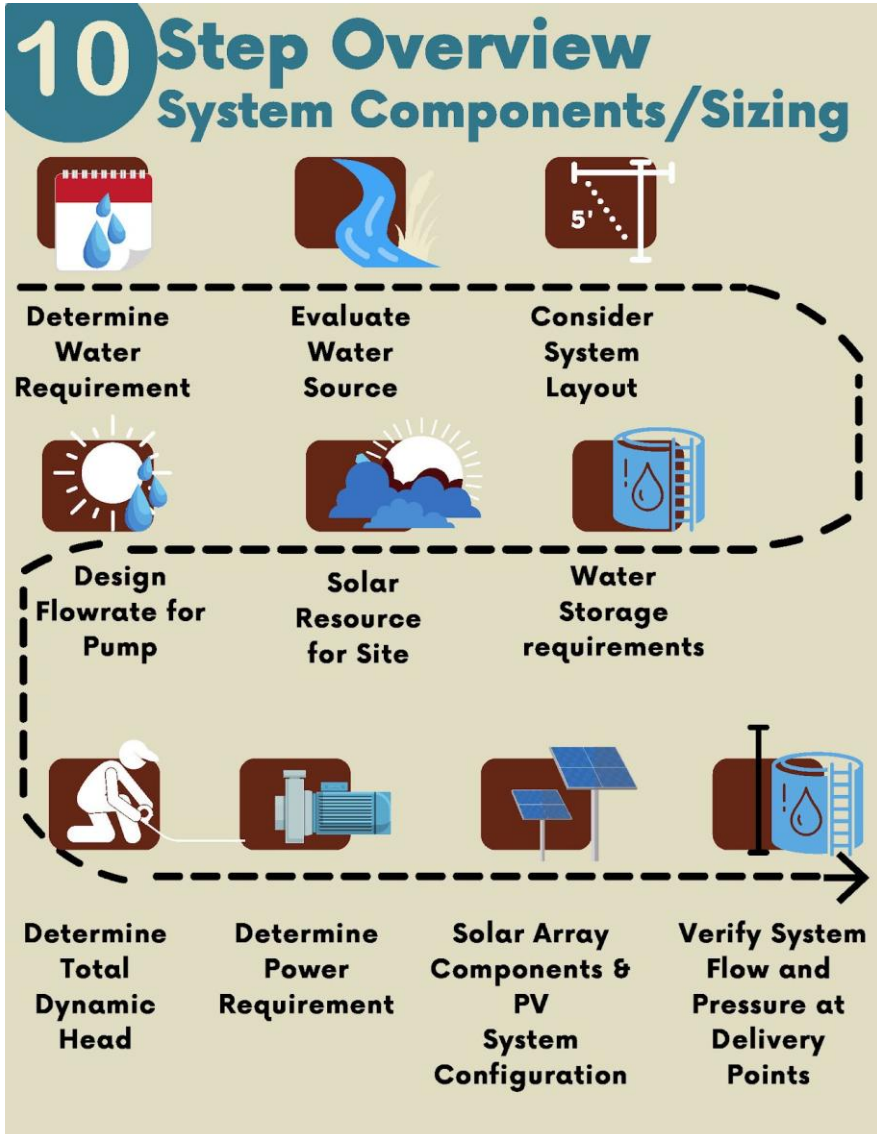
For example:

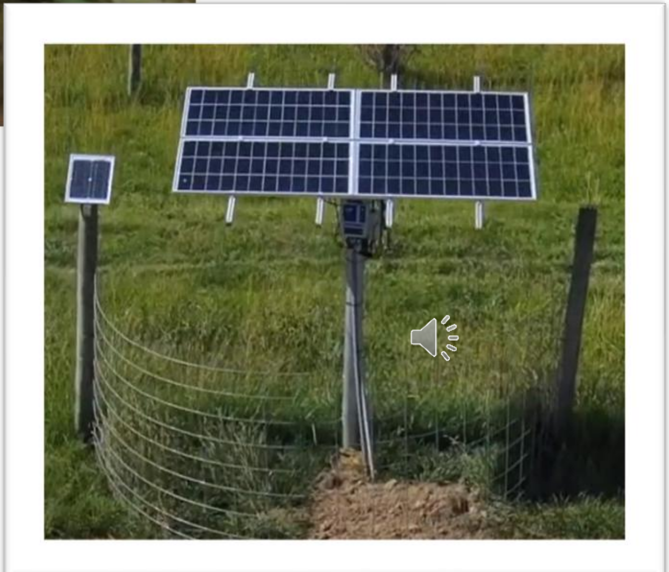
- off-grid solar to power a small water pump
- installed to offset all or a portion of the electrical energy usage through net metering
- *Among many other options..*

The variety of "solar" options continues to expand as markets and policies change.

No one application is a fit for everyone or everywhere, and it's important to understand all the details especially when expensive investments are considered.

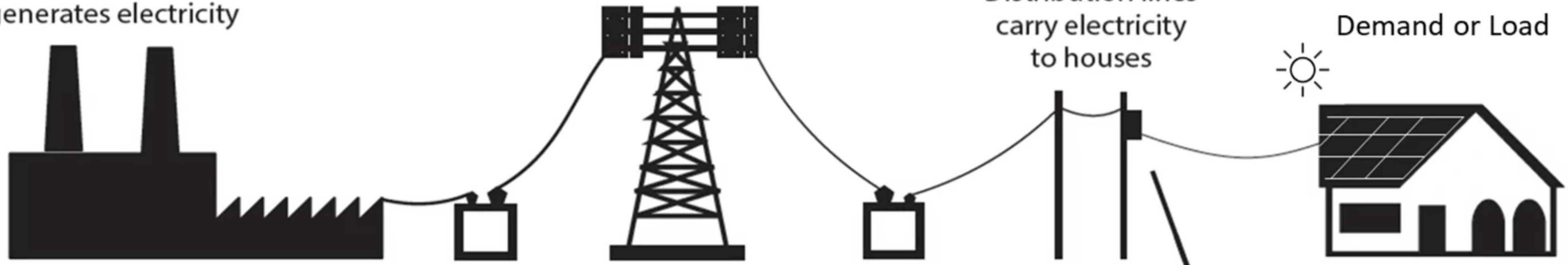
Solar-powered Water Pumping Systems



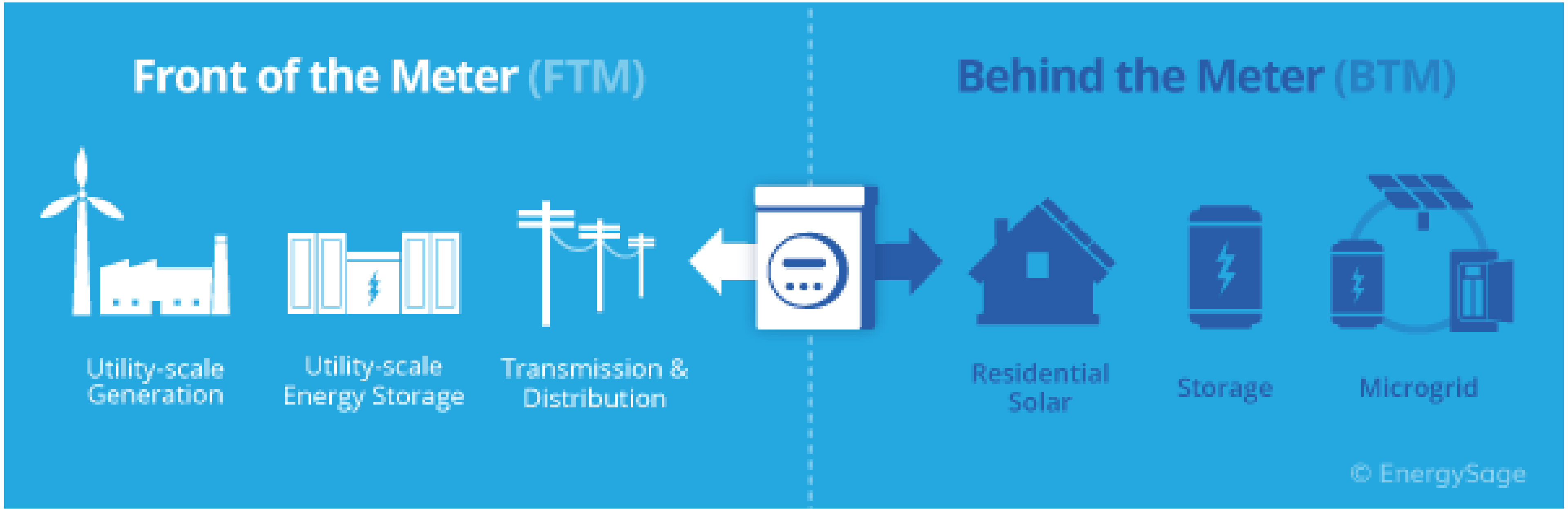


https://sites.google.com/vt.edu/solarwateroptions/home

The Grid



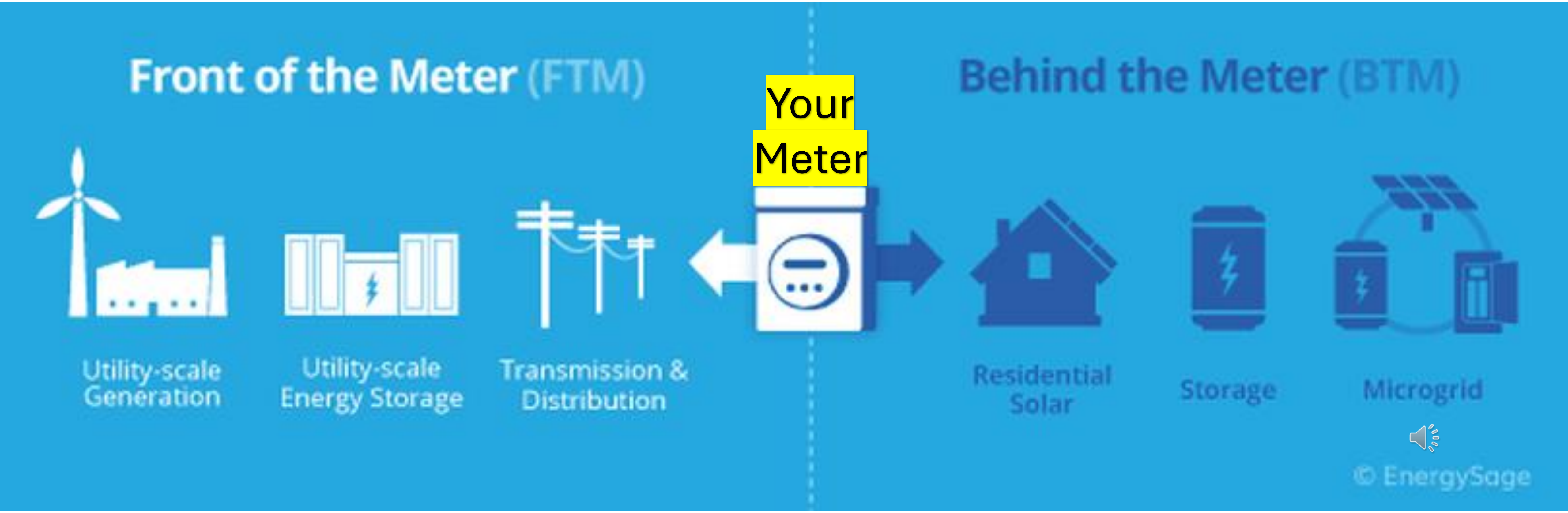
Source: NEED.org Electricity (2019)


Front of the Meter (FTM)
Behind the Meter (BTM)
Utility-scale Generation
Utility-scale Energy Storage
Transmission & Distribution
Residential Solar
Storage
Microgrid
© EnergySage

• the need for electric generation • service reliability • environmental impact • the public interest • economic development in the Commonwealth

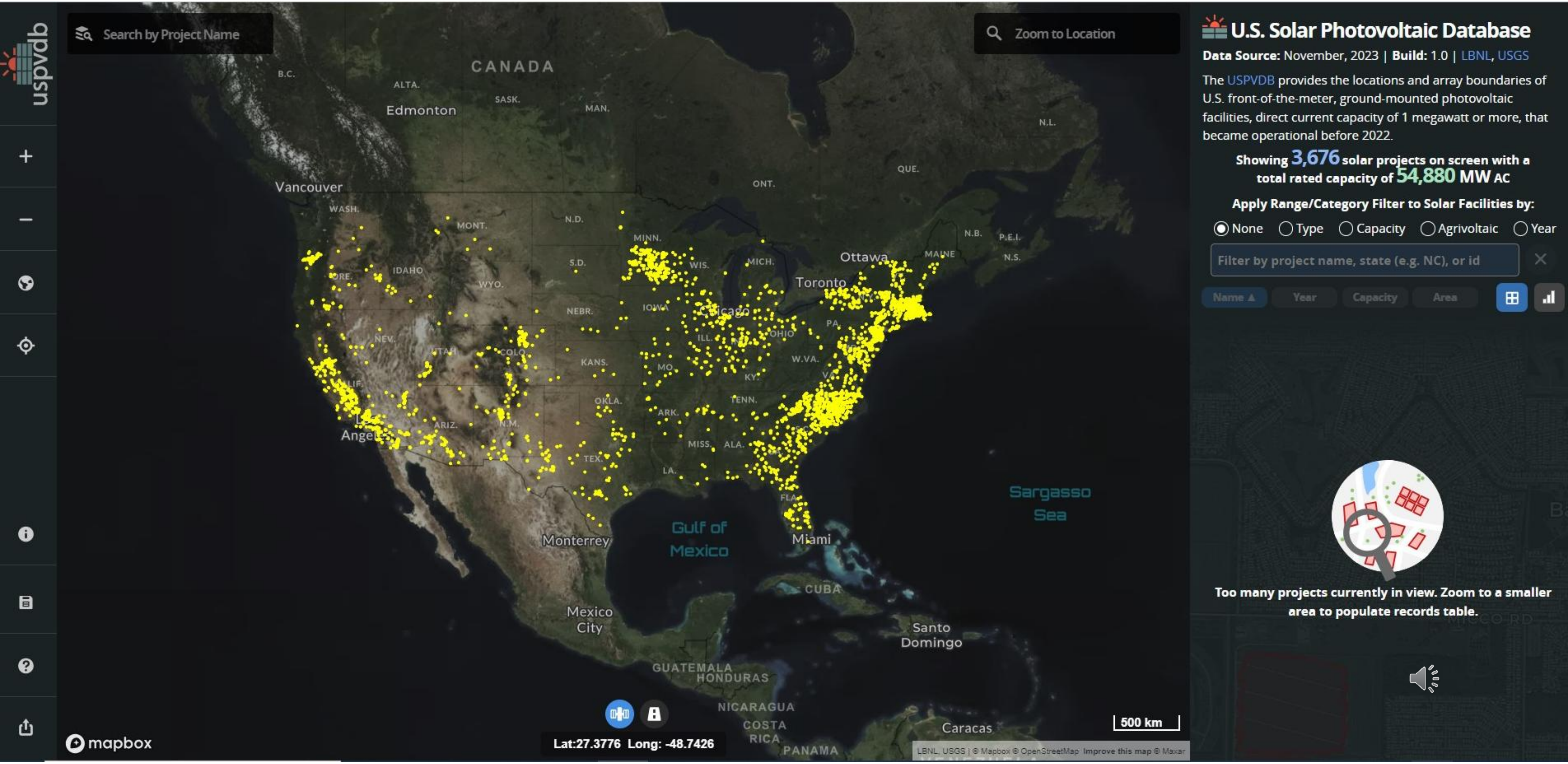
Competitive Markets & Many Regs

Owner's Investment Criteria & Less Regs



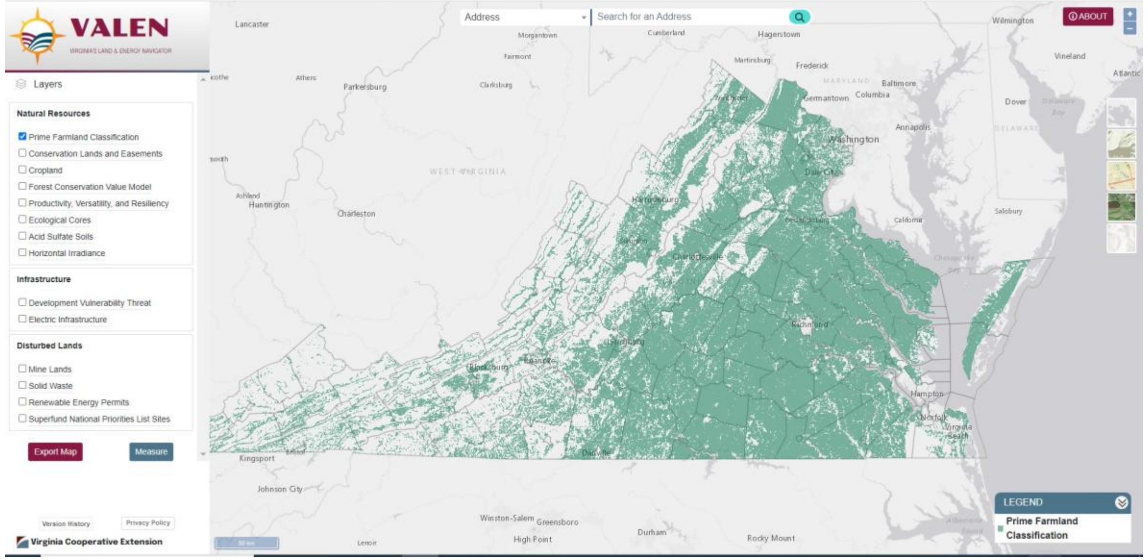
https://www.energysage.com/electricity/behind-the-meter-overview/

