Using Genetic Evaluation Data

Making sense of the numbers

Agenda

- ADGA Genetics Overview
- Basic Concepts
  - Genetic Production and Type Evaluations
  - Predicted Transmitting Ability (PTA)
    - Reliability
    - Confidence interval
    - MFP$, Percentile and Elite
  - Production Type Index (PTI)
  - Estimated Transmitting Ability (ETA)
  - Superior Genetics
- ADGA Genetics Tools
  - PTI/ETA Index Search
  - Production Evaluation Search
  - Type Evaluation Search
- Practical Application / Tips and Tricks
- Questions?

ADGA Genetics Overview

- History
  - 2001 First release
  - 2005 Cooperative agreement with ADGA
  - 2007 Second release, complete rewrite
  - Continuous improvement
- What is ADGA Genetics?
  - Utility for presentation of genetic evaluation data and ADGA registry/genetic information
  - Tools to help make informed breeding decisions

Basic Concepts – USDA Evaluations

- What data is used?
  - Production records from DHI
  - Linear Appraisal and pedigree records from ADGA
- Complex processing ("Animal Model") is applied to arrive at a relative genetic merit for various traits
- Production Evaluation
  - Done twice a year (approx. August and December)
  - Traits include PTA of yield, fat, fat% , protein and protein%
- Type Evaluation
  - Done once a year after Linear Appraisal is complete
  - Traits include PTA of 13 linear traits and Final Score

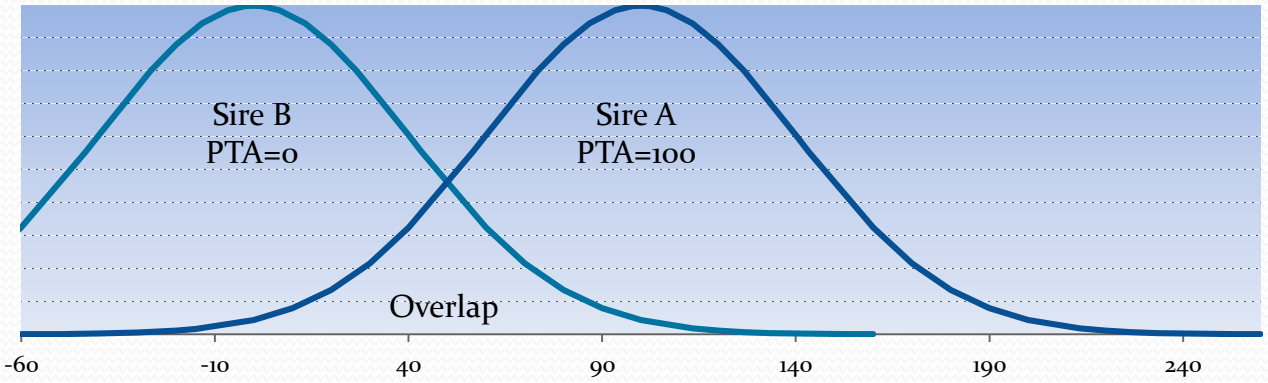
Basic Concepts – PTA (Predicted Transmitting Ability)

- PTA is the average genetic value for a certain trait that an animal transmits to its offspring
- This may be calculated with a certain degree of confidence (called Reliability)
- Three sources of information for a specific trait are used in this calculation:
  - The genetic merit of the parents and relatives
  - Performance of the animal itself (when applicable)
  - The progeny of an individual
- PTA = 0 is given to animals at the average genetic merit for a specific trait

Basic Concepts – PTA (Predicted Transmitting Ability)

- PTA of a sire is an average number, the best estimate of the sire's genetic merit.
- Genetic value and performance of progeny contains a certain degree of unpredictability
- Chance determines genes contributed at the time of mating
- Mating two animals of high genetic merit **does not** guarantee progeny will be above average
- PTAs can change over time as more data becomes available for the calculation
- PTA trends in an evaluation history can be used to visualize the direction a trait is moving

