

# MICHIGAN STATE | BEEF CENTER

SUMMARY OF ACTIVITIES

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# WHO WE ARE

The Michigan State University (MSU) Beef Center operates on approximately 300 acres of the MSU south campus. The Center is operated by MSU undergraduate and Institute of Agricultural Technology students under the supervision of the Center manager (Tristan Foster), operations supervisor (Wesley Mays), animal caretakers (Michael Long and Trent Cole), and faculty coordinator (Dan Buskirk). The Center consists of a purebred Angus herd, commercial Simmental × Angus herd, stocker cattle, and beef finishing operation. The cattle and facilities are utilized in student learning, research investigations, and outreach engagement. The Center is utilized by MSU departments in the College of Agriculture and Natural Resources (Animal Science; Plant, Soil and Microbial Sciences; Food Science & Human Nutrition), College of Veterinary Medicine (Large Animal Clinical Sciences), and the Division of Residential and Hospitality Services (Culinary Services).

OUR MISSION: Advance agriculture using multidisciplinary approaches to teach, generate, disseminate and apply knowledge in beef cattle biology and management.

Our publicly centered mission dictates that we demonstrate by our actions. Therefore, the MSU Beef Center is BQA certified, MAEAP verified, and AAALAC accredited.



Beef Quality Assurance (BQA) is a nationally coordinated, state implemented program that couples common sense husbandry techniques with accepted scientific knowledge to raise cattle under optimum management and environmental conditions. The goal of BQA is to raise consumer confidence through offering proper management techniques and a commitment to quality within every segment of the beef industry.



Michigan Agriculture Environmental Assurance Program (MAEAP) verified farms keep their land, water, and air as healthy as the food they produce. MAEAP represents the highest standards of environmental stewardship and is the pinnacle of environmentally responsible agriculture. Rigorous review is conducted every three years by the Michigan Department of Agriculture and Rural Development to ensure participating farms remain in compliance with MAEAP standards.



AAALAC International is a voluntary accrediting organization that enhances the quality of research, teaching, and testing by promoting humane, responsible animal care and use. It provides advice and independent assessments to participating institutions and accredits those that meet or exceed applicable standards.

# COW/CALF

The Center maintains of a purebred Angus herd and commercial Simmental × Angus herd. Following is a brief description of the management of those herds.

## **BREEDING**

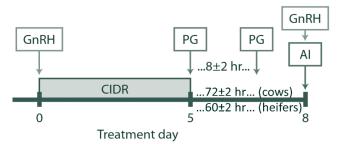
The Center's purebred cows are bred to calve beginning in February, and commercial (Simmental × Angus) cows are bred to calve beginning in March. Timing of the calving seasons are directed by teaching needs (*i.e.* Calf Watch) and seedstock merchandising opportunities. Artificial insemination (AI) and herd bulls are utilized in a shortened and controlled breeding season for both the purebred and commercial herds. The Center has been utilizing the 5-day CO-Synch +



Figure 1. Beef Center Angus yearling heifers.

CIDR protocol to synchronize estrous of all cows and heifers (Fig. 2.). Ten days following the fixed-time AI, herd bulls are placed with females for a 50-day breeding season. Within 60 days of the end of the breeding season, pregnancy diagnosis is accomplished by ultrasound. All non-pregnant females are culled. Pregnancy rates to AI and overall from 2013 to 2015 are shown in Fig. 3.

Figure 2. 5-day CO-Synch + CIDR fixed-time AI protocol for cows and heifers, as recommended by the Beef Reproduction Task Force.



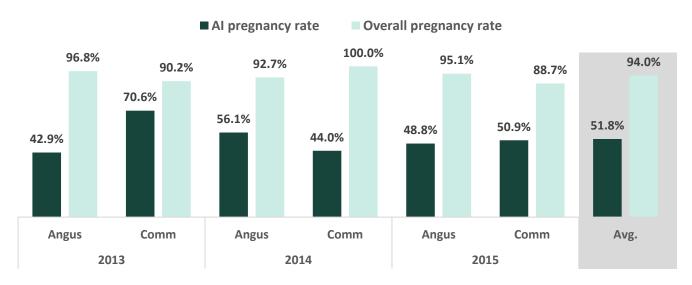


Figure 3. Artificial insemination and overall pregnancy rate for MSU Angus and Commercial (Comm) herd, 2013 to 2015.

Calving distribution has tightened since implementation of the unified breeding program in 2013 (Fig. 4).

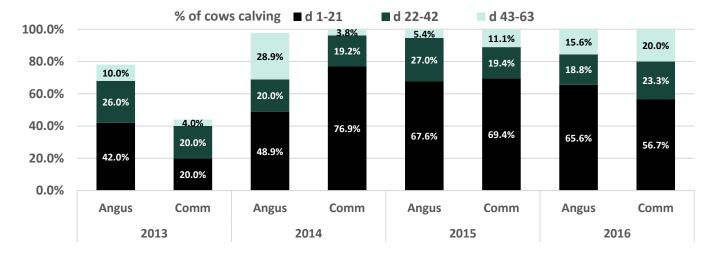


Figure 4. Percentage of cows calving in first 21, 42, and 63 days of the calving season (starting from date of third mature calving cow) for MSU Angus and Commercial (Comm) herd, 2013 to 2016.

## COW HERD FEEDING

The MSU Beef Cow/Calf Teaching and Research Center operates on approximately 300 acres, 222 acres of which is dedicated to grazing. Cattle are maintained in pastures most of the year, using natural woodlots for windbreaks. These pastures are primarily cool season grasses, such as bluegrass, white clover, orchardgrass and bromegrass. They vary in size from 10 to 50 acres and are rotationally grazed. Pastures are currently undergoing a rotated renovation plan. The hay fields are seeded to alfalfa and orchardgrass or bromegrass, and are often grazed after harvest of one cutting of hay or haylage (supplying other Centers). Much of the hay is stored as small square bales in barns, or wrapped as large round-bales for winter-feeding. Corn fodder, hay, and a limited amount of corn silage are used to provide the winter-feed supply. Most feedstuffs are typically grown on the MSU farms. Required protein supplementation is most often provided by dried corn distillers grains. A vitamin/mineral mix is provided free-choice for the cow herd throughout the year.