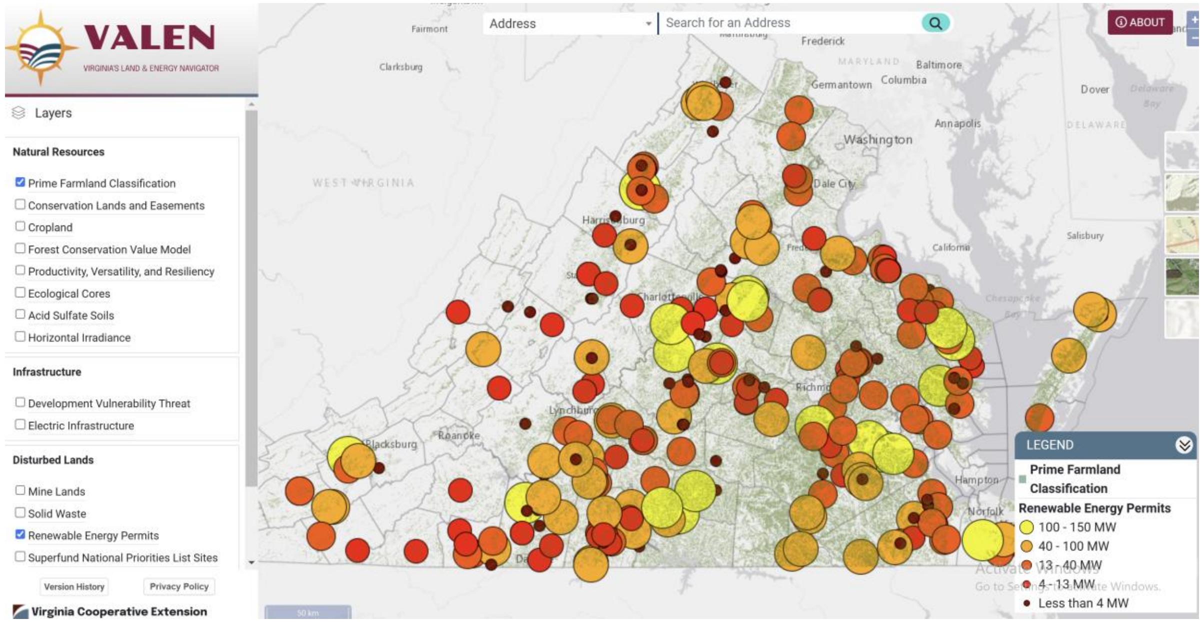
https://www.scc.virginia.gov/getattachment/9f54a6c5-92e3-41b9-a8d6-0609533bb5ed/electfac.pdf



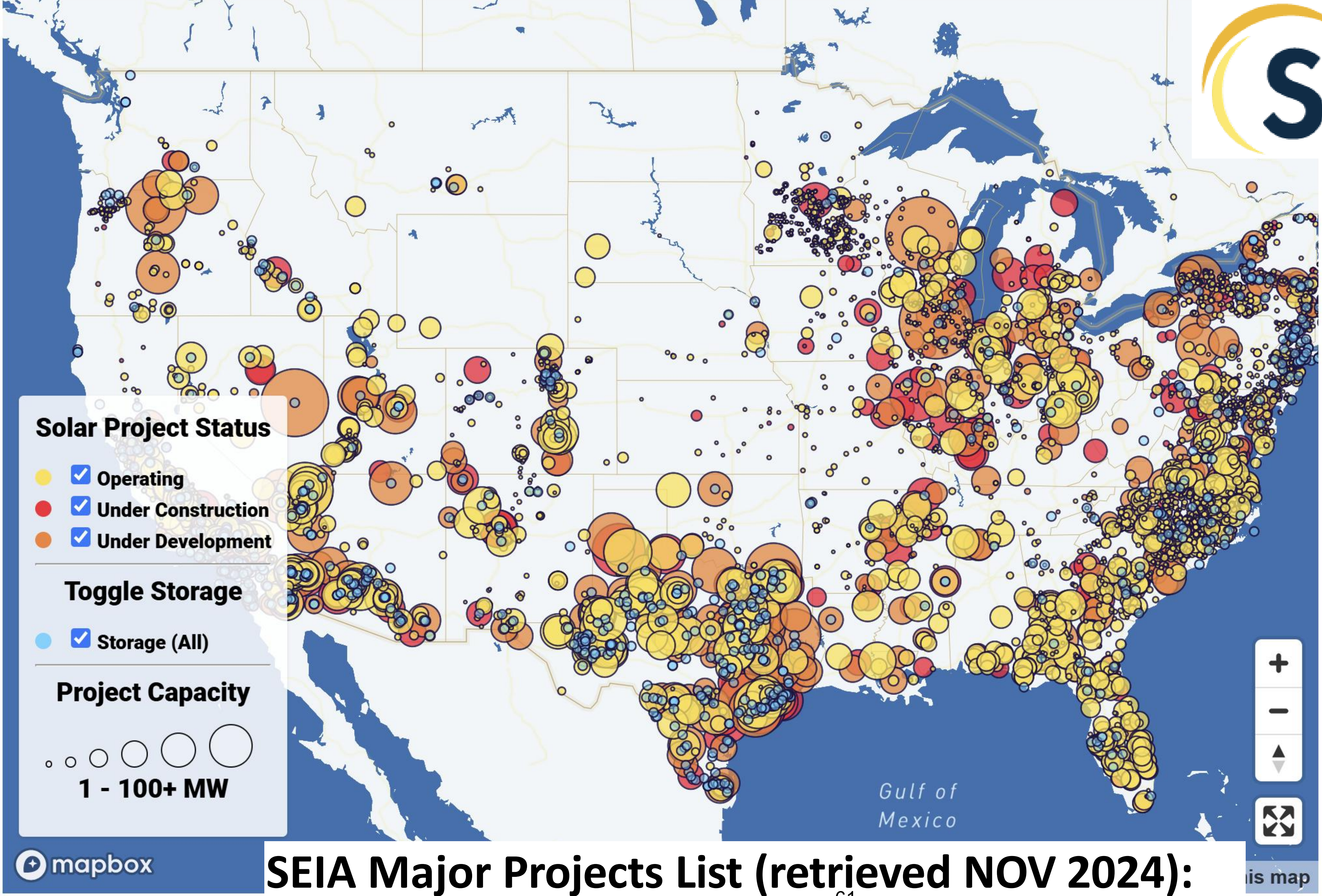
https://energy.usgs.gov/uspvdb/

Virginia Land & Energy Navigator VaLEN





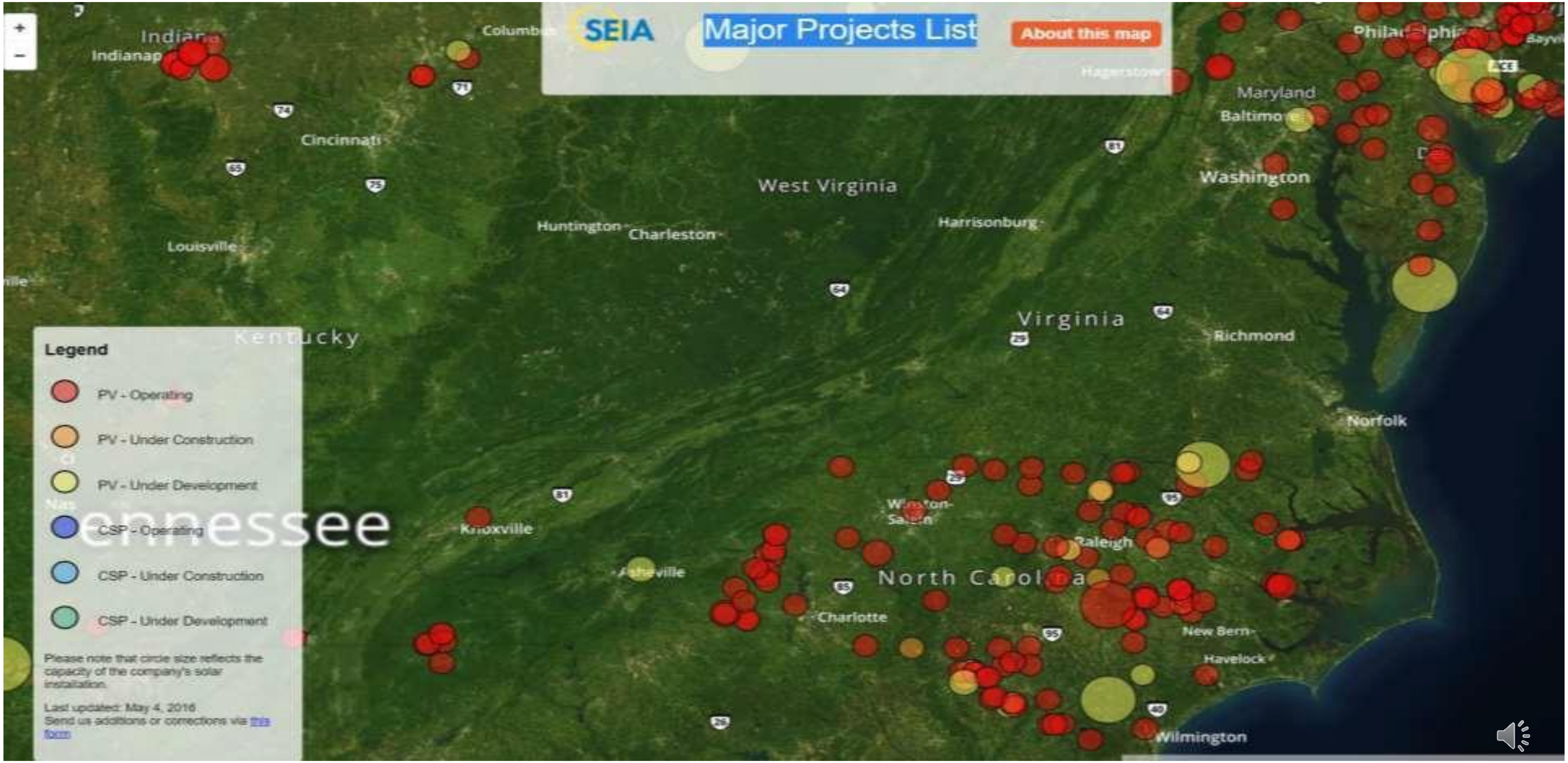
https://valen.ext.vt.edu



SEIA Major Projects List (retrieved NOV 2024):

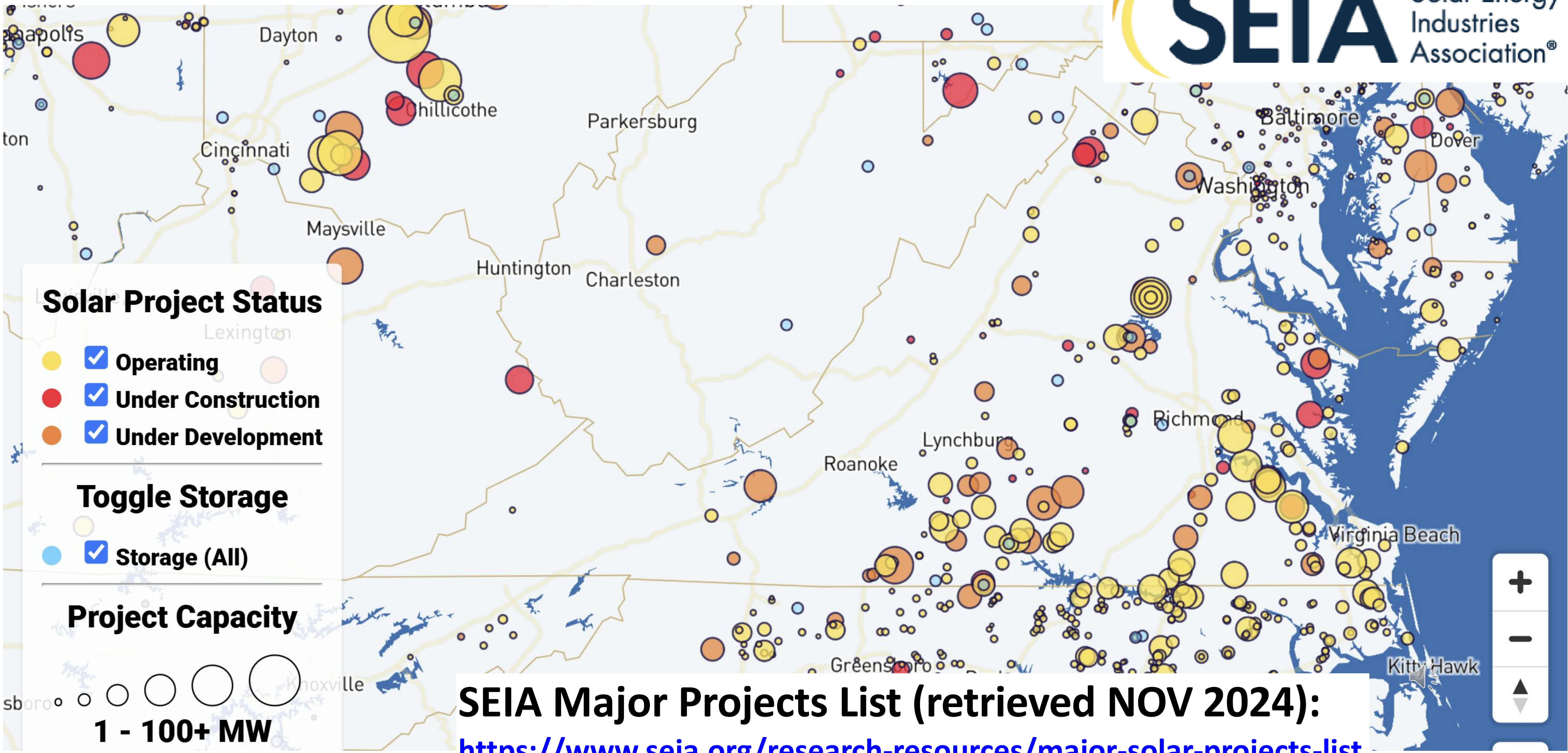
https://www.seia.org/research-resources/major-solar-projects-list

YEAR: 2016



SEIA Major Projects List:

http://www.seia.org/map/majorprojectsmap.php



SEIA Major Projects List (retrieved NOV 2024):

https://www.seia.org/research-resources/major-solar-projects-list

LIS

VIRGINIA'S LEGISLATIVE INFORMATION SYSTEM

SEARCH SITE

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- Bill Summaries — session summaries
- Reports to the General Assembly — House and Senate documents
- Legislative Liaisons

2020 SESSION

another bill? | print version

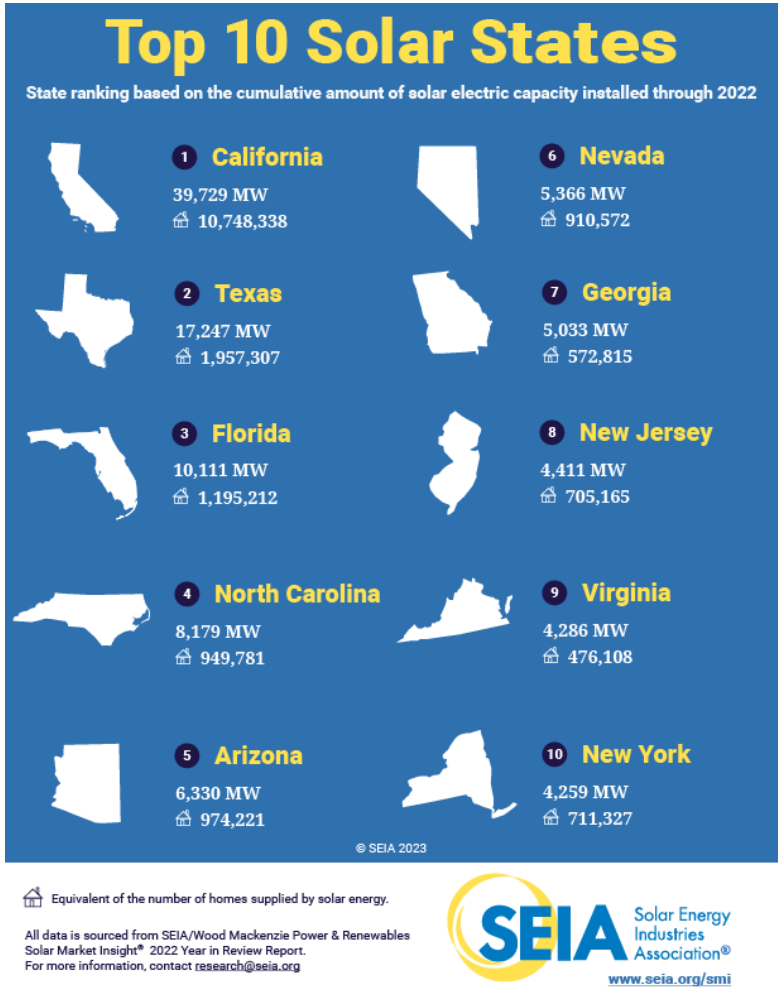
HB 1526 Electric utility regulation; environmental goals.