Basic Concepts – PTA (Predicted Transmitting Ability)



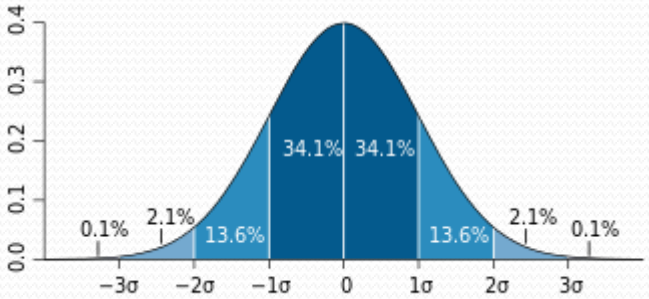
- With a normal distribution there may be overlap between the offspring these two animals
- Although Sire A's offspring are more likely to be above average, there will be some that will be below the average of Sire B

Basic Concepts – Reliability

- Reliability is the degree of confidence in a PTA estimate and is based on:
  - The reliability of the PTA of the parents and other relatives
  - The number of records (lactations, appraisals)
  - The number of herds in which the daughters are located for sire PTAs
- Sires with low Reliability involve greater risk but also greater opportunity
- Sires with high Reliability offer more of a known quantity

Basic Concepts – Confidence Interval

- Confidence Interval is the range of PTA values for a given trait that 68% of offspring are expected to fall into.



- Calculated from the PTA and the genetic standard deviation for a trait
- Basically:
  - Low Reliability means a larger confidence interval (more uncertainty)
  - High Reliability means a smaller confidence interval (more certainty)
- Example (PTA 100, STDEV 25):
  - If Reliability = 25%, Confidence Interval will be 100 ± 22
  - If Reliability = 50%, Confidence Interval will be 100 ± 18
  - If Reliability = 99%, Confidence Interval will be 100 ± 2.5

Basic Concepts - Percentile

- MFP$ is an indicator of economic value and is calculated using the formula:

  MFP$ = $.031 (PTA milk) + $.80 (PTA fat) + $2.00 (PTA protein)

- Factors are updated every 5 years at base change
- Percentile rankings are based on MFP$
- High ranking bucks and does are designated as Elite
  - Bucks must be in the top 15% and have daughters born within the last 4 years
  - Does must be in the top 5% and have kidded in the last 2 years and still be alive

Basic Concepts – PTI Production Type Index

- An artificial index calculated from production and type evaluations to help identify genetically promising animals
  - Production component uses PTA of Fat Corrected Milk (FCM)
  - Type uses PTA of the Linear Appraisal Final Score
- There are two flavors:
  - PTI 2:1 production has twice the weight as type
  - PTI 1:2 type has twice the weight as production
- Caveat:
  - The type component of this index uses Final Score, a non-linear and semi-subjective trait.

Basic Concepts – ETA Estimated Transmitting Ability

- Artificial index based on PTIs of Sire and Dam (or Dam's Sire). PTIs must be present for ETA to be calculated.
- Is an estimate of transmission of genetic merit to offspring
- Can be calculated for a planned breeding and can be used to identify young sires with high genetic potential
- There are two flavors:
  - ETA 2:1 production has twice the weight as type
  - ETA 1:2 type has twice the weight as production

Basic Concepts – Superior Genetics

- Superior Genetics (SG) is an ADGA award program
- The SG designation is given to the top 15% based on PTI values
  - Based on total number of animals by breed and gender that have PTI values
- SG awards are given twice a year, after evaluations are released and PTIs recalculated
- Once awarded, it becomes permanent even if the animal falls below the 15% cutoff

ADGA Genetics Tools PTI/ETA Search

- Good starting point for a general search
- Many filtering and ordering options
- Can view PTI and ETA values on one page
- Can drill down into individual animal details
- Direct Link:
  - http://adgagenetics.org/IndexSearch.aspx