## **MERCHANDISING**

Many of the heifer calves are retained for classroom instruction and replacement females in the herd. Selected bull calves are sold through consignment sales, or through the MCA/MSU Bull Evaluation Program. Heifer or castrated bull calves that do not possess acceptable performance or conformation desirable for breeding are finished at the MSU Beef Cattle Teaching & Research Center (feedlot). Each

year, a few cattle produced from this herd are fitted for exhibition and/or sale by the MSU student employees.

Figure 6. Main "Beef Barn" at MSU Cow/Calf Teaching and Research Center.



## PREVENTATIVE HEALTH

The Center is proactive with preventative health measures to reduce parasitism or infectious disease. The Center preventative health protocol (Table 1) is provided as an example only. Producers should work with their veterinarian in designing a custom protocol for their operation.

Table 1. MSU Beef Center preventative health protocol\*

CALF PROTOCOL		
Birth	BO-SE®	Selenium, Vitamin E
	Vitamin A & D Injection	Vitamins A, D <sub>3</sub>
Early Processing (~90-120 d)	Bovi-Shield Gold® One Shot™	(MLV) IBR, BVD (182), Pl3, BRSV, Mannheimia haemolytica (w/toxoid)
	Ultrabac® 7/Somubac®	Clostridium, Histophilus somni
Early summer	Dectomax® pour-on	Internal and external parasites
	Ultrabac® 7/Somubac®	Clostridium, Histophilus somni
Pre-weaning (~200 d)	Bovi-Shield Gold® One Shot™	(MLV) IBR, BVD (182), Pl <sub>3</sub> , BRSV, <i>Mannheimia haemolytica (w/ toxoid)</i>
Replacement heifer & bull calves	Staybred™ VL5	Campylobacter fetus, 5 strains leptospira
Post Weaning	Bovi-Shield Gold® One Shot™	(MLV) IBR, BVD (182), PI <sub>3</sub> , BRSV, <i>Mannheimia haemolytica (w/ toxoid)</i>
	Ultrabac® 7/Somubac®	Clostridium, Histophilus somni
Replacement heifer & bull calves	Staybred™ VL5	Campylobacter fetus, 5 strains leptospira
	Safe-Guard® drench	Internal parasites
OW PROTOCOL		
Precalving (first calf) (50-65 d)	ScourGuard® 4KC	Rotavirus, coronavirus, K99 E. coli, <i>Cl. perfringens</i>
Precalving (all) (30-45 d)	ScourGuard® 4KC	Rotavirus, coronavirus, K99 E. coli, <i>Cl. perfringens</i>
Prebreeding (30-45 d)	Bavi-Shield Gold® One Shat™	(MLV) IBR, BVD (182), Pl3, BRSV, Mannheimia haemolytica (w/toxoid)
	Ultrabac® 7/Somubac®	Clostridium, Histophilus somni
	Staybred™ VL5	Campylobacter fetus, 5 strains leptospira
Mid-summer	Dectomax® pour-on	Internal and external parasites
Post-freeze	Safe-Guard® drench	Internal parasites
BULL PROTOCOL		
At Prebreeding BSE	Bovi-Shield Gold® One Shot™	(MLV) IBR, BVD (182), Pl3, BRSV, Mannheimia haemolytica (w/ toxoid)
	Ultrabac® 7/Somubac®	Clostridium, Histophilus somni
	Staybred™ VL5	Campylobacter fetus, 5 strains leptospira
Mid-summer	Dectomax® pour-on	Internal and external parasites
Post-freeze	Safe-Guard® pellets	Internal parasites

<sup>\*</sup>Reference to commercial products or trade names does not imply endorsement by MSU Extension or bias against those not mentioned.

## **GENETICS**

The breeding program is currently focused on economic index-based selection of high accuracy sires, with particular emphasis on calving ease, performance, and end-product traits. Yearling purebred cattle are evaluated and performance and ultrasound records are collected and submitted to the American Angus Association for inclusion in the national cattle evaluation. Selected bulls and replacement heifers have genomic data collected to generate genomically enhanced Expected Progeny Differences (EPD). Many of the EPDs for bulls and females in the MSU Beef Center herd rank among the best in the Angus breed. The overall goal of the Angus breeding program is to produce seedstock for commercial beef producers that are targeting profitable production of high quality beef. Sires used in 2016 are listed in Tables 2 and 3, and their EPDs are shown in Table 4.

Table 2. Angus sires used in 2016



#### JMB Traction 292

Sitz Top Game 561X x S A V 004 Predominant 4438

An outcross, good-footed sire with a proven track record of excellent maternal, growth, and carcass traits. Traction is one of only three current Angus sires in the top 1% for both \$W and \$B.



#### PA Fortitude 2500

GAR-EGL Protégé x SydGen C C & 7

A favorite for use on heifers, he is the only sire in the Angus breed with a CED EPD in the top 2%, while also being in the top 1% for \$B.



## SydGen Black Pearl 2006

SydGen Trust 6228 × Connealy Forward

A balanced trait leader, heavily used in Australia and New Zealand, his EPDs are in the top 25% for CED, SC, Doc, HP, Milk, CW, Marb, and RE and top 5% for WW, YW, \$W, and \$B.



#### KM Broken Bow 002

Summitcrest Complete 1P55  $\times$  Basin Ambush 8161

He is among the top 10 active sires for Total Profit Index and ranks in the top 25% in reduced feed intake through the Angus Sire Alliance.



#### Varilek Kill Shot 3157 67

MOGCK Sure Shot × Connealy Sullivan 83A

MSUs latest herd sire addition, Kill Shot, is long-bodied, heavily muscled bull with good EPD profile balance. He ranks in the top 15% for \$W and top 3% for CW, RE, and \$B.

NO PHOTO AVAILABLE

#### **AHA True North 1420**

Woodhill Foresight × S S Objective T510 0T26

Balanced trait son of the popular Woodhill Foresight bull from Apple Hill Angus. His EPDs are in the top 30% for \$W and top 45% for \$B.