Introduced by: Richard C. "Rip" Sullivan, Jr. | all patrons ... notes | add to my profiles

SUMMARY AS PASSED: (all summaries)

Virginia Clean Economy Act. Establishes a schedule by which Dominion Energy Virginia and American Electric Power are required to retire electric generating units located in the Commonwealth that emit carbon as a by-product of combusting fuel to generate electricity and by which they are required to construct, acquire, or enter into agreements to purchase generating capacity located in the Commonwealth using energy derived from sunlight or onshore wind. The measure replaces the existing voluntary renewable energy portfolio standard program (RPS Program) with a mandatory RPS Program. Under the mandatory RPS Program, Dominion Energy Virginia and American Electric Power are required to produce their electricity from 100 percent renewable sources by 2045 and 2050, respectively. A utility that does not meet its targets is required to pay a specific deficiency payment or purchase renewable energy certificates. The proceeds from the deficiency payments are to be deposited into an account administered by the Department of Mines, Minerals and Energy, which is directed to distribute specific percentages of the moneys to job training and renewable energy programs in historically economically disadvantaged communities, energy efficiency measures, and administrative costs. The measure requires the State Air Pollution Control Board to adopt regulations to reduce the carbon dioxide emissions from certain electricity generating units in the Commonwealth and authorizes the Board to establish, implement, and manage an auction program to sell allowances to carry out the purposes of such regulations and to utilize its existing regulations to reduce carbon dioxide emissions from electric power generating facilities. Among other things, the measure also (i) requires, by 2035, American Electric Power and Dominion Energy Virginia to construct or acquire 400 and 2,700 megawatts of energy storage capacity, respectively; (ii) establishes an energy efficiency standard under which each investor-owned incumbent electric utility is required to achieve incremental annual energy efficiency savings that start in 2022 at 0.5 percent for American Electric Power and 1.25 percent for Dominion Energy Virginia of the average annual energy retail sales by that utility in 2019 and increase those savings annually; (iii) exempts large general service customers from energy savings requirements; (iv) revises the incentive for electric utility energy efficiency programs; (v) provides that if the Commission finds in any triennial review that revenue reductions related to energy efficiency measures or programs approved and deployed since the utility's previous triennial review have caused the utility to earn more than 50 basis points below a fair combined rate of return on its generation and distribution services or, for any test period commencing after December 31, 2012, for Dominion Energy Virginia and after December 31, 2013, for American Electric Power, more than 70 basis points below a fair combined rate of return on its generation and distribution services, the Commission shall order increases to the utility's rates for generation and distribution services necessary to recover such revenue reductions; (vi) establishes requirements regarding the development by Dominion Energy Virginia of qualified offshore wind projects having an aggregate rated capacity of not less than 5,200 megawatts by January 1, 2034, and provides that in constructing any such facility, the utility shall (a) identify options for utilizing local workers; (b) identify the economic development benefits of the project for

https://legacylis.virginia.gov/cgi-bin/legp604.exe?201+sum+HB1526

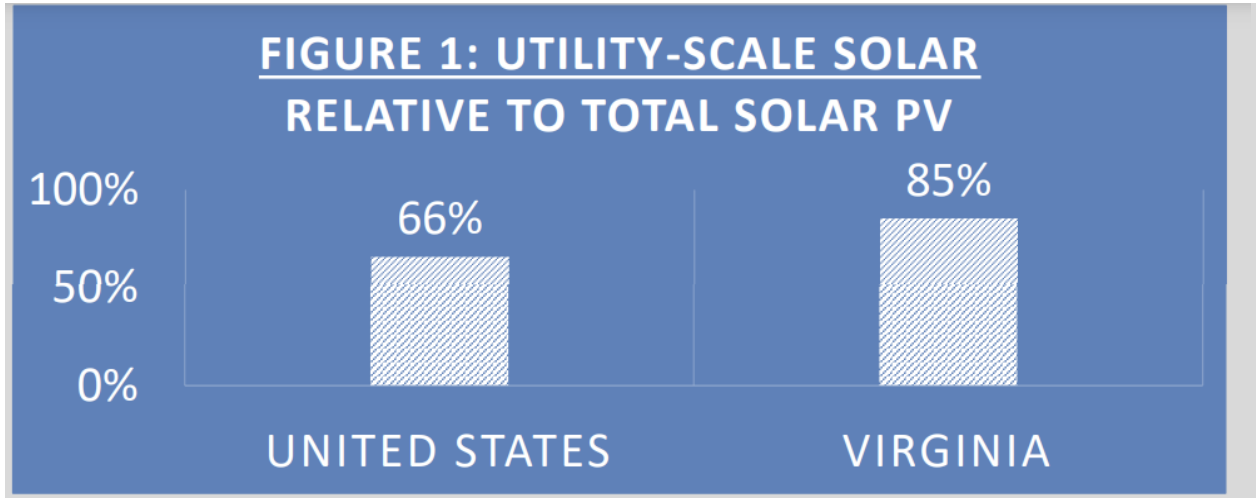


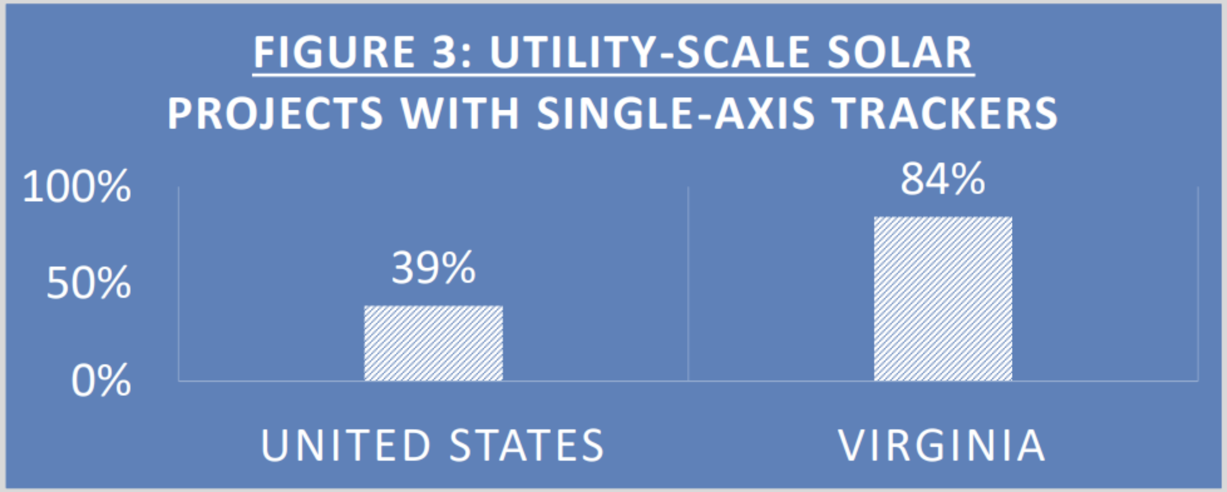
https://www.seia.org/

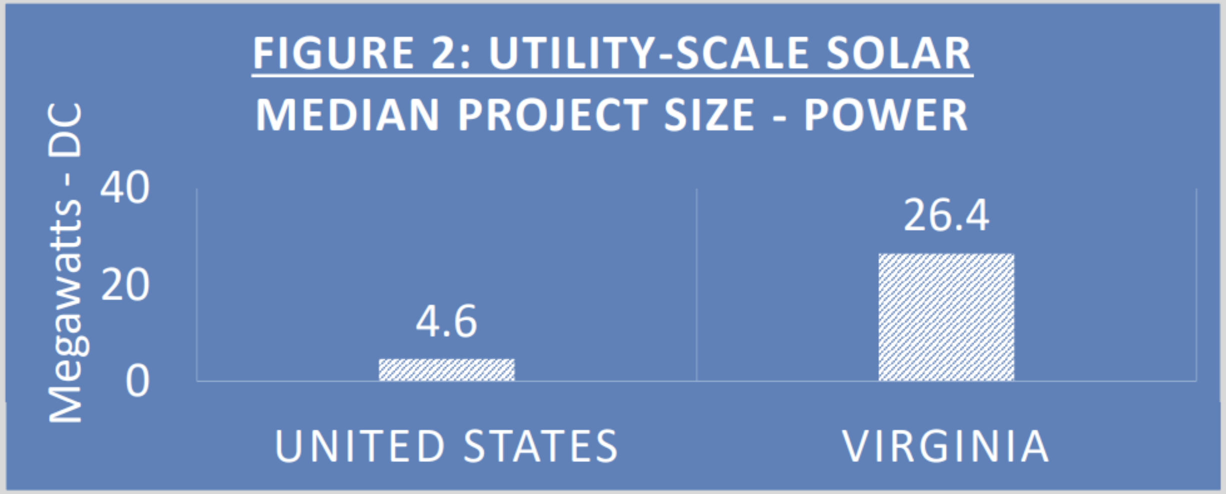
State	USS-PV (MW)	DIST PV (MW)	TOTAL PV (MW)	USS PV Ranking	DIST PV Ranking	DIST PV % of ALL PV
California	17232	15636	32868	1	1	48%
Texas	12869	2539	15408	2	4	16%
Florida	7486	2283	9769	3	7	23%
North Carolina	6337	455	6792	4	16	7%
Georgia	3875	302	4177	5	26	7%
Nevada	3630	874	4504	6	12	19%
Virginia	2875	427	3302	7	18	13%
Arizona	2764	2359	5123	8	6	46%
Colorado	1887	961	2848	9	10	34%
Utah	1628	499	2127	10	15	23%
New Jersey	*1104*	*2484*	*3588*	*16*	*5*	*69%*

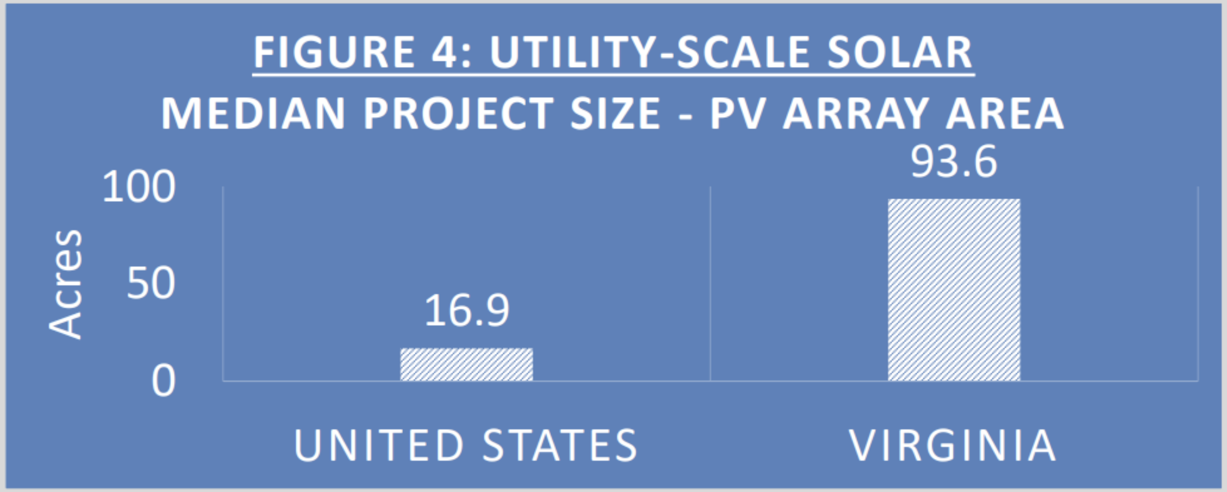
https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=table_6_02_b

In Virginia, about 87% of installed solar PV capacity is from solar projects larger than 1 MW







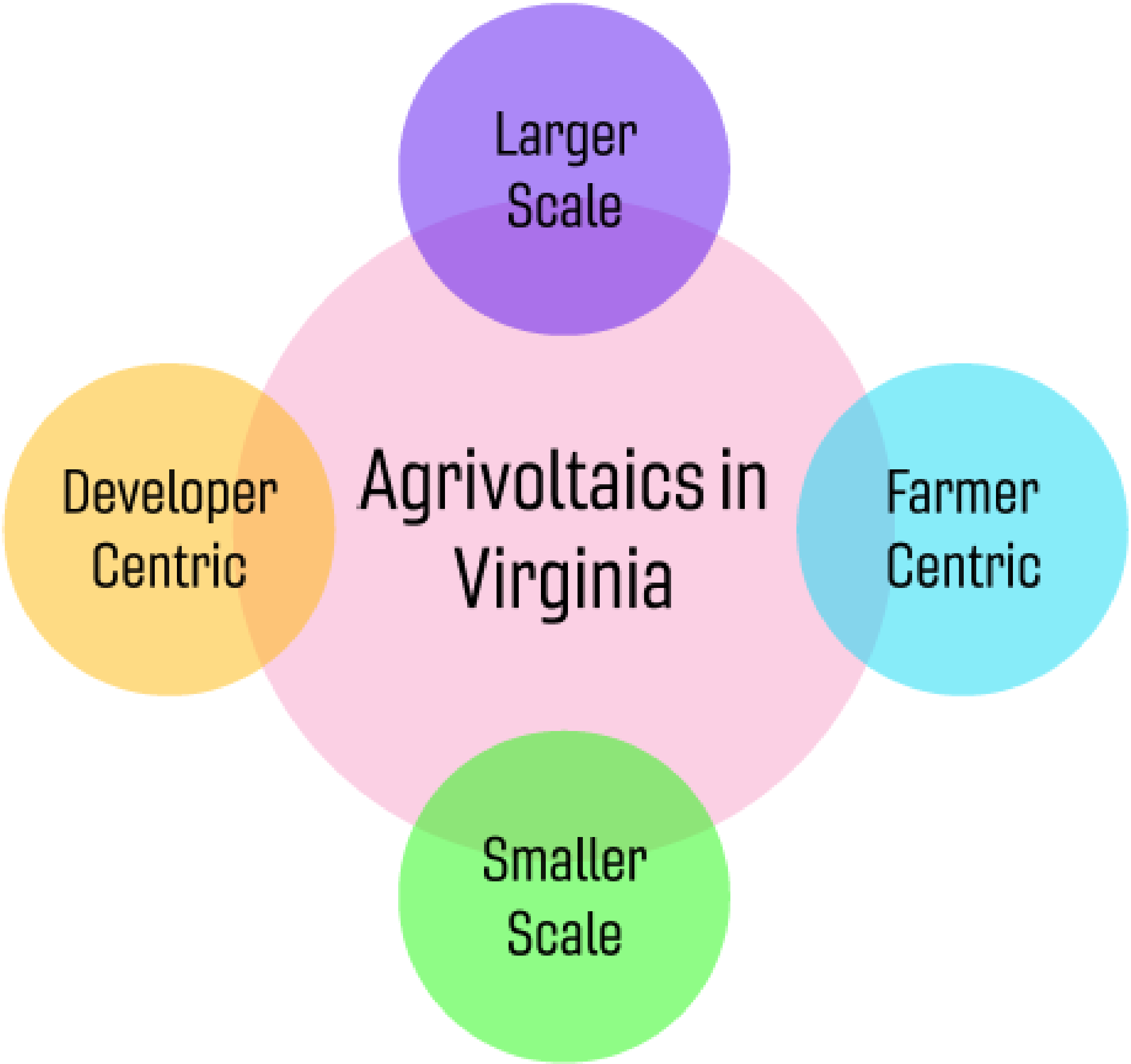


More Insights into Relative Size of Circles from Previous Map in Virginia as Compared to Nationally

U.S. Solar Photovoltaic Database

https://eerscmap.usgs.gov/uspvdb/viewer

Fujita, K.S., Ancona, Z.H., Kramer, L.A., Straka, M., Gautreau, T.E., Garrity, C.P., Robson, D., Diffendorfer, J.E., and Hoen, B., 2023, United States Large-Scale Solar Photovoltaic Database v1.0 (November, 2023)
U.S. Energy Information Administration. (2024, April). Electric Power Monthly



Dual-use Solar "Agrivoltaics"

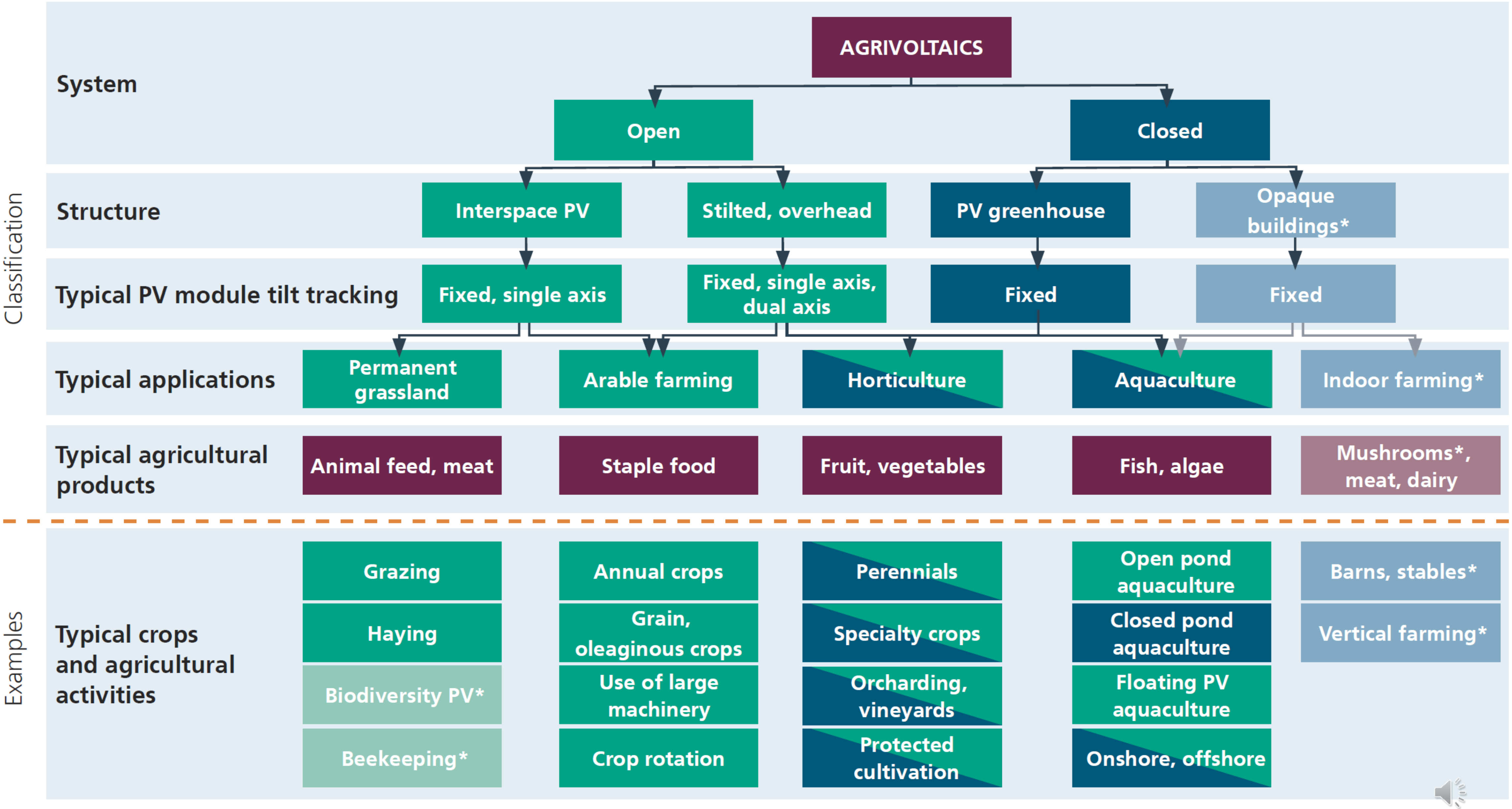
Related Definitions

"Dual-use agricultural facility means agricultural production and electricity production from solar photovoltaic panels occurring simultaneously on the same property."