ADGA Genetics Tools
PTI/ETA Search Results - Buck

Name	SG	On File	Registration#	Herdbook	DOB	PTI21	PTI12	ETA21	ETA12
ARTEMISIA ALPS YUKON	SG	NA	A000695666	AM	1987.02.12	247	307	104	139
SHAHENA'KO CROWN ROYAL	SG	NA	A000635453	AM	1985.03.27	237	256	42	104
LUIZ'S PHROSTY PHRISBEE	SGCH	NA	A000702455	AM	1987.03.15	179	181		
MT-ZION SAKE CHILD HAROLD	SG	C	A000987769	AM	1995.05.10	156	181	77	91
CAPRIHERB SMP KENNEBECK	SG	C	A000787935	AM	1989.01.25	145	187		
LEAP'N-LEABO ARIES HAIL	SG	C	A001180723	PB	2000.05.21	141	139	61	43
SUNSHINE SEIGN SEDRIC	SG	C	A001085273	PB	1998.02.03	139	138	78	96
SODIUM OAKS FANTASTIC VALLEJO	SG	NA	A180571503	AM	1984.02.07	138	149		
MUNCHIN HILL NAPOLEON	SGCH	NA	A000795524	PB	1990.03.17	138	206	21	74
SUNSHINE REHMA RELENT	SG	C	A001096362	PB	1998.04.05	135	148	61	76
HAMMERICH'S RISK'S ZACHARY	SG	C	A000741508	AM	1988.03.12	131	157	14	48
SHAHENA'KO S WILD APACHE	SGCH	C	A000627318	AM	1985.03.15	130	225		
IROQUOIS-KC SASIN CHE-THE	SG	C	A000898012	AM	1993.03.27	130	99	90	68
TROUBLESOME JEOPARDY	SG	C	A000849127	AM	1991.04.04	130	99	19	67
VAN WYK ACRES WEEJUN	SG	NA	A000776088	AM	1989.02.21	127	212	35	127
PINEPOLE-ACRES MR DANDY	SG	C	A000999087	AM	1995.04.04	126	155	-16	16
SUNSHINE SEIGN SERAFIN	SG	C	A001117651	PB	1999.02.14	125	131	79	109
SWEET DREAMS ORIGINAL SIN	SG	NA	A000788242	AM	1989.05.07	125	143	32	57
THREE-RINGS LEONIDES	SG	NA	A001250661	AM	2002.12.25	124	85	64	10
REDWOOD HILLS SEQUOIA	SG	C	A001061794	AM	1997.05.01	123	153	3	27

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ADGA Genetics Tools Production Search

- Emphasis on production
- Separate searches for bucks and does
- Many filtering and ordering options
- Can view all production related PTAs and other data on one page
- Can drill down to individual animal details
- Direct Link:
  - http://adgagenetics.org/ProductionSearch.aspx (bucks)
  - http://adgagenetics.org/ProductionSearchDoe.aspx (does)