Table 3. Simmental sires used in 2016.



WS All-Around Z35 [Black, homozygous polled]

WS Beef King W107 × HSF High Roller 12T

A tremendous genetic profile with both API and TI in the top 1% of the breed. For making steers for finishing, and replacements for the commercial herd, we especially like his CE (1%), YW (10%), Stay (3%), Marb (3%), and Shr (20%).

NO PHOTO AVAILABLE LACAT GRAND MAKER 126 [Black, polled] WS Beef Maker R13 × SS Ebonys Grandmaster

Bred by Lattimore Cattle Co., this herd sire has a solid terminal EPD lineup, with YW (5%), ADG (3%), CW (10%), Marb (15%), REA (3%), and Shr (30%)

STO MR REVENUE C21 [Black, polled]

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LMF Revenue Z24 × Star Q

Balanced EPD bull from Stough Simmentals has a TI EPD in the top 25% and Shr EPD in top 10% of breed.

Table 4. Data and Expected Progeny Differences of sires used in 2016 (Data current 7/2016)

Reg No.	Name	Sire	FS		CED	BW	WW	YW	HP	CEM	Milk	CW	Marb	RE	Fat	\$W	\$B
NGUS HERD	SIRES																
17595060	VARILEK <b>KILL SHOT</b> 3157 67	MOGCK Sure Shot	5.5	EPD	6	0.7	55	101	8.2	9	32	66	0.32	1.09	-0.017	62.93	164.08
				%	50	40	30	20	65	45	5	2	<i>75</i>	3	20	15	Ź
17794171	AHA <b>True North</b> 1420	Woodhill Foresight	5.9	EPD	6	1.0	52	96	1.3	9	27	33	0.75	0.26	-0.003	50.46	111.54
				%	50	45	35	30	90	40	25	50	25	85	30	30	45
NGUS AI SIR	RES																
17262374	JMB <b>traction</b> 292	Sitz Top Game	6.0	EPD	3	2.6	71	128	25.9	7	42	57	0.77	1.43	0.021	80.27	178.36
				%	75	80	2	/	2	65	/	5	15	/	60	/	,
17418539	PA <b>FORTITUDE</b> 2500	GAR-EGL Protege	5.6	EPD	16	-	55	105	12.6	14	25	57	0.50	0.85	-0.042	57.98	167.62
				%	2	10	30	15	40	4	40	5	50	10	5	20	1
+17236055	SYDGEN <b>Black Pearl</b> 2006	SydGen Trust 6228	6.2	EPD	10	0.6	67	118	18.7	8	29	50	0.87	0.80	0.011	71.97	150.87
				%	25	40	4	4	15	55	15	10	10	15	50	4	3
16764044	KM <b>Broken Bow</b> 002	Summitcrest	5.5	EPD	13	-	59	102	14.6	13	29	30	0.68	0.69	-0.048	61.94	130.53
				%	10	10	15	20	30	10	15	50	25	25	4	15	20

Reg No.	Name	Sire	FS		CED	BW	WW	YW	MCE	Milk	Stay	CW	Marb	RE	Fat	Shr	TI	API
SIMMENTA	L HERD SIRES																	
2650266	LACAT <b>Grand Maker</b> 126	WS Beef Maker	5.5	EPD	9.7	1.8	74.8	116.3	8.6	25.9	16.6	41.7	0.31	1.18	0.001	-0.40	79.1	130.0
				%	45	50	10	5	55	20	95	10	15	3	99	30	4	35
3001023	STO MR REVENUE C21	LMF Revenue		EPD	10.7	0.3	67.6	99.7	9.9	23.4	-	29.4	0.20	0.52	-0.101	-0.48	71.7	133.6
				%	35	20	35	30	40	35	-	40	35	95	1	10	25	25
SIMMENTA	L AI SIRE																	
2675740	WS ALL-AROUND Z35	WS Beef King	6.0	EPD	18.1	-0.7	79.7	113.5	13.4	22.0	27.5	35.7	0.43	0.70	-0.012	-0.43	87.5	172.9
				%	1	10	4	10	10	50	3	20	3	70	99	20	1	/

Table 5. Data and Expected Progeny Differences of Angus females (Data current 7/2016)