- Per § 56-594.4 Code of Virginia. [1. 2024 Virginia Acts of Assembly, Chapter 765. Shared solar programs, 1]

"Agrivoltaics is defined as a land use configuration where solar energy generation and sunlight-dependent agricultural activities are directly integrated and there is a layer of agricultural productivity within the boundaries of the solar infrastructure."

- Per National Renewable Energy Laboratory. [2. Macknick, J., et al. 2022, 3]



*No agrivoltaic application in the strictest sense

Fig. 9: Classification of agrivoltaic systems

https://www.ise.fraunhofer.de/content/dam/ise/en/documents/publications/studies/APV-Guideline.pdf

Fig. 24: Study with various types of lettuce at the agrivoltaics research site run by the University of Montpellier in France
© INRAE / Christian Dupraz

Fig. 20: Vertical agrivoltaic system in Aasen, Donaueschingen
© Solverde Bürgerkraftwerke

https://www.ise.fraunhofer.de/content/dam/ise/en/documents/publications/studies/APV-Guideline.pdf

Fig. 17: Agrivoltaic system in Blankenhornsberg, 2023
© Jona Pillatzke, WBI

Fig. 18: Agrivoltaic system in Geisenheim
© HS Geisenheim

McCall, J.; Macdonald, J.; Burton, R.; Macknick, J. Vegetation Management Cost and Maintenance Implications of Different Ground Covers at Utility-Scale Solar Sites. *Sustainability* **2023**, *15*, 5895. https://doi.org/10.3390/su15075895

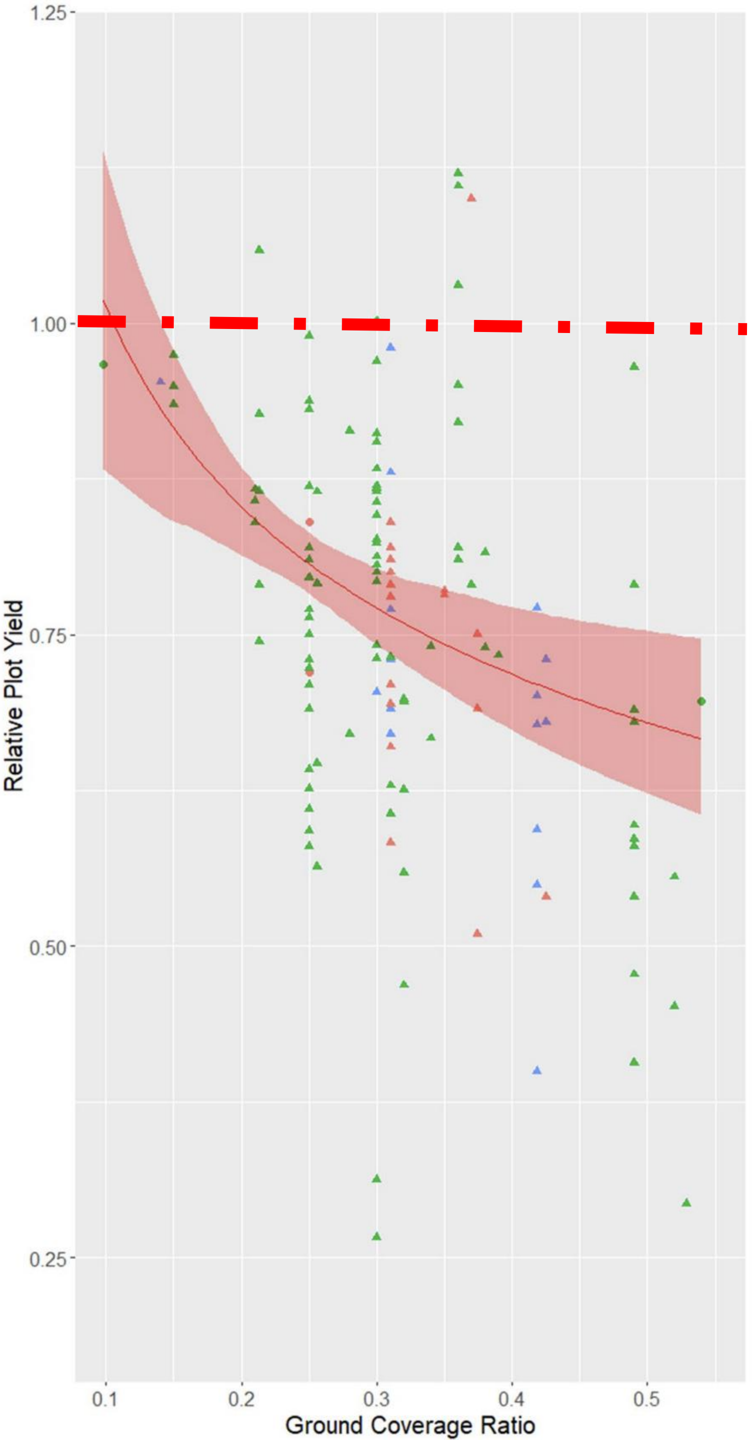


Fig. 2 Decrease in the relative plot yield in agrivoltaics as a function of the system's ground coverage ratio (comprising only the data that complied with the methodological criteria). Adjustment: $RPY = aGCR^b$ with $a = 0.5717$ and $b = -0.2486$

Dupraz, C. Assessment of the ground coverage ratio of agrivoltaic systems as a proxy for potential crop productivity. *Agroforest Syst* (2023). https://doi.org/10.1007/s10457-023-00906-3

Agroforest Syst
https://doi.org/10.1007/s10457-023-00906-3

33 pubs reviewed; 21 included; 12 discarded

Assessment of the ground coverage ratio of agrivoltaic systems as a proxy for potential crop productivity

Christian Dupraz

Table 3 Publications included in the final analysis of the relationship between the GCRs and RPYs (sorted by date of publication)

Reference (sorted by year of publication)	Country	Crop	Year of experiment	GCR	Panel Type and Movement
Marrou (2012) Ph. D. thesis	France	Durum wheat; Beans; Cucumber	2010	0.25; 0.49	Fixed
Marrou et al. (2013b)	France	Lettuce	2010;2011	0.49; 0.25	Fixed
Dupraz (2014, unpub. data)	France	Durum wheat	2014	0.25; 0.49	Fixed
Valle et al. (2017)	France	Lettuce	2015	0.25; 0.31	Fixed; ST; AT
Aroca-Delgado et al. (2019)	Spain	Tomato	2010–2012	0.09	Fixed
Thompson et al. (2020)	Italy	Basil; Spinach	2016; 2019	0.43	Fixed, tinted, semi-transparent
Andrew et al. (2021)	USA	Grass	2019–2020	0.28	Fixed
Trommsdorff et al. (2021)	Germany	Potato; Wheat; Celeriac; Clover grass	2017;2018	0.36	Fixed
Weselek et al. (2021)					
Al-agele et al. (2021)	USA	Tomato	2019	0.52	Fixed
Gonocruz et al. (2021)	Japan	Rice	2014 to 2017	0.21; 0.3; 0.39;0.34	Fixed
Hudelson and Lieth (2020)	USA	Kale; Chard; Broccoli; Peppers; Tomato; Spinach	2018	0.42	ST
Kim et al. (2021)	South Korea	Sesame; Mung bean; Red bean; Maize; Soybean	2020	0.21;0.26;0.32	Fixed
Potenza et al. (2022)	Italy	Soybean	2021	0.14	ST
Lee et al. (2022)	South Korea	Potato; Sesame; Soybean; Rice	2021	0.25 to 0.3	Fixed; ST
Jiang et al. (2022)	China	Kiwifruit	2018–2020	0.15; 0.25; 0.31	Fixed, semi-transparent
Jo et al. (2022)	South Korea	Rice; Rye; Soybean; Adzuki bean; Silage maize; Garlic; Onion	2018–2020	0.30	Fixed
Juillion et al. (2022)	France	Apple	2022	0.43	ST; AT
Kumpanalaisatit et al. (2022)	Thailand	Bok Choi	2018	0.53	Fixed
Edouard et al. (2023)	France	Alfalfa	2020;2021	0.37	Fixed; AT
Ramos-Fuentes et al. (2023)	France	Maize	2019–2021	0.25; 0.31; 049	Fixed; ST; AT

Caption for the movement of the panels: ST = Solar tracking; AT = Agronomical tracking (adaptive tracking to favour the crops during some stages)

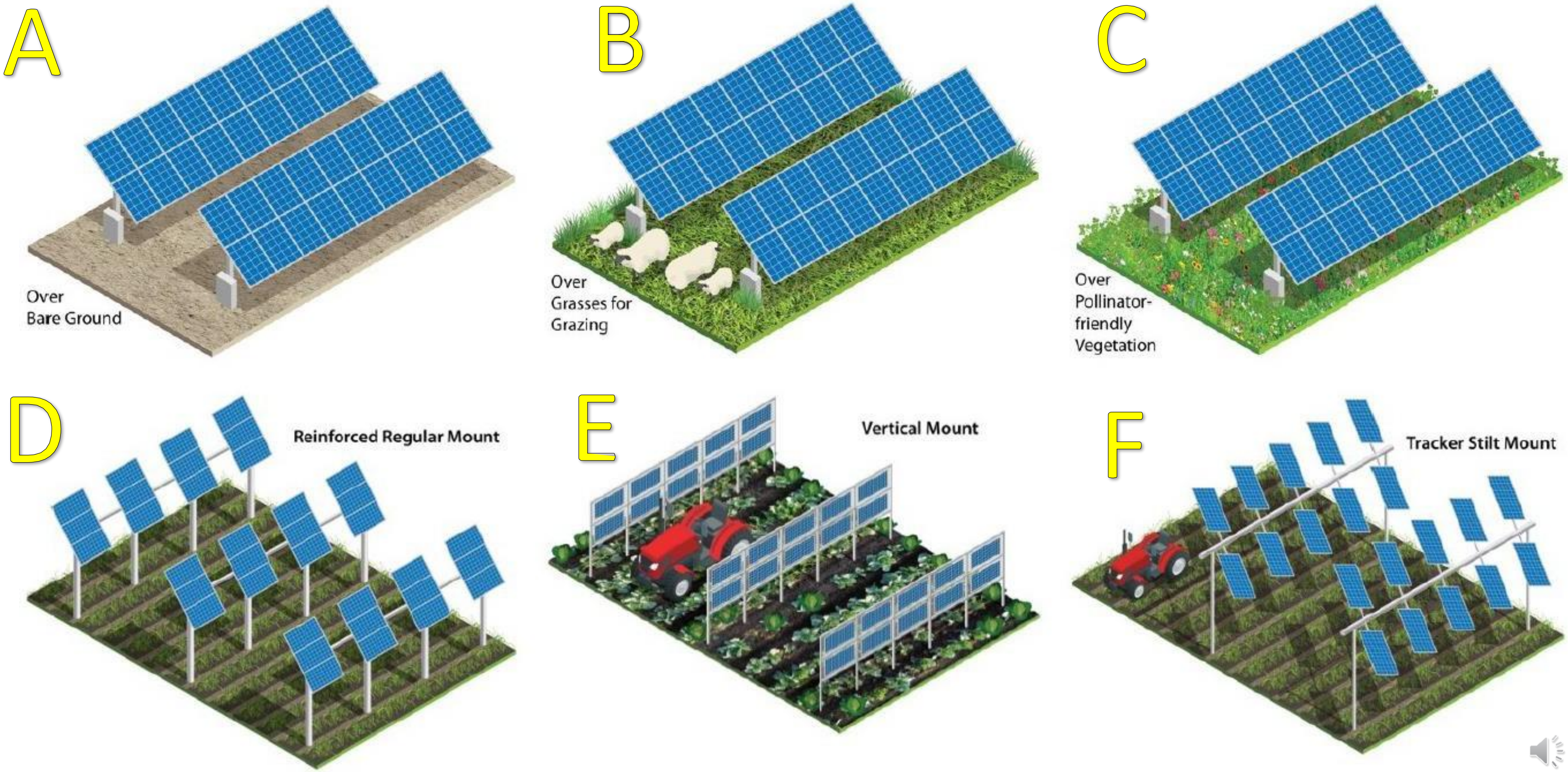


Figure 1. Illustrations of the system designs modeled for each dual-use PV scenario

Horowitz, K., Ramasamy, V., Macknick, J., & Margolis, R. (2020). *Capital costs for dual-use photovoltaic installations: 2020 benchmark for ground-mounted PV systems with pollinator-friendly vegetation, grazing, and crops* (No. NREL/TP-6A20-77811). National Renewable Energy Lab.(NREL), Golden, CO (United States).

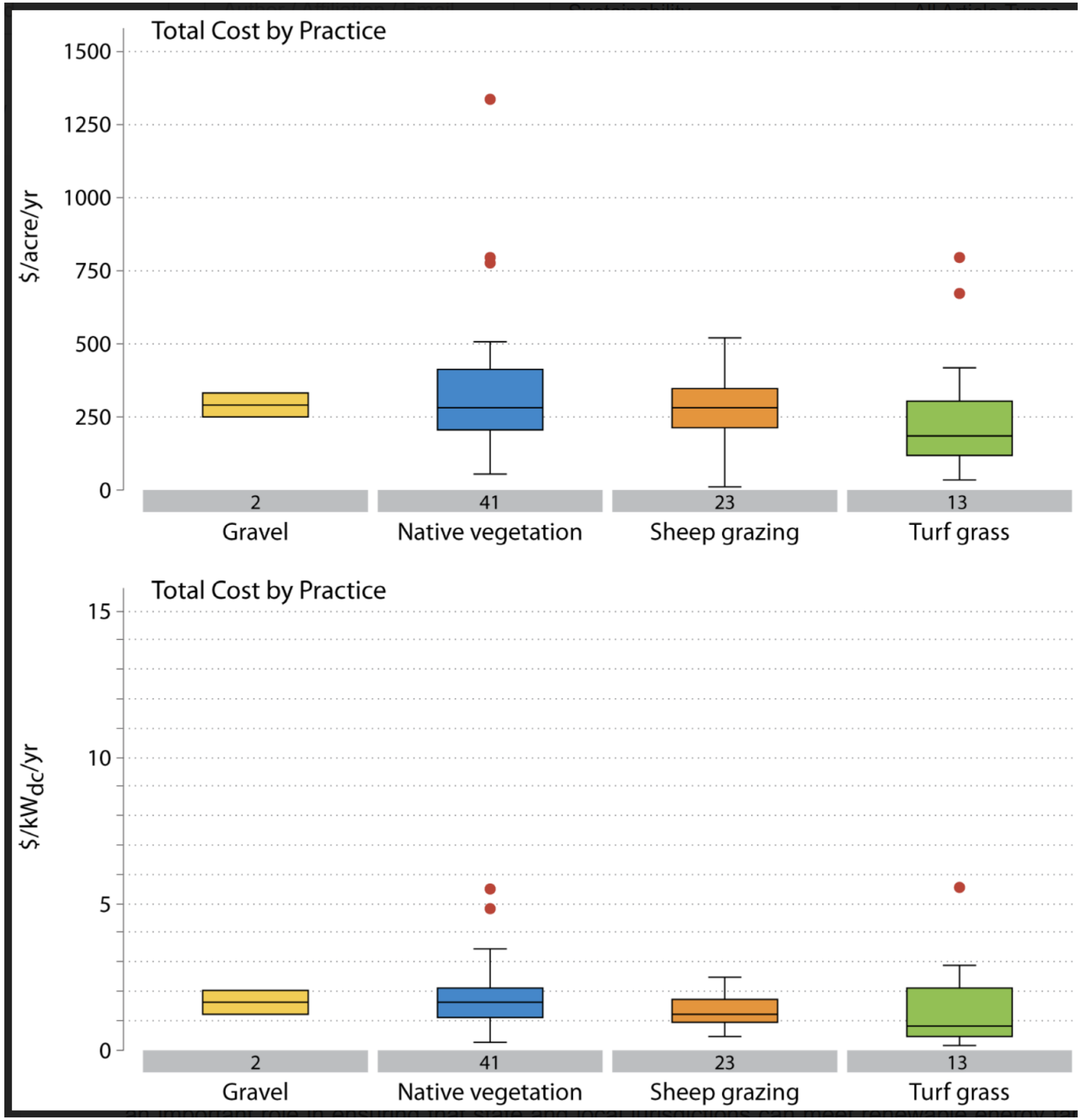


Figure 5. Total O&M costs by practice in $/acre/year (**top**) and $/kW$_{dc/}$year (**bottom**). Dots indicate values outside of the 5th and 95th percentiles.