ADGA Genetics Tools
Production Search Results - Buck

Name	SG	Reg#	Herdbook	Breed	Herds	Daus	Lacts	Milk	Fat	Fat%	Prot	Prot%	Rel	Pctile	PTI21	PTI12	ETA21	ETA12
SODIUM OAKS SASIN	SG	A000472503	AM	A	59	151	400	19	3.7	0.13	-1.8	-0.11	97	59	100	153		
NIXON'S RANCHMAN		A000436494	PB	A	41	75	153	-77	-0.5	0.11	2.0	0.20	95	0	-34	-40		
REDWOOD HILLS SUNSHINE REVERIE		A000436095	PB	A	67	112	273	-92	-6.4	-0.14	-2.4	0.01	94	25	-67	-33		
SUNSHINE STELLA'S STRIKE		A000273493	PB	A	33	68	178	3	-0.5	-0.03	1.2	0.05	93	67	-26	-47		
NEW ERA'S KANE	SGCH	A000604582	PB	A	31	65	159	-89	-7.0	-0.17	-4.6	-0.09	93	12	-9	87	-109	-32
SUNSHINE ROBELTA'S ROSCOE		A000210206	PB	A	26	49	129	-65	-7.3	-0.23	-3.7	-0.08	93	0	-14	73		
REDWOOD HILLS MARVELOUS PROFET		A000377787	PB	A	34	78	191	-12	-3.1	-0.13	-0.8	-0.03	93	0	-10	18		
SODIUM OAKS ROYAL RISK	SGCH	A000420754	AM	A	31	56	149	28	1.4	0.01	-3.4	-0.19	92	40	123	222	-55	-4
QU'APPELLE JOI ACCLAIM	SGCH	A000465825	PB	A	36	69	193	-198	-3.8	0.17	-2.4	0.18	92	29	-15	73		
REDWOOD HILLS ACCLAIM MYSTIC	SG	A000566345	PB	A	19	34	72	-250	-6.0	0.17	-4.8	0.14	92	10	-11	120		
SUNSHINE ROBELTA ROMMEL		A000239597	PB	A	24	75	202	-23	-3.8	-0.14	-1.2	-0.03	92	0	5	60		
CHATEAU DE VILLE'S GYRFALCON	SG	A000653394	PB	A	23	43	78	-24	4.5	0.24	1.9	0.12	91	82	67	91		
NIXON'S JOI HUCKSTER	SG	A000207392	PB	A	20	52	126	-192	-2.2	0.24	-4.4	0.07	91	0	6	95		
REDWOOD HILLS PSYCHIC		A000455719	PB	A	30	53	96	-183	-1.7	0.25	-5.3	0.01	90	0	-26	21		
REDWOOD HILLS ACLAIM PENDRAGON	SG	A000566344	PB	A	26	41	94	-135	-3.9	0.05	-1.5	0.12	90	0	51	186		
RAINTREE BF SKY PILOT		A000372132	PB	A	28	44	84	-159	-8.0	-0.10	-3.1	0.08	89	16	-115	-92		
SHAHENA'KO SUMO TIERRO	SGCH	A000735126	AM	A	25	59	130	12	3.6	0.14	-0.3	-0.03	88	70	98	152	36	55
SUNSHINE REBELTA'S MAJSETYK		A000234811	PB	A	33	61	124	-390	-11.1	0.19	-9.9	0.11	88	1	-77	87		
SERENDIPITY'S BRUISER		A000407958	PB	A	25	35	73	-197	-14.2	-0.34	-8.0	-0.10	88	0	-85	49		
TANGLEROOT RISING SUN		A000663711	PB	A	14	121	387	148	6.0	0.02	7.2	0.11	87	95	37	-39	-52	-49

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ADGA Genetics Tools
Type Search

- Emphasis on type
- Separate searches for bucks and does
- Many filtering and ordering options
- Can view all type related PTAs, ETAs and other data on one page
- Can drill down to individual animal details
- Direct Link:
  - http://adgagenetics.org/TypeSearch.aspx (bucks)
  - http://adgagenetics.org/TypeSearchDoe.aspx (does)