			na Exposica i Togoriy								EPD	)					
ID	Age	#	Name	Sire Name	CED	BW	WN	YW	CEM	Milk	CW	Marb	RE	FAT	\$W	\$B	Tend%
0405	12		M S U Blackbird 0405	Alberda Traveler 416	2	3.3	33	65	-1	21	9	0.63	0.24	0.000	19.87	77.17	
503	11.5		MSU Blackbird 503	Hyline Right Time 338	I	2.6	38	71	2	19	38	0.55	0.33	-0.010	27.32	121.09	
601	10		MSU Elba 601	S A V 8180 Traveler 004	4	3.7	49	86	9	22	34	0.55	0.31	0.033	36.71	106.65	
628	10		MSU Blackcap Heiress 628	EXAR Nacho 3090	16	-0.6	40	76	13	17	14	0.71	0.30	0.019	33.83	82.85	
706	9	#	MSU Elba 706	EXAR New Look 2971	-6	4. I	59	101	- 1	34	33	0.51	0.63	-0.024	56.99	120.34	
719	9		MSU Elba 719	Boyd On Target 1083	П	0.5	45	81	14	23	29	0.65	0.35	0.031	47.25	104.85	
734	9	#	MSU Ruby of Tiffany 734	Boyd Network M275	5	1.6	35	72	3	32	26	0.61	0.41	0.035	38.57	106.74	
801	8		MSU Elba 801	BC 7022 Raven 7965	-5	4.8	50	93	0	17	30	0.62	0.62	-0.020	24.62	110.81	
803	8		MSU Blackbird 803	Connealy Power One	-2	3.0	35	69	-1	19	8	0.54	0.74	0.007	23.43	76.66	
817	8		MSU Eriskay 817	Connealy Power One	-3	3.1	38	74	3	29	16	0.61	0.47	0.011	32.16	88.25	79
824	8		MSU Elba 824	TC Total 410	2	2.7	62	107	8	26	46	0.58	0.57	-0.015	55.28	139.19	
841	7.5		MSU Erica 841	BC 7022 Raven 7965	14	-0.7	36	66	14	12	18	0.51	0.76	-0.013	21.93	92.94	
843	7.5		MSU Elba 843	BR Midland	5	2.9	39	72	7	16	15	0.59	0.27	0.002	20.70	89.63	
935	7	#	MSU Blackcap 935	TC Total 410	4	1.2	52	99	8	27	32	0.55	0.73	-0.043	51.17	119.98	
021	6		MSU Ruby of Tiffany 021	S A V Providence 6922	4	2.9	55	98	3	33	47	0.71	0.50	0.052	56.47	133.59	
022	6		MSU Eriskay 022	O C C Jupiter 671J	9	-0.5	51	83	8	20	27	0.45	0.60	0.028	53.98	102.19	
029	6	#	MSU Queen Kimberly 029	S A V Providence 6922	4	2.8	49	73	8	31	26	0.41	0.27	0.012	52.30	91.68	13
040	6		MSU Elba 040	S A V Providence 6922	2	3.4	58	97	7	35	49	0.37	0.39	-0.007	59.03	129.04	
049	5.5		MSU Elba 049	B C Lookout 7024	3	2.9	37	68	4	12	20	0.56	0.46	-0.015	14.77	96.56	
102	5		MSU Erica 102	Kesslers Frontman R001	14	-2.3	59	93	13	36	22	0.33	1.01	0.052	82.72	91.86	
104	5		MSU Ruby of Tiffany 104	S A V Cast Iron 8083	6	1.6	34	75	6	26	28	0.70	0.52	0.056	29.58	103.62	
109	5		MSU Miss Burgess 109	S A V Providence 6922	5	1.9	47	81	8	26	31	0.29	0.46	-0.002	48.57	95.27	
120	5		MSU Eriskay 120	S A V Providence 6922	3	3.9	51	86	9	29	38	0.15	0.73	0.045	48.49	101.55	
142	5		MSU Queen Blackbird 142	B C Lookout 7024	2	2.9	39	66	4	18	23	0.31	0.42	-0.033	29.06	92.86	
203	4		MSU Ruby of Tiffany 734	S A V Prosperity 9131	-2	3.4	55	93	2	33	41	0.61	0.72	0.031	55.24	133.74	

											EPD						
ID	Age 7	#	Name	Sire Name	CED	BW	WN	YW	CEM	Milk	CW	Marb	RE	FAT	\$W	\$B	Tend%
220	4		MSU Elba 220	S A V First Class 0207	7	0.9	47	84	9	34	39	0.50	0.31	0.022	58.99	113.95	
230	4		MSU Blackbird 230	Connealy Consensus 7229	4	1.8	44	81	4	23	31	0.91	0.55	0.054	44.79	112.31	
234	4		MSU Elba 234	Connealy Consensus 7229	6	1.9	52	93	8	25	26	0.90	0.58	0.070	54.82	104.45	
402	2		MSU Erica 402	EF Complement 8088	14	-1.9	47	90	14	20	30	0.49	0.76	0.040	44.77	111.07	66
405	2		MSU Eriskay 405	PA Safeguard 021	-1	0.6	54	95	I	30	37	0.97	0.66	0.016	57.96	129.33	61
407	2		MSU Elba 407	A A R Ten X 7008 S A	4	1.8	53	104	7	20	44	0.77	0.56	-0.023	40.62	148.90	32
417	2		MSU Eriskay 417	PA Safeguard 021	2	1.3	38	75	4	28	23	0.51	0.84	0.044	44.58	90.77	32
421	2		MSU Blackbird 421	PA Safeguard 021	0	2.1	48	90	-1	29	28	0.97	0.73	0.006	45.09	118.19	14
423	2		MSU Blackbird 423	EF Complement 8088	-2	2.5	49	93	3	24	22	0.80	0.55	0.056	46.16	106.92	8
424	2		MSU Elba 424	W H S Limelight 64V	4	2.8	69	118	6	24	55	1.07	0.51	-0.006	61.97	162.21	25
501	1		MSU Elba 501	PA Safeguard 021	3	0.3	50	97	5	29	29	0.94	0.72	0.017	53.66	113.37	38
503	- 1		MSU Queen Kimberly 503	PA Safeguard 021	10	-1.5	47	88	9	24	26	0.87	0.87	-0.004	45.65	110.50	51
504	1		MSU Elba 504	A A R Ten X 7008 S A	3	2.3	50	97	7	23	38	0.90	0.41	-0.023	42.27	142.44	65
505	I		MSU Eriskay 505	PA Safeguard 021	9	-0.3	47	88	6	31	26	1.20	0.52	0.022	52.64	113.30	81
508	I		MSU Elba 508	PA Safeguard 021	-4	1.6	60	108	0	36	38	0.84	0.77	0.003	67.27	129.40	22
509	1		MSU Elba 509	A A R Ten X 7008 S A	5	1.6	49	97	6	19	39	0.91	0.48	-0.033	33.72	143.17	22
510	1		MSU Blackbird 510	PA Safeguard 021	-6	3.2	51	97	-3	28	42	0.80	0.61	0.020	45.00	132.26	7
512	I		MSU Blackcap 512	A A R Ten X 7008 S A	7	0.9	58	113	10	26	47	0.87	0.82	-0.047	60.50	156.34	28
514	I		MSU Miss Burgess 514	PA Safeguard 021	I	1.1	43	85	3	30	29	0.71	0.66	0.010	51.91	102.42	49
515	I		MSU Ruby of Tiffany 515	PA Safeguard 021	-15	4.4	54	96	-6	38	49	1.04	0.78	0.029	51.29	147.93	1
519	I		MSU Blackbird 519	A A R Ten X 7008 S A	0	3.0	49	96	3	22	34	0.76	0.87	0.002	40.51	135.30	18
521	1		MSU Queen Kimberly 521	BAF Fast Break 924W	4	3.3	55	88	9	28	33	0.69	0.72	-0.003	54.96	124.75	20

<sup>#</sup> Recognized by the American Angus Assoc. as a Pathfinder Cow, having produced ≥ 3 calves with an average weaning wt. ratio of ≥ 105.