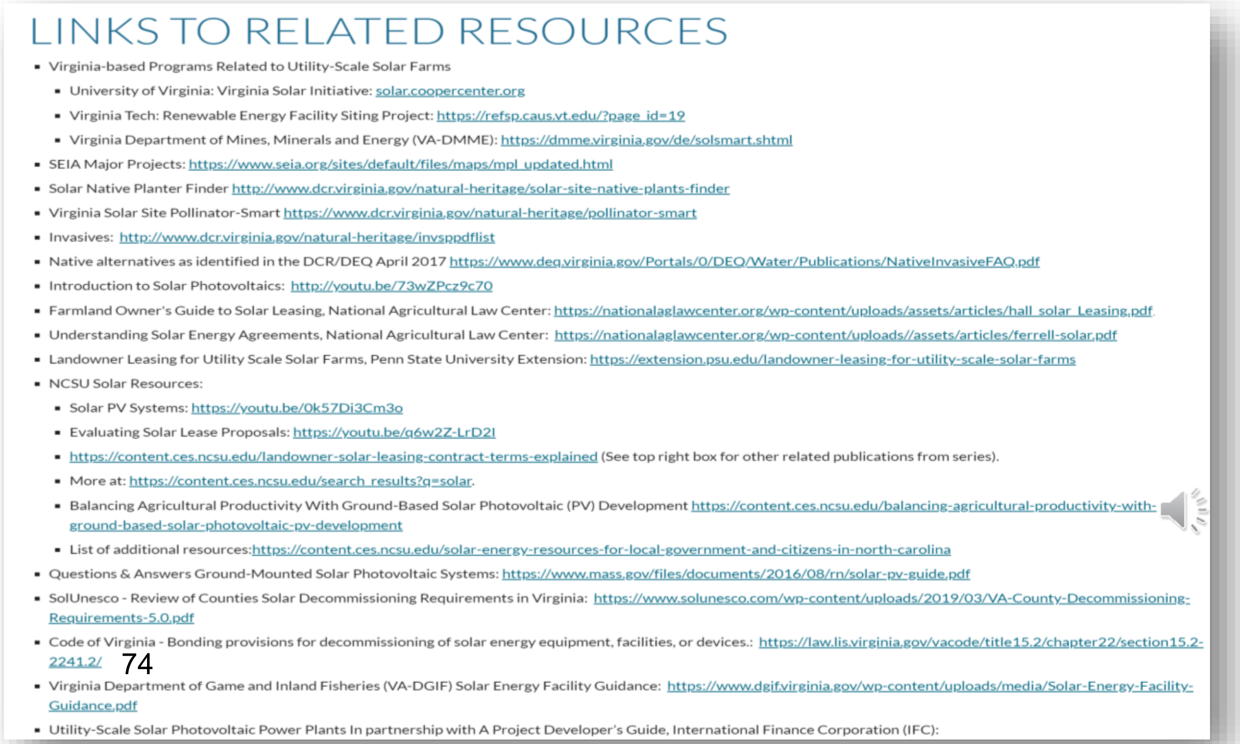
McCall, J.; Macdonald, J.; Burton, R.; Macknick, J. Vegetation Management Cost and Maintenance Implications of Different Ground Covers at Utility-Scale Solar Sites. *Sustainability* **2023**, *15*, 5895. https://doi.org/10.3390/su15075895

https://sites.google.com/vt.edu/vceinservice121919solarfarms/home

Webinar Recordings & Related Materials Available Online

LINK TO WEBPAGE WILL BE POSTED IN CHAT BOX

Speaker Bios
Resources & Information from Related Info Webinars
PDFs of Presentations & Recordings to be Posted After Event



LINKS TO RELATED RESOURCES

- Virginia-based Programs Related to Utility-Scale Solar Farms
  - University of Virginia: Virginia Solar Initiative: solar.coopercenter.org
  - Virginia Tech: Renewable Energy Facility Siting Project: https://refsp.caus.vt.edu/?page_id=19
  - Virginia Department of Mines, Minerals and Energy (VA-DMME): https://dmme.virginia.gov/de/solsmart.shtml
- SEIA Major Projects: https://www.seia.org/sites/default/files/maps/mpl_updated.html
- Solar Native Planter Finder http://www.dcr.virginia.gov/natural-heritage/solar-site-native-plants-finder
- Virginia Solar Site Pollinator-Smart https://www.dcr.virginia.gov/natural-heritage/pollinator-smart
- Invasives: http://www.dcr.virginia.gov/natural-heritage/invsppdflist
- Native alternatives as identified in the DCR/DEQ April 2017 https://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/NativeInvasiveFAQ.pdf
- Introduction to Solar Photovoltaics: http://youtu.be/73wZPcz9c70
- Farmland Owner's Guide to Solar Leasing, National Agricultural Law Center: https://nationalaglawcenter.org/wp-content/uploads/assets/articles/hall_solar_Leasing.pdf
- Understanding Solar Energy Agreements, National Agricultural Law Center: https://nationalaglawcenter.org/wp-content/uploads//assets/articles/ferrell-solar.pdf
- Landowner Leasing for Utility Scale Solar Farms, Penn State University Extension: https://extension.psu.edu/landowner-leasing-for-utility-scale-solar-farms
- NCSU Solar Resources:
  - Solar PV Systems: https://youtu.be/0k57Di3Cm3o
  - Evaluating Solar Lease Proposals: https://youtu.be/q6w2Z-LrD2I
  - https://content.ces.ncsu.edu/landowner-solar-leasing-contract-terms-explained (See top right box for other related publications from series).
  - More at: https://content.ces.ncsu.edu/search_results?q=solar.
  - Balancing Agricultural Productivity With Ground-Based Solar Photovoltaic (PV) Development https://content.ces.ncsu.edu/balancing-agricultural-productivity-with-ground-based-solar-photovoltaic-pv-development
  - List of additional resources:https://content.ces.ncsu.edu/solar-energy-resources-for-local-government-and-citizens-in-north-carolina
- Questions & Answers Ground-Mounted Solar Photovoltaic Systems: https://www.mass.gov/files/documents/2016/08/rn/solar-pv-guide.pdf
- SolUnesco - Review of Counties Solar Decommissioning Requirements in Virginia: https://www.solunesco.com/wp-content/uploads/2019/03/VA-County-Decommissioning-Requirements-5.0.pdf
- Code of Virginia - Bonding provisions for decommissioning of solar energy equipment, facilities, or devices.: https://law.lis.virginia.gov/vacode/title15.2/chapter22/section15.2-2241.2/
- Virginia Department of Game and Inland Fisheries (VA-DGIF) Solar Energy Facility Guidance: https://www.dgif.virginia.gov/wp-content/uploads/media/Solar-Energy-Facility-Guidance.pdf
- Utility-Scale Solar Photovoltaic Power Plants In partnership with A Project Developer's Guide, International Finance Corporation (IFC):

Thank You

February 26, 2025

Sheperd’s Symposium

Via Recording & ZOOM

John Ignosh

Extension Specialist

Dept. Biological Systems Engineering

Virginia Tech & Extension

Harrisonburg, VA 22801

NC STATE EXTENSION

Sheep + Solar:

The new age of lamb production

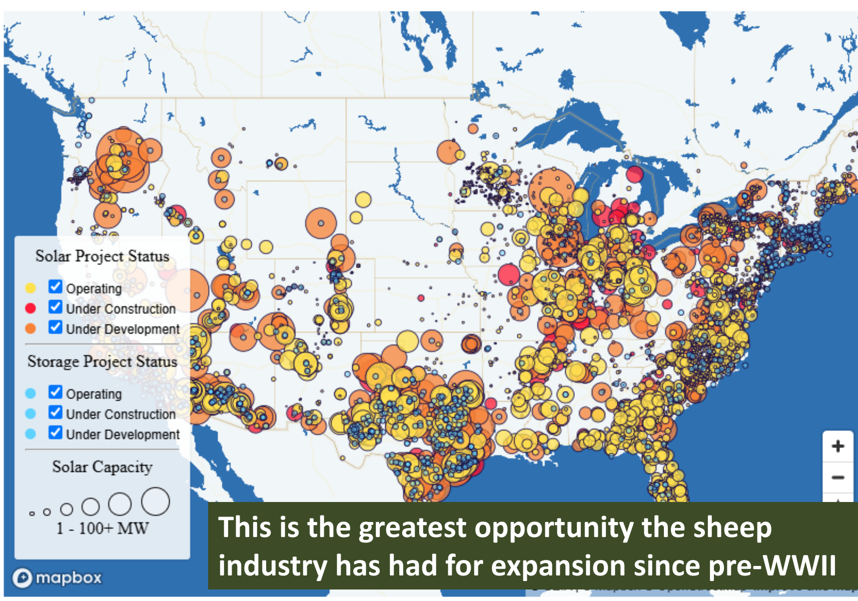
Andrew Weaver
Extension Small Ruminant Specialist
North Carolina State University
arweave3@ncsu.edu

PC: Rogers Cattle Company

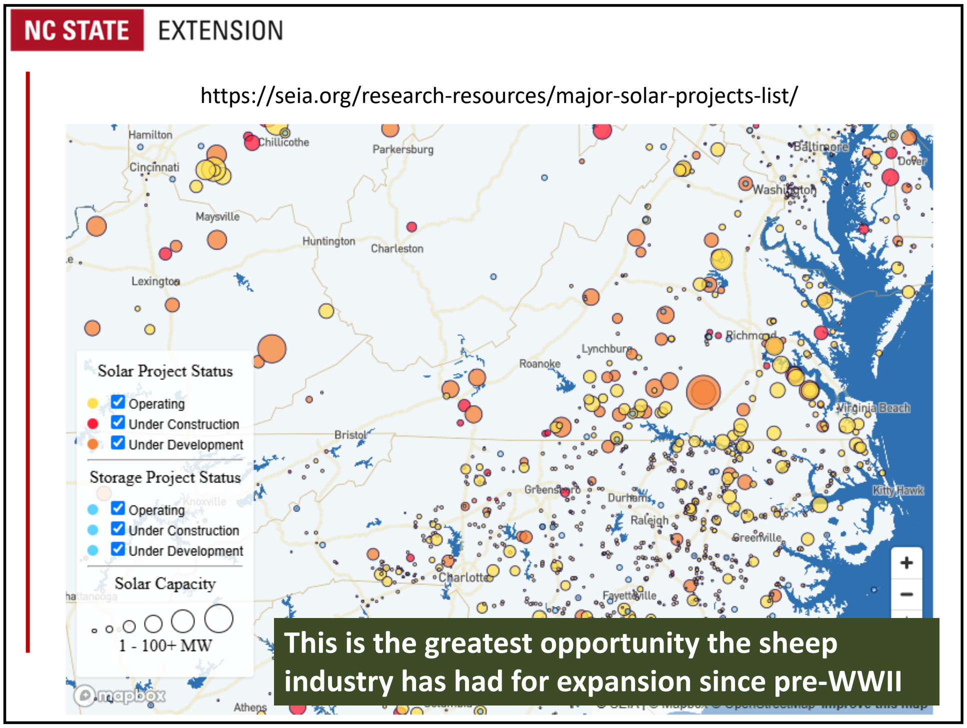
1

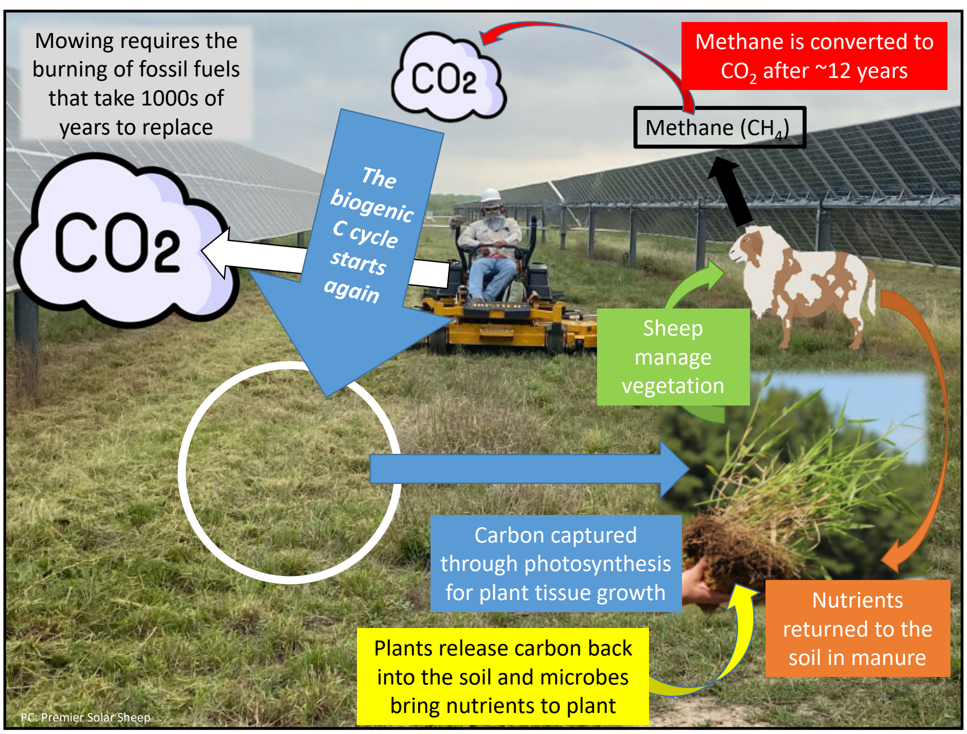
NC STATE EXTENSION

https://seia.org/research-resources/major-solar-projects-list/

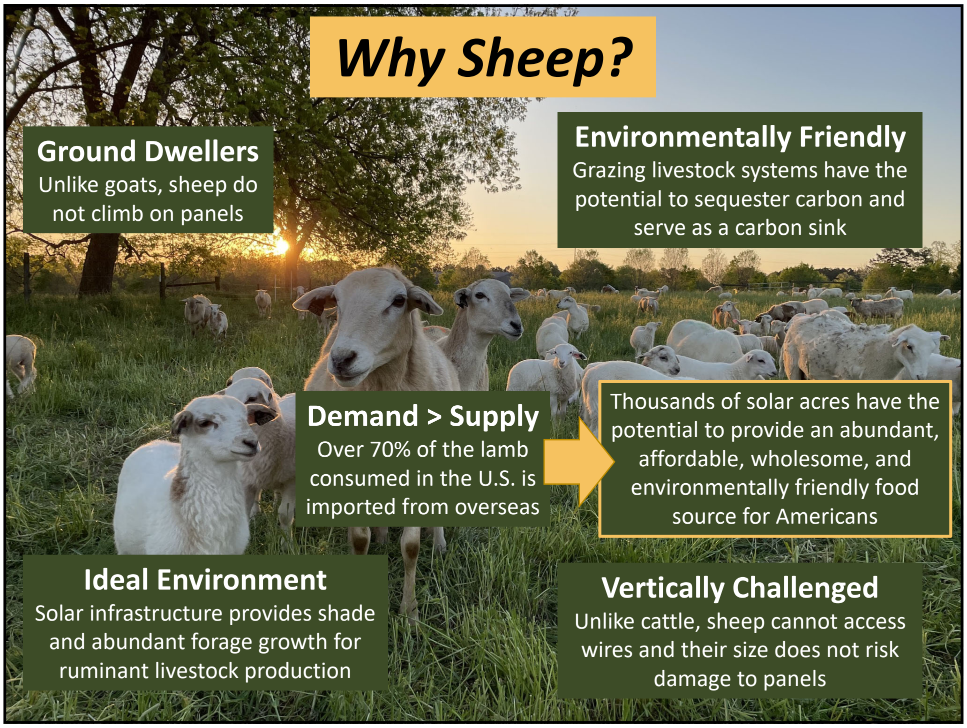


This is the greatest opportunity the sheep industry has had for expansion since pre-WWII


NC STATE EXTENSION
https://seia.org/research-resources/major-solar-projects-list/
Solar Project Status
Operating
Under Construction
Under Development
Storage Project Status
Operating
Under Construction
Under Development
Solar Capacity
1 - 100+ MW
This is the greatest opportunity the sheep industry has had for expansion since pre-WWII


Mowing requires the burning of fossil fuels that take 1000s of years to replace
CO2
CO2
The biogenic C cycle starts again
Methane is converted to CO_2 after ~12 years
Methane (CH_4)
Sheep manage vegetation
Carbon captured through photosynthesis for plant tissue growth
Nutrients returned to the soil in manure
Plants release carbon back into the soil and microbes bring nutrients to plant
PC: Premier Solar Sheep

"When you buy an acre of land, you buy a 43,560 sq. foot SOLAR PANEL." - Jim Gerrish
...and also 43,560 sq. feet of water collection
CO2
O2
SUGAR



Why Sheep?
Ground Dwellers
Unlike goats, sheep do not climb on panels
Environmentally Friendly
Grazing livestock systems have the potential to sequester carbon and serve as a carbon sink
Demand > Supply
Over 70% of the lamb consumed in the U.S. is imported from overseas
Thousands of solar acres have the potential to provide an abundant, affordable, wholesome, and environmentally friendly food source for Americans
Ideal Environment
Solar infrastructure provides shade and abundant forage growth for ruminant livestock production
Vertically Challenged
Unlike cattle, sheep cannot access wires and their size does not risk damage to panels

NC STATE EXTENSION

YOU ARE A SERVICE PROVIDER

The solar company is your customer

Raising sheep is just a tool used to provide the service and satisfy customers' needs (meet/exceed contract expectations)

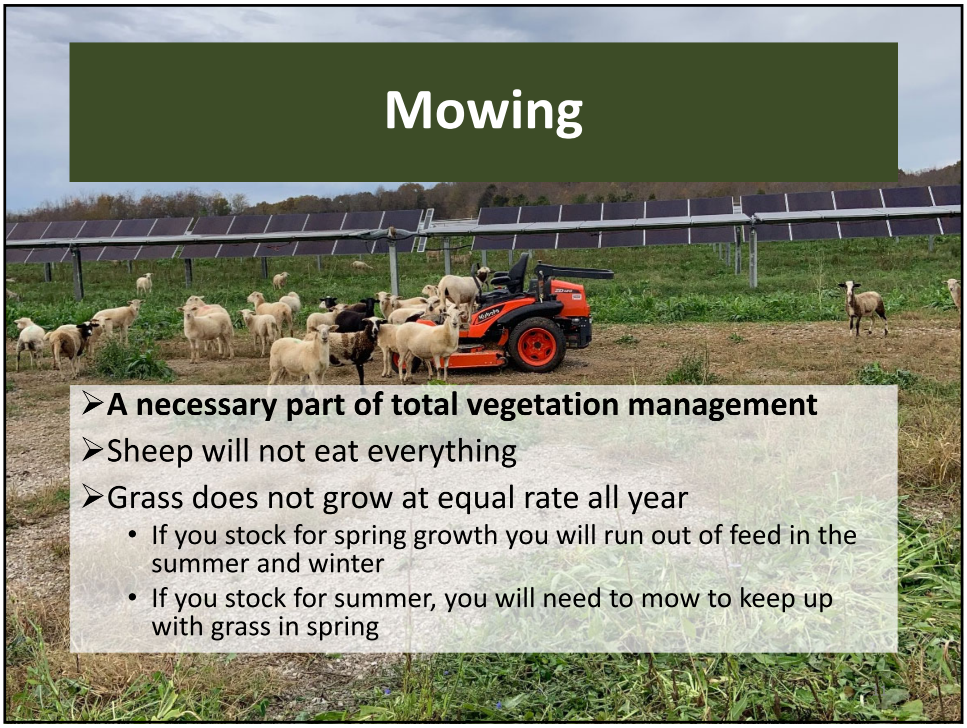
8

You are the EXPERT in your field

- ➢ The solar company is dependent on you for sheep husbandry knowledge and skills
  - ❖ Failure is a public relations nightmare and the end of grazing for you (and maybe all the rest of us)
- ➢ **Weaver's Non-negotiables**
  - ✓ 24/7 access to site
  - ✓ If 365 day/year access is not granted, start and end date are in contract before grazing begins
  - ✓ Total vegetation management (mowing + grazing)

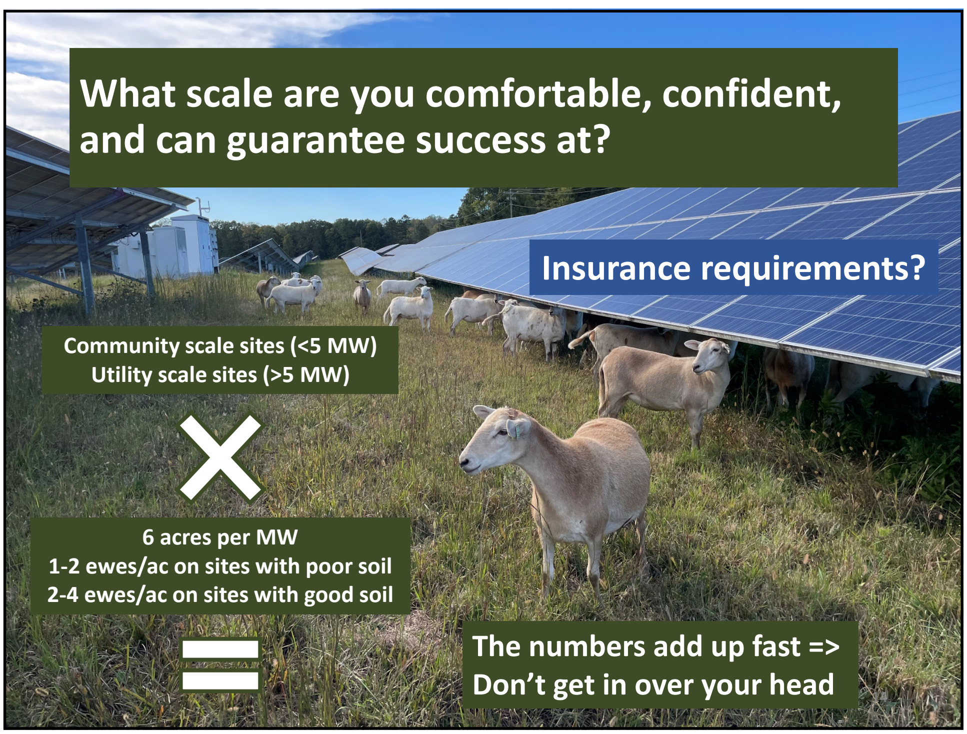
Your job is vegetation management

- ➢ **Goal:** Manage vegetation to (or above) contract expectations to allow for optimal efficiency of light capture by solar panels, O&M access, and positive public perception
- ➢ **Methods:**
  1. Mowing
     - Mimic maximum stock density => you cut the good and bad
     - But you burn fossil fuels the panels were built to help save
  2. Grazing
     - Not perfect but keeps carbon in a biogenic cycle
     - Some contracts are graze only and a third party mows
  3. **Hybrid model**
     - **Most effective form of total vegetation management**


Mowing
➢A necessary part of total vegetation management
➢Sheep will not eat everything
➢Grass does not grow at equal rate all year
• If you stock for spring growth you will run out of feed in the summer and winter
• If you stock for summer, you will need to mow to keep up with grass in spring


Winter Management
➢Location for winter management should be determined PRIOR to signing a contract
Do sheep come home or stay on site?
Stockpiled Fescue (on or off site) => Tall fescue is your friend!
Can winter annuals be planted at home or on ancillary ground?
Can hay be unrolled on site or on ancillary ground?
Corn stalks (regionally dependent): When is residue available?


Lambing Management
Lamb on site?
Lamb at home?
Trailering or
trailing bred ewes?
Trailering or trailing lambs?
Dead sheep is a bad look even if it's within expected
death loss levels. Solar companies, O&M personnel, and
public driving by don't understand that sheep like to die.

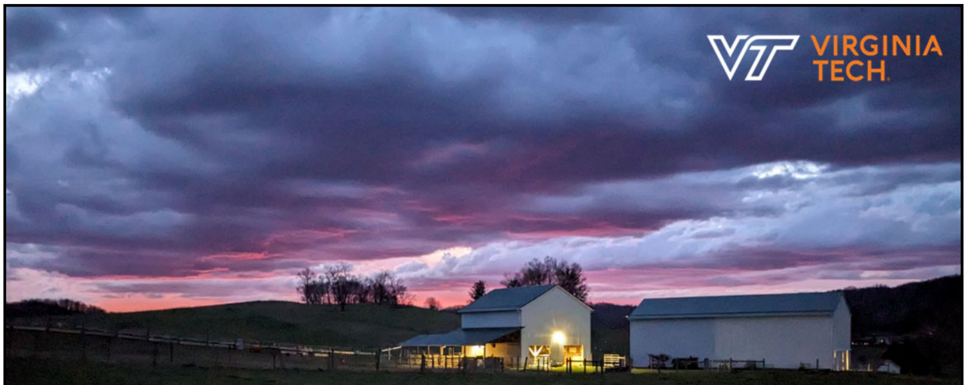

What scale are you comfortable, confident,
and can guarantee success at?
Insurance requirements?
Community scale sites (<5 MW)
Utility scale sites (>5 MW)
6 acres per MW
1-2 ewes/ac on sites with poor soil
2-4 ewes/ac on sites with good soil
The numbers add up fast =>
Don't get in over your head


Water and Electric Availability
Need to power temporary fencing (7+ kV) and provide water source for sheep
PC: JR Howard


Strategic Use of Dogs
Herding dogs are major asset to moving sheep under panels and working large groups with minimal labor resources
Guard dogs are still needed and industry professionals should be aware of their presence and role during solar grazing
PC: Katie Carothers


Grazing Training and Experience has Value
NC CLEAN ENERGY
TECHNOLOGY CENTER
AMERICAN
Lamb
HOMEGROWN
NC Choices
a Center for Environmental Farming Systems initiative
ASGA
AmazingGrazing
Pasture-Based Livestock Education Program


Grazing Training and Experience has Value
https://lambboard.com/grazing-workshops
ALB Grazing Schools
➢Texas (May 5-7)
➢Illinois (June 11-13)
➢Maryland (TBD)
➢California (TBD)
➢Kentucky (TBD)
Camren Maierle
Director of Sustainability Programs
American Lamb Board
camren@americanlamb.com
Andrew Weaver
Small Ruminant Specialist
North Carolina State University
arweave3@ncsu.edu



Parasite Management – Creating a Toolbox for Success

Nicole Valliere-Kopetzky
Graduate Research Assistant, PhD Student
Virginia Tech
nvalliere@vt.edu

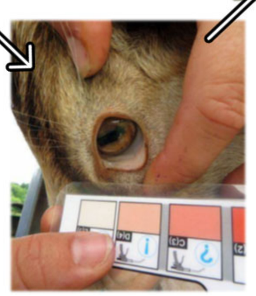
Parasite Challenges

- Parasites are consistently identified as one of the top disease problems
- Worm of concern belongs to Trichostrongyle family
- Found in abomasum, intestines… collectively called gastrointestinal nematodes (GIN)

Dr. Roger Ramirez-Barrios

Parasite Challenges

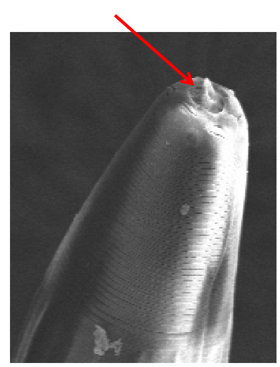
- *Haemonchus contortus*
  - “Barber Pole worm”



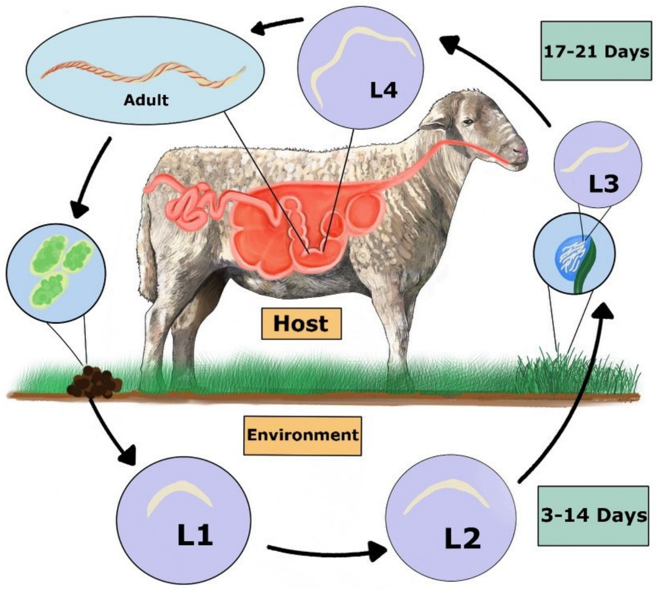
Health Impacts

- *Haemonchus contortus*
  - Reduced weight gain, reduced feed intake, and condition losses
  - Severe infection may cause anemia, bottle jaw (submandibular edema), weakness, death
  - Does not cause diarrhea

Susan Schoenian



Life Cycle



Environmental Conditions

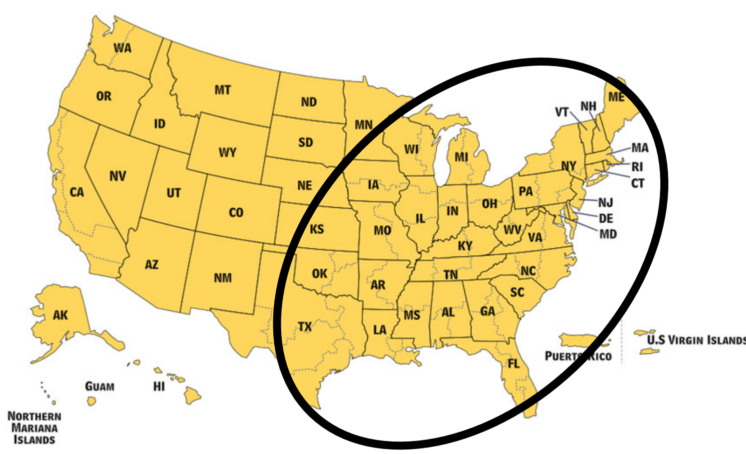
- Cannot be eradicated… only managed
- Generally speaking:
  - Egg development to L3 occurs rapidly in hot, humid weather
  - Survival of L3 may be lengthened during winter months… why?

Hypobiosis/Arrested Development

- If an L3 is ingested by the host in the fall, it can enter the GI wall and become dormant for several months
- Tool for parasite to survive unfavorable environmental conditions
- Resumes development in spring or at time of lambing/kidding
- Why waste energy reproducing when eggs and larvae won't survive environment?
- Arrested worms do not cause disease

When to assess burden?

- Weather and climate dependent
- Virginia season: mostly June-October



How to assess burden?

- Fecal egg count (FEC)
- Measure of the number of strongylid parasite eggs in 1 gram of fecal matter
- Why do we not assess adult worm burden?

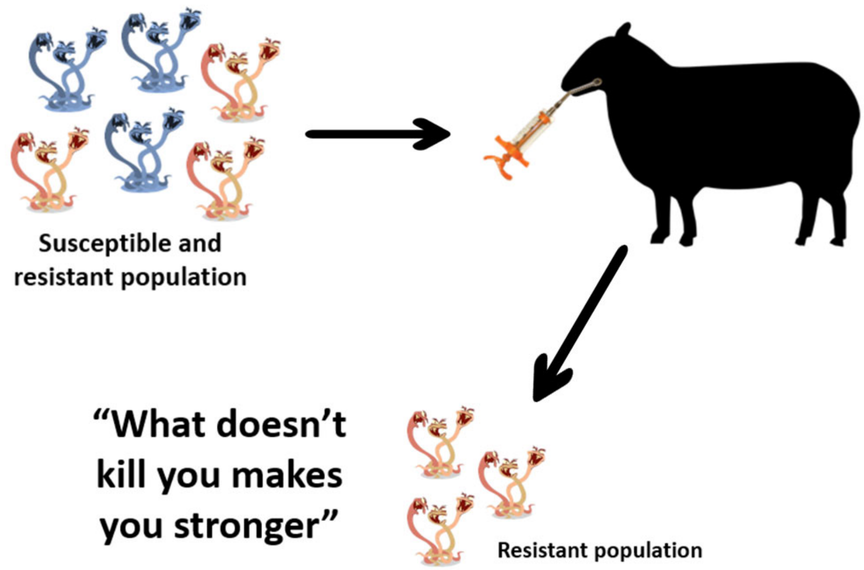
Ramirez Parasitology Laboratory
Virginia Tech
www.wormx.info/lowcostfec
May-September
$6 per sample

Control Methods

- Since the 1960s, dewormers have been available to reduce parasite burden
- So, we should just be able to repeatedly treat every single animal in our flock with a dewormer without any consequences, right?

Consistent reliance on dewormers selects for drug resistant worms!!!