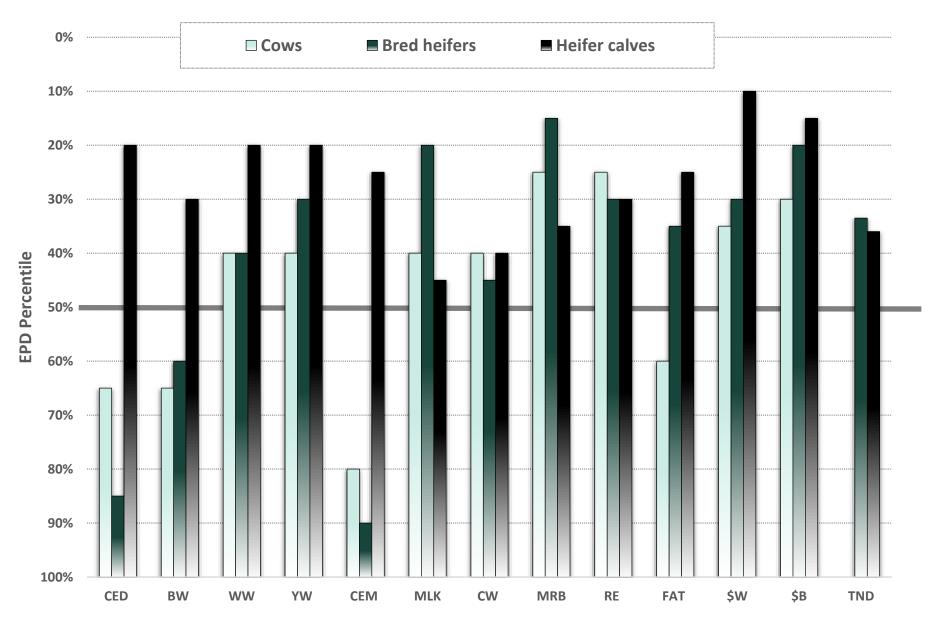


Figure 5. MSU Angus female average Expected Progeny Difference percentiles (Cows = Current Dam percentile; bred heifers and heifer calves = Non-Parent Cow percentile).

# FEEDLOT (BEEF CATTLE TEACHING & RESEARCH CENTER)

Many of the research projects conducted at this facility investigate methods to increase productivity of Michigan feedlots. There are also reproductive physiology trials conducted at the facility, because of the ability to intensively handle and manage cattle. The facility is used extensively for instruction of the Livestock Agricultural Technology student's clerkship program. Students in the program learn to run all the equipment necessary to feed and care for the cattle at the facility.

## **FACILITY**

The major components of feedlot facility are:

Main building wings - 31 under-roof pens (14 ft × 39 ft)

Slotted floor barn - 40 under-roof, slotted-floor confinement pens (10 ft x 13.5 ft).

ID barn - 4 under-roof pens with Calan gates or self-locking head gates (10 ft x 40 ft).

Physiology room – 16 stalls with handling facility

Scale house – Handling facility with Silencer hydraulic chute, scale system, and RFID readers

Student house – Beef student employees

# Feed storage:

Hay barn – Feed, bedding, equipment storage (50 ft × 200 ft)

- 1 Harvestore silo (250 ton capacity; wet storage)
- 2 Harvestore silos (250 ton capacity; dry storage)
- 1 large bunker silo (1,200 ton capacity)
- 4 experimental bunker silos (150 ton capacity)
- 4 supplement bins (1 six ton, 3 two ton capacity)

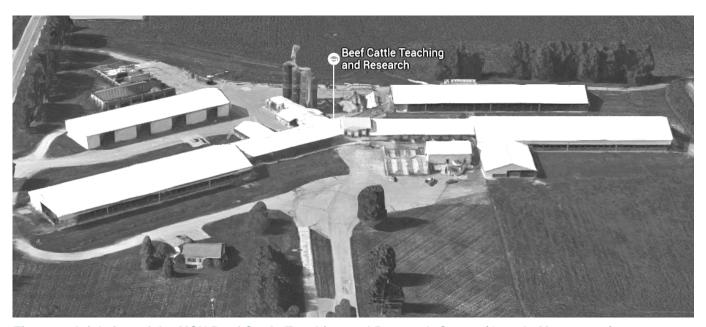


Figure 7. Arial view of the MSU Beef Cattle Teaching and Research Center (Google Maps, 2016).

## **FINISHING**

The facility has a one-time capacity of 500 cattle. Cattle vary in size and gender depending on the research protocol. There are typically two major classes of livestock fed at the facility. One-half to two-thirds of the animals are often yearling cattle (beef breeds or Holstein) with a starting weight of 700 to 900 pounds. The cattle are generally 12 months or older and are fed for 100 to 160 days on a diet comprised of approximately 75% corn, 20% corn silage, and 5% supplement on a dry matter basis. The second class consists of weaned, preconditioned beef calves weighing 500 to 650 pounds. Their diet generally contains more corn silage (grower diet) early in the feeding period. These calves are normally fed for 180 to 240 days. The beef and dairy type cattle are most often purchased from Michigan, Tennessee, Kentucky, West Virginia, Virginia or Missouri.

#### **MARKETING**

Cattle are fed until they meet research requirements or the manager estimates that they have adequate finish to meet market specifications, based on size and degree of finish. Cattle are harvested at commercial plants in Michigan, Pennsylvania, and Illinois, or through the MSU Meats Laboratory.

The Center's relationship with MSU Food Stores/Residential Dining Services has created a complete beef supply chain (pasture to plate) for MSU students to become involved. Undergraduate students, and those in the Livestock Agriculture Technology program finish the cattle that are born and raised at the MSU Cow/Calf Teaching and Research Center. The arrangement satisfies Food Stores desire for providing locally raised beef, while providing students and researchers a broader understanding of the logistical requirements for local value chains and product traceability.