Anthelmintic Resistance



Integrated Parasite Management

- There are no silver bullets!
- Utilize multiple tools in the toolbox
  – Selective deworming/FAMACHA scoring
  – Rotational or multi-species grazing
  – Nutritional supplementation
  – Confinement housing
  – Genetic selection

FAMACHA Scoring

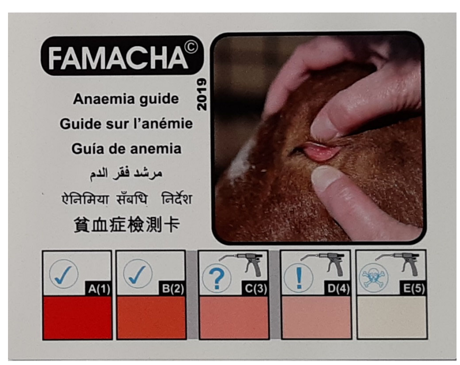
- Assess anemia via mucus membrane color in eye
- Increased burden = paler coloration
- Pros: easy, on-farm tool!
- Cons: only relevant for *H. contortus* infections, subjective, resistance vs. resilience

FAMACHA score	Color class	Hematocrit (% Red Blood Cells)
1	Red	$\geq$28
2	Red-pink	23-27
3	Pink	18-22
4	Pink-white	13-17
5	White	<12

Color on card directly linked to % red blood Cells in blood

Targeted Selective Deworming

- Use FAMACHA scores to only treat animals that need to be treated
- In most circumstances, majority of individuals may not require deworming
- Slows rate of resistance development



Don't treat	Don't treat	Maybe treat	Treat	Treat

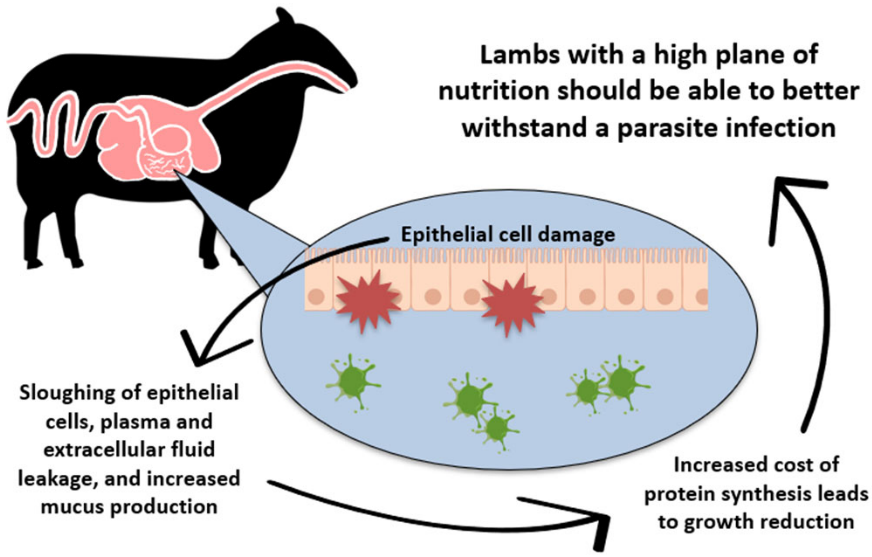
Pasture Management

- Understanding parasite life cycle is key
- Use temporary fencing to keep sheep away from reoccurring larval exposure
- Rotate pasture allocations every 3-5 days if possible
- Most larvae don't migrate more than 4 inches up the forage
- Can harvest regrowth for hay
- Graze most vulnerable groups on "cleanest" pastures

Pasture Management

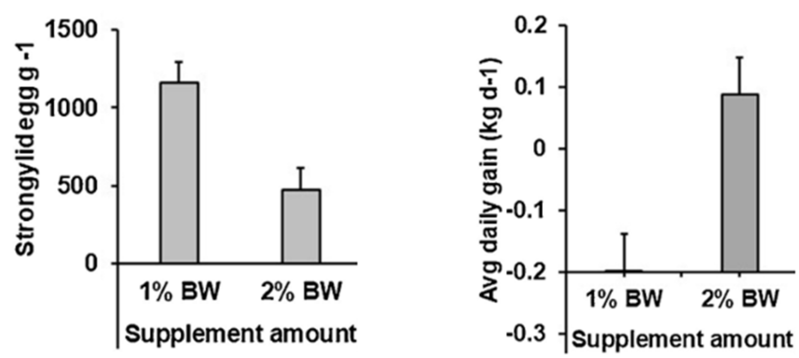
- Mixed species grazing
  - Parasites are mainly species specific
  - Small ruminant parasites won't infect cattle/horses
  - Sheep, goats, llamas, alpacas, and deer can share parasites

Nutritional Supplementation



Nutritional Supplementation

Increased supplementation decreased FEC and increased ADG



Crawford et al., 2020

COLLEGE OF AGRICULTURE AND LIFE SCIENCES
SCHOOL OF ANIMAL SCIENCES
VIRGINIA TECH

Confinement Housing

- Dry lot lambs or periparturient ewes
- *H. contortus* life cycle requires forage
- Pros: decrease death loss and improve performance
- Cons: higher feed costs and overhead barn costs

	% Dewormed
LowFEC	
Dry-lot	0
Pasture	24.3
HighFEC	
Dry-lot	0
Pasture	47.5

Valliere-Kopetzky et al., unpublished

COLLEGE OF AGRICULTURE AND LIFE SCIENCES
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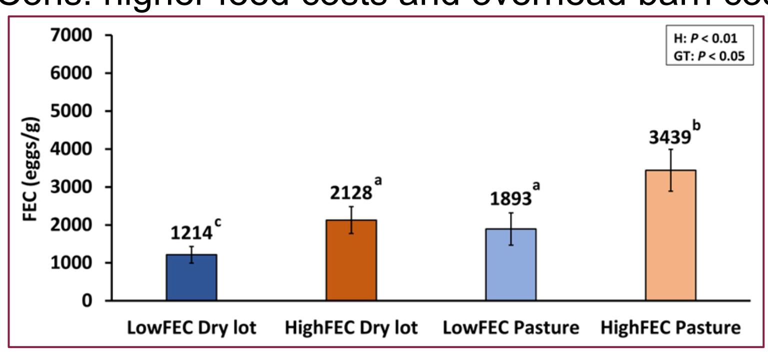

Valliere-Kopetzky et al., unpublished

Genetic Selection

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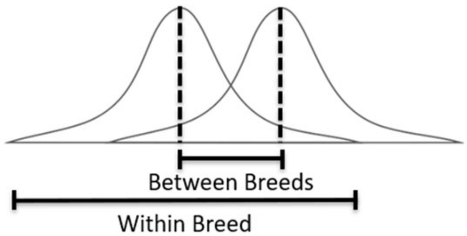
VIRGINIA TECH

- Parasite resistance varies between and within breeds
- Immune response is incredibly complex
- Moderate heritability… allows for selection



Genetic Selection Tools

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VIRGINIA TECH

- Phenotypic selection
- Estimated Breeding Values (EBV)
  - Quantitative trait
  - Prediction of individual genetic merit
    - Individual performance
    - Pedigree information
    - Progeny data

NSIP
National Sheep Improvement PROGRAM

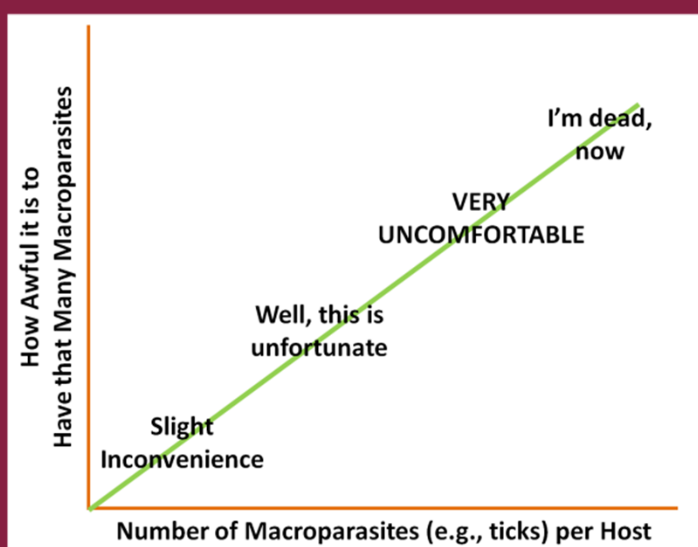
Upcoming Parasite Management VT Sheep Extension Workshops

Loudoun/Fauquier County Youth FAMACHA Training:
Tuesday, March 18th 5:30 pm – 7:30 pm
Register: https://bit.ly/432gyyE
$15 includes cost of materials and dinner

Lee County FAMACHA Training:
Thursday, May 8th 6 pm – 8 pm
Register: https://tinyurl.com/leeparasite25
$25 includes cost of materials and dinner

Washington County IPM and FEC Workshop:
Tuesday, May 13th 6 pm – 8:30 pm
Register: https://forms.office.com/r/uKX2j6ydNL or email nvalliere@vt.edu or afletcher@vsu.edu
$5 includes dinner

Questions?



aggregation | Parasite Ecology

Virginia Department of Agriculture and Consumer Services

2025 Sheep Update

Contacts:

Dr. Chris Fletcher (276) 228-5501

Dr. Dan Hadacek (540) 209-9120

Dr. Tabby Moore (540) 209-9122

Topics

- 2024 NAHMS Study
- Scrapie Report
- Identification
- Health Tips

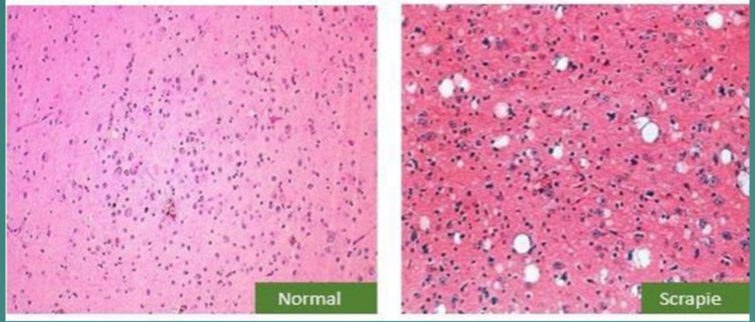
VIRGINIA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

2024 NAHMS Study

- USDA's National Animal Health Monitoring System
- Conducted once every 10 yr
- Results from this study will help veterinarians and producers with new treatments, controls, and preventive actions for the future
- Questionnaires and samples including interdigital swabs, blood, and fecal samples were taken
- Gastrointestinal parasites (and resistance levels), enteric microbes, lameness pathogens
- Results not released yet.

Virginia Department of Agriculture and Consumer Services

Figure 2. Brain tissue from a normal sheep and a sheep with scrapie

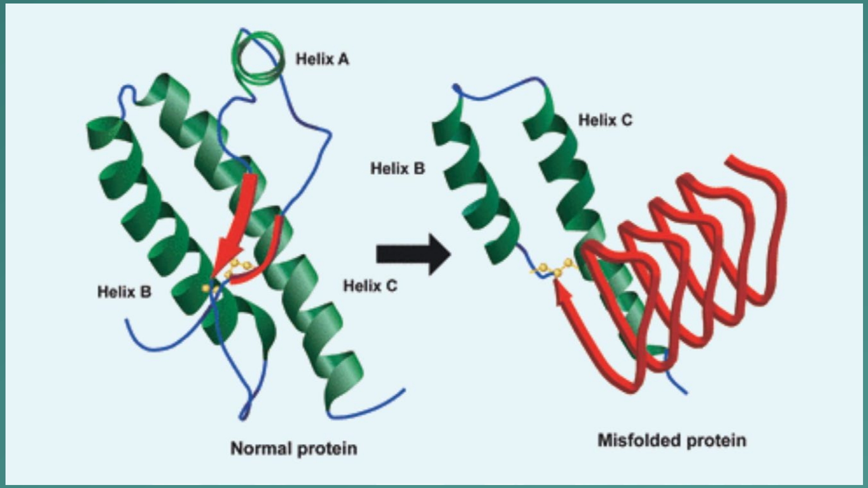


Scrapie

- A fatal, degenerative disease affecting the central nervous system of sheep and goats.
  - Ataxia, Behavior changes, Wt. loss, Star gazing, Intense rubbing
- Classified as transmissible spongiform encephalopathies (TSE)
  - BSE - “Mad cow” disease, and CWD – chronic wasting disease in cervids
- Genetic resistance
  - Sheep codon 171: RR/QR/QQ
  - Goats codon 222: KK/QK/QQ
- Surveillance, and depopulation are the primary means of controlling this disease.
- Spread through all secretions.

Virginia Department of Agriculture and Consumer Services

Prion Disease

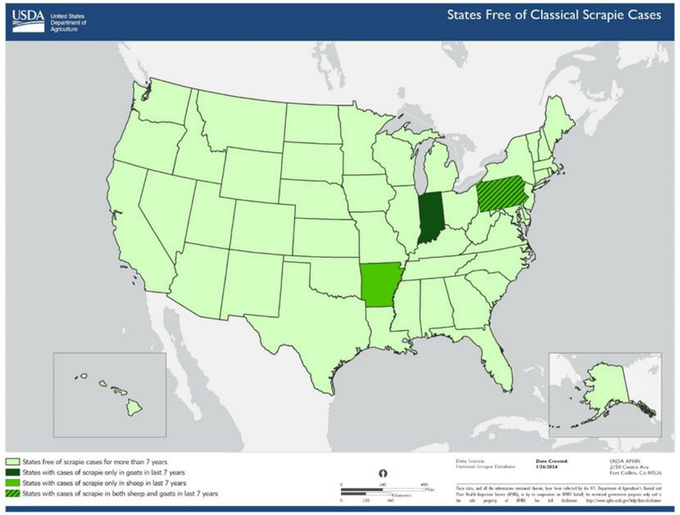


- Virus, Bacteria, Parasites, Fungal, AND **Prions**
- Not fully understood
- Causes misfolding of normal proteins in the brain
- No prevention or treatment
- Shed in all secretions
- Not alive – so very hard to inactivate!

In the US

- Yearly testing with a goal of ~40,000 samples
  - Last positive sheep was in January 2021 (Arkansas)
  - Last positive goat was in June 2019 (PA and Indiana)
- Virginia – Last positive was in 2014

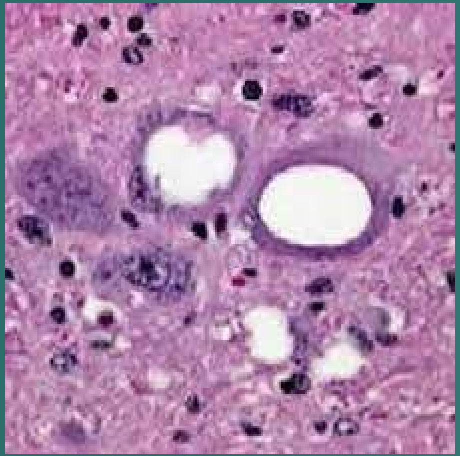
States Free of Classical Scrapie Cases > 7 Years



* As of December 31, 2023.

Virginia (All State) Producers

- We need Whole heads from sheep and goats
  - Over 18 months
  - Slaughtered, die, or euthanized
  - Especially if the Sheep/Goat was exhibiting neurological symptoms
  - Your veterinarian or VDACS can collect
  - Scrapie Tag needs to be submitted with the animal



Virginia Department of Agriculture and Consumer Services

Why is all this important?

- For the US to be deemed FREE of Scrapie
  - Must go 7 years without a positive classical scrapie case (2028)
- Only Australia and New Zealand are considered Free of Scrapie
- Would open new Sheep and Goat Trade
  - Est. loss of $10-20 million

VIRGINIA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

Free Scrapie Tags for New Producers

- 1-866-USDA-TAG
- VA producers → 804-343-2569

Virginia Department of Agriculture and Consumer Services

Both plastic and metal tags are acceptable identification.

New style (Shearwell) plastic tags from USDA

Who Needs Tagged?