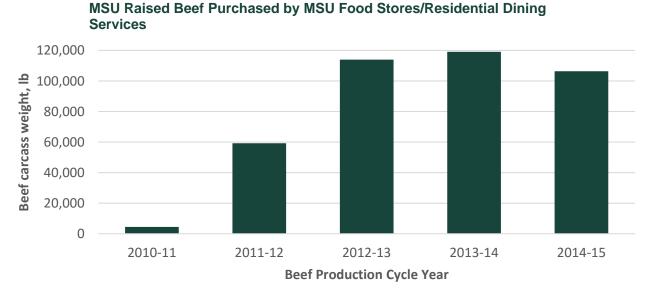


Figure 8. Quantity of beef supplied to MSU Food Stores/Residential Dining Services through the MSU Beef Supply Chain Project.

# TEACHING

One of The MSU Beef Center's missions is to teach knowledge in beef cattle biology and management. The Center regularly provides the facilities, cattle, and/or beef for numerous experiential learning opportunities. The courses that have utilized the Beef Center in the last three years are listed in Table 6.

Table 6. MSU Beef Center course use, 2013-2016

Course	Course Title	Instructor
ANS 110	Introductory Animal Agriculture	Waite
ANS 122B	Beef Feedlot Clerkship	Kiesling
ANS 122B	Beef Cow/Calf Clerkship	Kiesling
ANS 200A	Introductory Judging of Livestock & Carcasses	Kiesling
BIOL 120	Environmental Science (Lansing Community	Paine
CSS 201	Forage Crops	Cassida
ANS 211	Animal and Product Evaluation	Kiesling
ANS 222	Introductory Beef Cattle Management	Buskirk
ANS 305	Applied Animal Behavior	Siegford
ANS 422	Advanced Beef Cattle Feedlot Management	Buskirk
ANS 490	Reproductive Technologies in Cattle	Pursley
VM 511	Clinical Competencies I	Roberts
VM 547	Respiratory Disease	Grooms
LCS 610L	Clinical Problems in Large Animal Clinical Sciences	Grooms
LCS 616	Large Animal Surgery and Medicine	Roberts
SCS 643	Neurology Clerkship	Probst
LCS 679	Food Animal Production Medicine I	Roberts
LCS 682	Food Animal Production Medicine II	Roberts

In addition to formal course work, MSU clubs also utilize the Center and its cattle. The MSU Block & Bridle club use cattle from the Center for their Little International Show, and the CVM Food Animal Club are involved in the Calf Watch program. The 4-H Livestock program also utilizes cattle maintained at the Center.

# RESEARCH

One of the MSU Beef Center's missions is to generate knowledge in beef cattle biology and management. The Center regularly provides the facilities and cattle for research projects. Examples of research projects using the Center are listed in Table 7.

Table 7. MSU Beef Center research use, 2013-2016

Research Project	Principle Investigator
Actively reducing antibiotic resistance in untreated animals	B. Norby
Evaluation of Silo-Guard II as a silage amendment to enhance fermentation and improve retention of harvested nutrients	S. Rust
Cattle, corn stover and bioenergy: A sustainable integrated system	S. Rust
Use of Jumpstart 360 to minimize nitrogenous losses from the manure deposited in feedlot pens	S. Rust
Production and supply side strategies for a local, Michigan grass-finished beef production system	J. Rowntree
Mitigation of lameness and tail injuries in indoor confined slatted floor feedlots	D. Grooms
Detection of bovine interferon-γ response in blood collected during exsanguination of cattle sensitized with <i>Mycobacterium bovi</i> s	D. Grooms/C. Okafor
Embryotropic actions of follistatin: mechanisms and translational relevance	G. Smith
Impact of small ovarian reserve and low progesterone production during estrous cycles on fertility and longevity in dairy cattle	J. Ireland
Accelerating the commercialization of the ammonia fiber expansion (AFEX) process: Animal feeding trials	S. Rust
Use of UHF RFID for continuous monitoring of cattle health and inventory	D. Buskirk
Characterization and mitigation of lameness in indoor confined feedlots	D. Grooms
Mitigation of lameness and tail injuries in indoor confined slated floor feedlots	D. Grooms
Survival of mycobacterium bovis in ensiled forages	D. Grooms
BREAD Trypanosomiasis resistant cattle	J. Cibelli
Accelerating the commercialization of the Ammonia Fiber Expansion (AFEX) process: Animal feeding trials	S. Rust
Microbial ecology and shiga toxin-producing <i>Escherichia coli</i> (STEC) shedding in cattle	S. Manning/S. Rust
NSRA: MSU-AAQRF test system evaluation using beef cattle heifers by measuring baseline environmental emissions when fed a finishing ration for the last 14 days of finishing	W. Powers-Schilling

Clinical Study (GCP): Effect of LY488756 on environmental emissions when fed to beef cattle for the last 14 days of finishing	W. Powers-Schilling
Diet strategies to reduce emissions (NH <sub>4</sub> , CH <sub>4</sub> , H <sub>2</sub> S, VOC) from growing cattle	W. Powers-Schilling

## Publication of research completed at the MSU Beef Center, 2013-2016

## **Peer Reviewed Manuscripts**

- Li, P., J. Meng, W. Liu, G. W Smith, J. Yao, and L. Lyu. 2016. Transcriptome analysis of bovine ovarian follicles at predeviation and onset of deviation stages of a follicular wave. Int. J. Genomics. 2016:3472748.
- Venegas-Vargas, C., S. Henderson., A. Klare, R. Mosci, J. Lehnert, P. Singh, L. Ouellette, B. Norby, J. A. Funk, S. R. Rust, P. Bartlett, D. L. Grooms, and S. D. Manning. 2016. Factors associated with Shiga toxin-producing *Escherichia coli* shedding in dairy and beef cattle. Appl. Environ. Microbiol. doi:10.1128/AEM.00829-16
- Mossa, F. S. W. Walsh, J. J. Ireland, and A.C.O. Evans. 2015. Early nutritional programming and progeny performance: Is reproductive success already set at birth? Anim. Frontiers 5:18-24.
- Gupta P.S., J. K. Folger, S. K. Rajput, L. Lv, J. Yao, J. J. Ireland, and G. W. Smith 2014. Regulation and regulatory role of WNT signaling in potentiating FSH action during bovine dominant follicle selection. PLoS One. 9:1-9.
- Kroll, L. K., D. L. Grooms, J. M. Siegford, J. P. Schweihofer, C. L. Daigle, K. Metz, and M. Ladoni. 2014. Effects of tail docking on behavior of confined feedlot cattle. J. Anim. Sci. 92:4701-4710.
- Kroll, L. K., D. L. Grooms, J. M. Siegford, J. P. Schweihofer, K. Metz, and S. R. Rust. 2014. Effects of tail docking on health and performance of beef cattle in confined, slatted-floor feedlots. J. Anim. Sci. 92:4108-4114.
- Buskirk, D. D., Schweihofer, J. P., Rowntree, J. E., Clarke, R. H., Grooms, D. L., and Foster, T. P. 2013. A traceability model for beef product origin within a local institutional value chain. J. Agric., Food Sys. Comm. Dev. 3:33–43.
- Folger, J. K., F. Jimenez-Krassel, J. J. Ireland, L. Lv, and G. W. Smith. 2013. Regulation of granulosa cell cocaine and amphetamine regulated transcript (CART) binding and effect of CART signaling inhibitor on granulosa cell estradiol production during dominant follicle selection in cattle. Biol Reprod. 89:137-145.
- Selvaraju S., J. K. Folger, P. S. Gupta, J. J. Ireland, and G. W. Smith. 2013. Stage-specific expression and effect of bone morphogenetic protein 2 on bovine granulosa cell estradiol production: regulation by cocaine and amphetamine regulated transcript. Domest. Anim. Endocrinol. 44(3):115-120.
- Okafor, C.C., D. L. Grooms, S. R. Bolin, T. D. Gravelyn, and J. B. Kaneene. 2013. Effect of transportation, time of sampling, and lymphocyte numbers on gamma interferon response to *Mycobacterium bovis* in cattle at time of slaughter. J. Vet. Diagn. Invest. 25(2):248-253.

Okafor, C. C., D. L. Grooms, S. R. Bolin, and J. B. Kaneene. 2012. Detection of bovine interferon-γ response in blood collected during exsanguination of cattle sensitized with *Mycobacterium bovis*. Amer. J. Vet. Res. 73(6):847-853.

#### **Theses**

- Jean, M. A. 2016. Cattle, corn stover, and bioenergy: A sustainable integrated system. M.S. Thesis.
- Foster, T. P. 2016. A comparison of beef traceability models during serial and parallel processing methods. M.S. Thesis.

#### **Abstracts**

- Chapman, B. R., D. S. Smith, C. N. Curtiss, M. J. Atkin, S. R. Rust, and D. L. Grooms. 2015. Effects of rubber covers for concrete slats on lameness in confined feedlots. J. Anim. Sci. 93(E-Supplement 2):337. (Abstr.).
- Grooms D. L., S. R. Bolin, P. Durst P, J. Hattey, S. R. Rust, D. Buskirk, A. Lim, and R. Smith. 2015. Survival of *Mycobacterium bovis* during forage ensiling. Proceedings of the 2016 Annual Conference of the American Association of Bovine Practitioners, New Orleans, LA, September 18-20. (Abstr.).
- Smith, D. S., B. R. Chapman, C. N. Curtiss, M. J. Atkin, S. R. Rust, and D. L. Grooms. 2015. Effects of rubber coverings for slatted floor facilities on cattle performance and cleanliness. J. Dairy Sci. 98(E-Supplement 1):11. (Abstr.).
- Foster, T., D. Buskirk, and J. Schweihofer. 2013. Comparison of serial and parallel beef fabrication methods in a traceable supply chain. J. Anim. Sci. 91(E-Suppl. 2):63. (Abstr.).
- Gupta, P. S. P., J. K. Folger, L. Lv, J. Yao, J. J. Ireland, and G. W. Smith. 2013. Regulation and regulatory role of WNT signaling in potentiating FSH action during bovine dominant follicle selection. 46th Annual Meeting of SSR, Montreal Canada, July 22-26. (Abstr.).
- Gupta, P. S. P., J. K. Folger, S. Rajput, L. Lv, J. Yao, J. J. Ireland, and G. W. Smith. 2013. Regulation and regulatory role of WNT signaling in potentiating FSH action during bovine dominant follicle selection. 4th Annual meeting of MI Alliance for Reproductive Technologies and Science (MARTS), Ann Arbor, MI, May 10. (Abstr.).
- Jimenez-Krassel, F., A. M. Wilson-Alvarado, G. W. Smith, J. L. H. Ireland, and J. J. Ireland. 2015. Impact of long-term treatment with Acyline, a GnRH receptor antagonist, on gonadotropin secretion, follicular waves and dominant follicle development in cattle. 48th Annual Meeting of SSR, San Juan, Puerto Rico, July 18-22. (Abstr.).
- Kroll L. K., D. L. Grooms, and J. M. Siegford. 2013. Behavioral response of feedlot cattle following tail docking. Proceedings of the 46th Annual Conference of the American Association of Bovine Practitioners, Milwaukee, WI, September 19-21. pg 27. (Abstr.).
- Kroll L. K., D. L. Grooms, and J. M. Siegford. 2013. Pain and fly avoidance behavior of feedlot cattle after tail docking. Proceedings of the 23rd Annual MSU CVM Phi Zeta Research Day, East Lansing, MI, October 4. pg. 27. (Abstr.).

# **EXTENSION**

One of the MSU Beef Center's missions is to disseminate knowledge about biology and management of beef cattle. The Center regularly provides the venue and cattle for a wide range of outreach events. Recent Center outreach events are listed in Table 8.