- Any Sheep or Goat that leaves your farm!
  - Livestock market
  - Shows
  - Even if you sell an animal to your neighbor!
- The only time they don't need a tag is:
  - Staying at home (however it's good for your own records)
  - Lambs under 18m going directly to slaughter facility

VIRGINIA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

Quick Health Tips And Tricks

To Recognize Abnormal → Know NORMAL

- Temp: 102.2-104.9 ^{0}F
  - Rectal temp, human thermometer will work
- Pulse: 60-90 BPM
  - Inside of the thigh
- Resp: 12-20 BPM
  - Watch chest, or place hand in front of nose
- Hydration status:
  - Skin tent
  - Gap between eyeball and eyelid
- Anemia level: FAMACHA Score

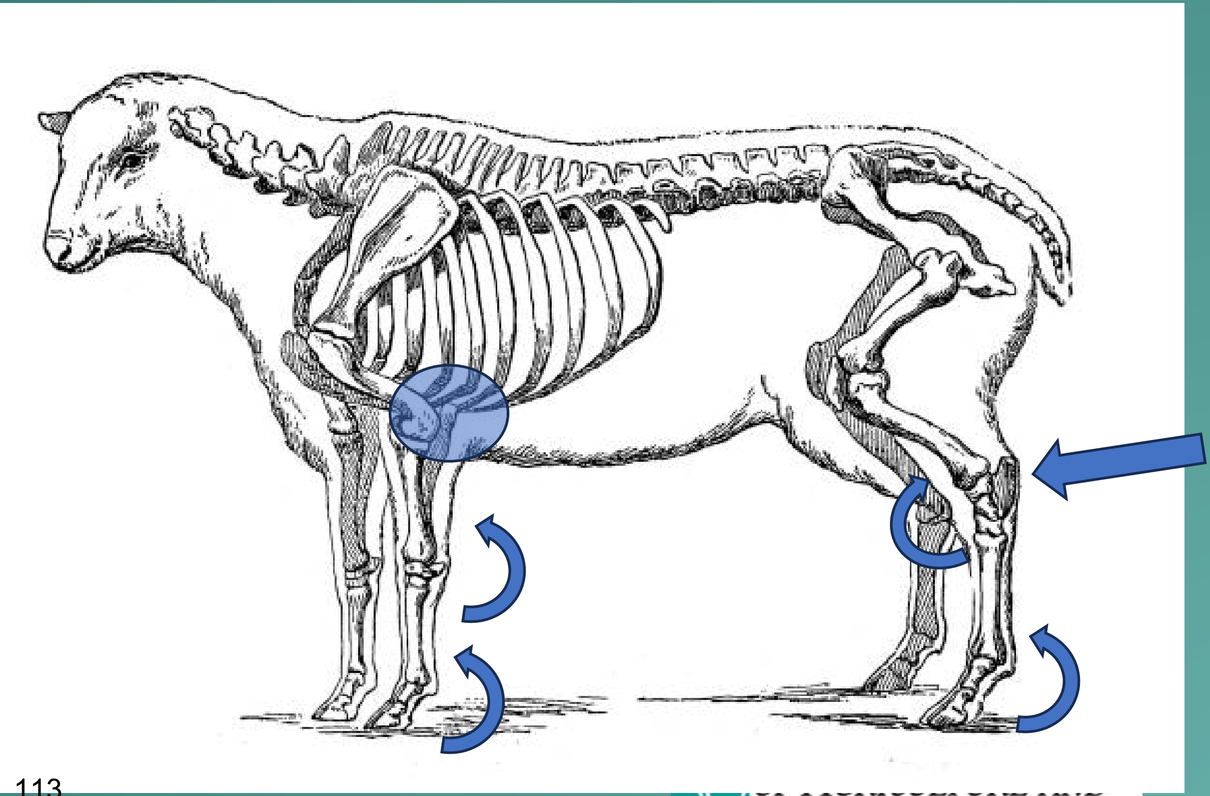
VIRGINIA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

Lambing

- 50% of the lambs that are lost….die w/in the first 48 hrs!!
  - Another 10% die from 2d – 2 weeks.
- Causes of Lamb Death
  - Dystocia
  - Starvation
  - Hypothermia
  - Predators & Disease (Resp and Scours)

Front Limb VS Hind Limb

- Front limbs → Joints flex in same direction
- Hind limbs → Joints flex in opposite directions



Tubing

- LOOK, FEEL & SUCK
- > 99 ^{0}F
- Gravity Flow

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1: Measure tube from mouth to point of elbow and mark

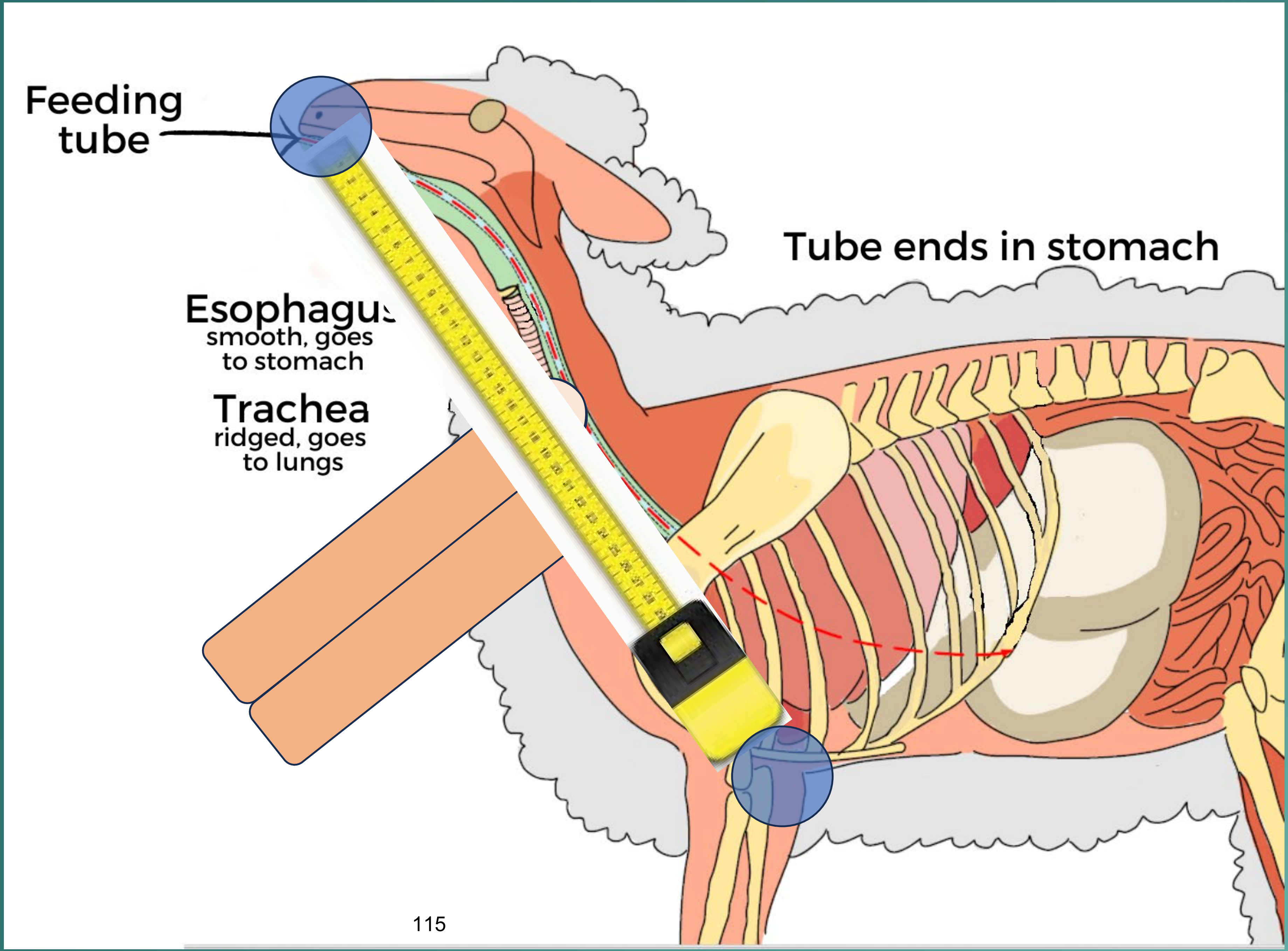
2: Start tube over tongue

3: Advance tube to middle of neck, watching for the tube just under the skin, usually on the LEFT side

4: Feel for the end of the tube just under the skin. May need to move tube back and forth. Should be 2 tubes, Feeder and Trachea

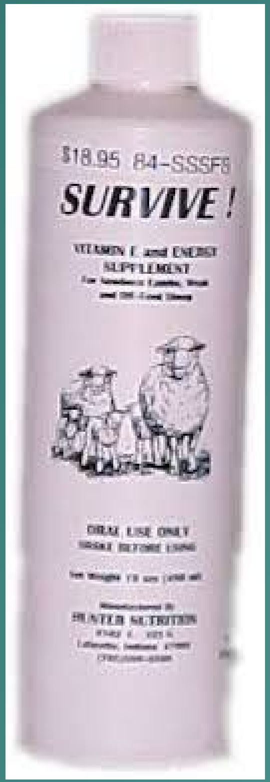
5: Suck on the end of the tube. If correct placement – will not be able to suck air

6: Advance tube to your marked length



Survive!

- Works great!
- High Fat supplement
  - AD&E



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Got Water??

- Then you can have HOT water!!
- $25.00

Prolapses

OF AGRICULTURE AND CONSUMER SERVICES

Mastitis

- Sub-Clinical
- Post-weani
- May not se
- Next lambi
- Scar tissue
- Palpate ud
    - Prior to B
    - Lumps / H
    - Cull

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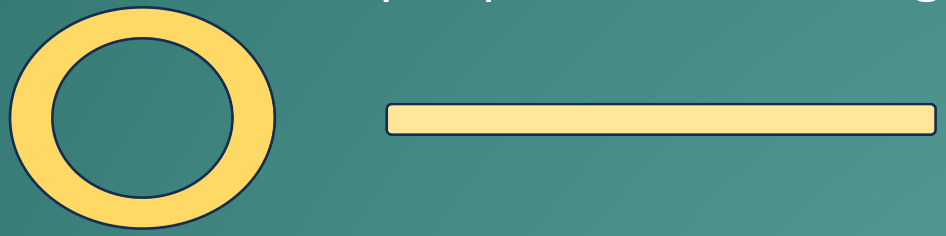
Jug Bedding → Shavings VS Straw

- Absorption
  - Straw at 2.1, Pine shavings at 2.0 #'s of water per pound of bedding
- Insulating capacity
  - Straw - Hollow center



- Bacteria
  - Shavings stick to skin – can lead to ↑ bacteria (udder & navel cord)
- Cleanability
  - Straw ✓

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Lime

- Use Barn lime after stripping lambing jug
- Antibacterial
  - Shifts pH
  - Absorbent
- ↓ ammonia smell

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Coccidia & CDT

- Provide growing lambs access to coccidiostat
  - Lasalocid (Bovatec®)
  - Decoquinate (Deccox®) – safer for equine LGA
  - Feed or Mineral
  - Treatment – Not a typical parasite
- Don’t forget to give lambs CDT
  - 6-8 WK old
  - Booster 4 weeks later

Virginia Department of Agriculture and Consumer Services

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STOP THE BAN!

Unfair. Wrong Approach.

Visit www.stopthebanprotectjobs.com to learn more and join the campaign.

Paid for by Stop the Ban. Protect Jobs.

USDA Wool Marketing Loan Kicks In

- Pandemic damage to the wool business on top of global economic conditions and the U.S.-China Trade war have been severe.
- ASI worked with the wool trade, USDA market reporters, and USDA Farm Services Agency in July 2019 to update the wool marketing loan.
- After much effort, an ungraded wool loan deficiency payment was announced in May 2020. Currently at 40 cents per lb. greasy and $2.746 per unshorn pelt.
- ASI secured a rate update to 55 cents per lb. greasy in the US House Agriculture Committee version of the bill in May.

Sheep Industry Priorities

- Update and renew the wool marketing loan (rates established in 2002).
- Renew the Wool Manufacturers Trust Fund.
- Fund the National Sheep Industry Improvement Center
- Fund the National Foreign Animal Disease programs of the 2018 Farm Bill.

Farm Bill

- Fund conservation and disaster programs for livestock producers to address storm losses and adverse weather.
- Possible extension again of the bill this fall or final legislation in the "lame duck" session after the general election or start over in 2025.
- Interest in USDA report on risk management for Farm bill?

Risk Management for the Sheep Industry

- The pandemic and ensuing bankruptcy of Mtn States Rosen resulted in the loss of Livestock Mandatory Price Reporting information needed to offer LRP-Lamb insurance for purchase.
- With loss of that lamb plant and different purchase methods of the new plants, price information was still not available to support LRP-Lamb insurance by summer of 2021. USDA withdrew the product from their crop insurance line-up.
- USDA Risk Management Agency contracted a firm to take input from the sheep industry and advise development options of risk management for sheep producers. USDA posted the report in July of 2024 without a path that USDA plans to pursue for sheep.

Secure Sheep & Wool Supply (SSWS) Plan

- If Foot and Mouth disease (FMD) is found in the U.S., Regulatory Officials will limit the movement of sheep and sheep products to try and control the disease spread.
- The SSWS Plan provides guidance for producers who have sheep with no evidence of FMD infection to meet the movement requirements.
- Producers who develop a SSWS Plan will be in a better position to request a movement permit and maintain business continuity during an FMD outbreak.
- Currently developing movement criteria for sheep and cattle grazing on federal public land allotments.

Secure Sheep & Wool Supply (SSWS) Plan

- In May 2023, ASI exercised the SSWS Plan in Colorado in collaboration with Colorado Dept. of Ag, Colorado Wool Growers Assn., two Colorado producers, and one lamb packer.
- ASI will be building capacity for SSWS Plan outreach and education through multiple virtual train-the-trainer programs in 2024.
- Attendees of the 2024 ASI Convention in Denver, CO had the opportunity to see first-hand implementation of the SSWS Plan on a lamb feedlot and in a sheep processing plant.
- Learn more at www.securesheepwool.org

Efforts to Assess Electronic ID

- USDA has indicated they want real time animal tracking/traceability to occur for cattle, sheep, pigs, and goats.
- ASI is engaged in efforts that consider how best to accommodate a transition to electronic ID, out of concern that USDA will at a future time impose a plan of their own for the sheep industry.
- ASI Electronic ID Transition Working Group evaluated how to accommodate a transition toward electronic ID for the sheep industry.

Efforts to Assess Electronic ID

- In April 2022, ASI conducted a small pilot project at Delta Sales Yard, in Delta, CO to evaluate the feasibility of integrating an EID system for sheep in an auction market.
- Assessed the technology with respect to business practices, how to make transmission work at the speed of commerce and identified the needs/gaps for implementation.
- Learn more in 2 project videos at www.youtube.com/user/SheepUSA1

Wool Market Overview

- Approx. 55 – 65 % of the U.S. wool clip has been exported annually over last 30-years (except during COVID).
- Market prices world wide in 2024 are lower again than 2023 representing one of the toughest markets in decades.
- Coarse & lower value wool markets has been stagnant since 2018 China trade war.
- ASI competed for USDA export funds and drew $2 plus million across 5 separate federal programs. Hundreds of thousands in Quality Samples program alone drove sales among the 5 export firms.
- ASI hosted 6 international companies this spring which resulted in hundreds of thousands of lbs. of American wool sold

Domestic Wool Market

- The U.S. military continues to consume 15 – 20% of the annual U.S. wool production
- Military demand for U.S. wool is greatest in military dress uniforms.
- Interest in wool socks from the military continues to be explored and grow.
- The wool sock industry is a steady market for U.S. wool and knitting.

American Wool Assurance Program

- Developed by ASI and Colorado State University
- Focuses on year-round animal care best practices
- As consumers and wool processors want to know more about where their wool comes from and how it was raised, assurance programs are providing a way to meet this need.

American Wool Assurance Program

- Learn more about AWA and gain access to resources and contacts at www.AmericanWoolAssurance.org
- Earn a Level I certificate by completing online courses
- AWA Evaluators (individuals in the sheep industry) and AWA Auditors (livestock auditors) are available to help producers earn a Verified or Certified certificate that they can share with their wool buyer.
- More than 350 growers have registered online. Over 100 are now Level I Educated.
- Over 32,000 pound of wool was sold as Certified or Verified this year.

Developing Shearer & Mentor Grant

- Created to help dedicated, developing shearers progress and stay in the industry.
- Available to newer shearers and their mentors, this grant provides 10 shearers with $1,500 each to help with buying equipment and other expenses as students learn and develop.

ASI

Young & Emerging

ENTREPRENEURS

EMPOWERING THE FUTURE
THROUGH EDUCATION & INNOVATION

The New U.S. Wool Lab

- In January 2020, ASI raised over $300,000 from its entities and partners to support a wool lab with an existing wool research program, specialists and building, at Texas A&M AgriLife in San Angelo, Texas
- The wool lab is fully operational since January 2023. The lab performed another 1100 tests through July of 2024.
- ASI facilitated these tests to be certified for the USDA Wool LDP program in 2024.
- The vast majority of tests are April – June.

New Resources

Be sure to look for these new resources!

ASI AMERICAN WOOL

ASI Guard Dog Fund

- The ASI Guard Dog fund remained active on top priority issues for the American Sheep Industry
- Pre-liminary investigation on the impacts of imported lamb meat on the U.S. market.
- ASI interviewed international trade law firms and hired a firm in May 2023 to conduct a pre-liminary investigation on injury and any significant "dumping" of imported lamb.
- Eight state sheep producer associations and NLFA requested this specific investigation be pursued.
- Nearly 40 surveys on injury have been confidentially filed with the law firm.
- Investigators compiled production costs and prices in NZ, AUS, and the U.S.

ASI Guard Dog Fund

- The Executive Board on September 26 reviewed the findings.
- The firm reported possible tariff remedy of 1 – 2% if a case was successful. That rate would have absolutely no impact on American pricing of meat much less live lamb markets. The ASI board has been informed the investigation is complete and no further expenses anticipated.
- A trade case would have to meet federal decisions and can take 8 to 9 months for possible implementation of tariffs on imports. Estimated legal costs would have been $1.3 million
- ASI had similar pre-liminary investigations in 2018 and 2020.
- The law firm states there is no evidence to win a section 201 case today and that congressional restrictions is in consistent with US law.

ASI Working Group – solar grazing

- **AgriVoltaics and Solar Grazing –** ASI plans to support a working group to identify partnerships and coalition efforts to advance this revenue source of sheep production this August.
- **ASI Targeted Grazing –** ASI plans to provide the newest edition of guidance by the end of 2024.

- **National Grazing Lands Coalition –** ASI is a founding member of this coalition with the next seminar planned for December. .

ASI Guard Dog Fund

- **Gray Wolf –** ASI is working in coalition on several fronts to support the Department of Interior's decision to delist the gray wolf from the Endangered Species Act
- **Bighorn Sheep –** ASI has helped win two court decisions in support domestic sheep grazing in Washington state. An appeal on a win in Colorado sheep grazing is underway that ASI is fighting.
- **Federal Grazing –** ASI is funding a challenge to the BLM landscape (conservation) rule and to the WWP suit on NEPA and permit renewal.
- **Coyote trapping in grizzley habitat –** ASI helping Montana fund a challenge against coyote trapping in grizzley habitat.

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The Strength of a United Voice
ASI Annual Convention
Scottsdale, AZ
Jan 15-18, 2025