Table 8. MSU Beef Center Extension use, 2013-2016

Date	Outreach Events and Activities
01/26/13	Ingham County 4-H, Cattle Weigh-In
02/17/13	Michigan Junior Livestock Association, Annual Meeting
03/18/13	Michigan 4-H, Capitol Experience Program
04/19/13	4-H/FFA, Carcass Judging Contest
04/20/13	MSU CANR Student Senate, Small Animals Day
04/21/13	MSU Block & Bridle Club, Judging Contest
04/21/13	Michigan Junior Livestock Association, Meeting
04/28/13	Michigan Junior Angus Association, Meeting
05/09/13	National Public Radio, Interview with Dan Charles on Beef Traceability Research
06/07/13	Vetward Bound, Center Tour
06/27/13	MSU Grandparents University, Educational Event
07/12/13	State 4-H/FFA Livestock, Judging Contest
07/30/13	Iowa Farm Bureau, Producer Center Tour
10/27/13	Michigan Junior Angus Association, Meeting
03/05/14	FFA, Center Tour
03/06/14	FFA, Center Tour
03/22/14	Byron Center Meats, Customer Tour & Education Day
04/12/14	MSU CANR Student Senate, Small Animals Day
05/14/14	Certified Angus Beef, Chef Course
05/21/14	ANS/FSHN, Veterans Meat Course
06/10/14	Capitol Area Professional Chef's And Cooks, Meeting, Tour, & Education
06/19/14	4-H, Exploration Days
06/19/14	CVM, Vet-Ward Bound
06/26/14	Grandparents University, Education Event
11/03/14	NDSAI Asian Veterinary Shortcourse, Education Event
11/22/14	2014 Intercollegiate Animal Welfare Judging/Assessment Contest
12/03/14	Dr. Masatoshi Matsuzaki, Hirosaki Univ. Japan, Tour
02/21/15	Ingham County 4-H, Weigh-In
03/05/15	Quebec Feedlot Producers, Producer Tour

Date	Outreach Events and Activities
03/11/15	Clinton Co. FFA Students, Tour
03/12/15	FFA, Tour
03/12/15	Agriking, Research Tour
04/18/15	MSU CANR Student Senate, Small Animals Day
05/20/15	Certified Angus Beef / Sysco-Detroit Beef Course
06/25/15	4-H Exploration Days - Marketing Tour
06/25/15	Vetward Bound
08/01/15	Diversity Program
08/11/15	4-H Judging Team
08/20/15	Certified Angus Beef/Sysco Detroit
09/24/15	Veterinary Tech - BCS & handling lab
09/30/15	Gabrielle Simon – Animal welfare photo collection, MS at UC, Davis
10/14/15	MSU Extension – Farm to Fork workshop
04/17/16	Michigan Shorthorn Breeders Assoc. Board Meeting
05/25/16	Certified Angus Beef/Sysco Detroit
06/15/16	Certified Angus Beef/Sysco Detroit
06/22/16	Vetward Bound
06/23/16	4-H Exploration Days - Marketing Livestock Session
06/24/16	Multicultural Apprenticeship Program
06/30/16	Grandparents University
07/25/16	Diversity Program
08/04/16	Animal Training - DNR
08/17/16	MSU Extension - Animal Control Officer Training

# **CENTER SUPPORT**

Annual operating expenses of the MSU Beef Center are approximately \$1.2 million. Because of the Center's unique missions, about one-tenth of the annual operating expenses are provided through the Department of Animal Science (General Fund and AgBioResearch funding lines) to support the three, full-time staff salaries. In all other ways, the Center is financially similar to private beef operations, in that cattle proceeds must cover operating costs.

The Beef Education Endowment Fund (BEEF) directly enhances support for the excellent educational opportunities afforded to students at the Beef Center. The endowment, initiated by our partners, the Michigan Cattlemen's Assoc., provides a sustained source of funds to be used to support the educational missions of the Center. Investment income generated by the fund helps to ensure our combined effort of developing future beef industry leadership. For more details see: spartanbeef.com/support.

# BRIEF HISTORY



Michigan Agricultural College (MAC) was chartered as the pioneer land grant university in the

U.S. Beef cattle have been part of the classroom instruction since the founding of MAC in 1855. The established tradition of providing high quality instruction in beef cow/calf management has included Galloway (1866), Devon and Shorthorn (ca. 1872), Hereford (1885), Angus (1909), and most recently, Simmental cattle. Over time, the MSU beef barns have been in three different



Figure 9. Cattle outside of what is now Cook Hall, 1901.

locations on campus. Originally the barns were near Agriculture Hall, north of the Red Cedar River. In the early 1930's, new barns were built near Shaw Lane. In 1953, the "Beef Barn" was moved by cutting it into sections and moving it on wagons and then reassembling it at its present location. The feedlot facility was built in 1964 from legislative appropriations and donations from the Michigan agricultural industry.

## **MSU Angus Herd History**

The foundation Angus at MAC were purchased from the James Bowman "Elm Park" herd at Guelph, Ontario in 1909. Descendants of the Pride and Rosebud cow families remained in the MSU herd until the early 1970's. During the first 50 years, bulls that were linebred to *Earl Marshall* or *Black Bardolier* were used extensively in the herd. Bulls such as *Black Bardolier of White Gates 3<sup>rd</sup>* and *0. Bardoliermere 32<sup>nd</sup>* left their mark. In 1967-1968, Harlan Ritchie, Ron Nelson, Byron Good and Larry Cotton embarked on a mission to find outcross genetics. The arrival of *Atlas Marshall, Megaton of Wye*, plus bulls from Erdmann Ranches- "*Big John*", "*Little John*" and "*Pipeline*" signaled the emergence of MSU as a dominant force in the Angus industry. Later, *Freestate of Wye* was purchased. The addition of females from Erdmanns, Graham and Appleland enabled the staff to replace the cow herd with new genetics. At



Figure 10. MSU show cattle, 1922.

the 1972 All American Angus Futurity, MSU exhibited the Grand Champion Female, Supreme Champion, Intermediate Champion Bull and Best Six Head. In 1975, MSU exhibited the last International Grand Champion Angus Female and in 1976, MSU exhibited the Grand Champion Angus Bull at the National Western Stock Show in Denver. A more complete history of the first century of Angus cattle at MSU can be found at: spartanbeef.com/seedstock

# "The secret of change is to focus all your energy, not on fighting the old, but on building the new"

-Author & Lecturer, Dan Millman



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