ADGA Genetics Tools
Type Search Results - Buck

Name	SG	Reg#	Herdbook	BirthDate	States	Herds	Daus	Appraisals	FSAvg	PTA	Rel	PTI21	PTI12	ETA21	ETA12
SODIUM OAKS SASIN	SG	A000472503	AM	1982.03.09	12	48	93	164	84.8	0.9	95	85	169		
NIXON'S RANCHMAN		A000436494	PB	1981.03.17	9	33	62	95	84.0	-0.2	93	-50	-53		
REDWOOD HILLS SUNSHINE REVERIE	GCH	A000436095	PB	1981.04.08	10	45	63	98	84.1	0.1	90	-57	-14		
NEW ERA'S KANE	SGCH	A000604582	PB	1984.06.09	11	25	49	94	84.8	0.9	90	14	133	-56	-42
SWEET DREAMS GOLDEN BOY	SG	A000817863	PB	1990.03.09	5	9	58	100	84.5	0.5	89	43	92	3	-41
NODAWAY SORCERER VISIONARY		A000763639	PB	1989.04.06	6	13	56	82	82.8	-0.5	88	-60	-100	17	9
REDWOOD HILLS MARVELOUS PROFET	GCH	A000377787	PB	1980.02.24	7	22	31	52	84.5	0.2	88	-18	19		
WALNUT-FORK XE KHARTOUM	SG	A001178699	AM	2000.03.29	3	9	58	101	86.4	0.8	88	49	136	34	38
SHAHENA'KO SUMO TIERRO	SGCH	A000735126	AM	1988.03.13	12	32	49	88	85.9	0.8	88	79	152	60	41
NODAWAY MD AYLA'S ARIES	SG	A000919627	PB	1993.03.24	3	4	45	99	85.7	0.2	87	68	62		
WAIILATPU GOLIATH'S ULYSSES		A001063847	AM	1997.03.13	1	1	57	97	85.4	0.3	87	-14	35	-40	-62
NODAWAY MYSTICAL SORCERER	SG	A000600592	PB	1984.04.16	8	12	39	95	85.3	0.5	87	-22	59	-34	19
REDWOOD HILLS ACCLAIM MYSTIC	SG	A000566345	PB	1983.05.08	2	11	24	41	85.7	1.1	87	13	161		
SODIUM OAKS ROYAL RISK	SGCH	A000420754	AM	1981.02.13	4	15	20	35	86.5	1.4	87	122	257	-10	-8
SUNSHINE CONIT SCHWARZEE	SG	A000877650	PB	1992.04.24	4	6	52	90	85.2	0.7	87	72	134	49	60
TANGLEROOT ROYAL IMAGE	SGCH	A000811451	AM	1990.03.03	7	25	41	71	85.6	0.9	86	88	170	74	65
SODIUM OAKS WAMPUM	SG	A000627203	AM	1985.02.18	3	15	50	78	83.3	1.0	86	62	171		
SUNSHINE REHMA REVIVE	SG	A001009902	PB	1996.04.04	4	6	45	73	85.6	0.5	86	38	89	12	-36
PLEASANT-GROVE SUPER STANDOUT		A001259013	PB	2003.03.01	2	3	52	87	88.1	0.4	86				
QU'APPELLE JOI ACCLAIM	SGCH	A000465825	PB	1981.03.25	9	18	29	55	84.5	0.8	85	6	115		

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ADGA Genetics Tools
Buck Production Evaluation History

Production Evaluation For: TEMPO AQUILA FREELANCE - A001271542 (AM Buck SG)

Production Parameter	Value
SG	SG
Registry	AM
Herds	19
Daughters	67
Lactations	160
Milk PTA	42
Fat PTA	0.5
Fat % PTA	-0.05
Protein PTA	0.6
Protein % PTA	-0.03
Reliability	90
Percentile Rank	80

Evaluation History for: TEMPO AQUILA FREELANCE - A001271542 (AM Buck SG)

Year	Breed	Herds	Daus	Lacts	Rel	Milk	Fat	Fat%	Prot	Prot%	Pctile
2007	A	1	5	7	46	83	4.7	0.06	2.2	-0.02	0
2008	A	1	17	22	52	65	3.2	0.03	1.2	-0.04	0
2009	A	4	26	39	59	116	6.9	0.11	3.6	0.00	89
2010	A	4	32	56	67	95	3.4	-0.01	3.0	0.00	90
2011	A	10	45	82	76	138	3.2	-0.09	4.1	-0.01	93
2012	A	12	51	98	82	81	1.2	-0.08	1.6	-0.04	86
2013	A	16	63	126	87	15	-1.5	-0.10	-0.3	-0.04	70
2014	A	19	67	147	89	9	-0.4	-0.04	-0.6	-0.04	71
2015	A	19	67	160	90	42	0.5	-0.05	0.6	-0.03	80

ADGA Genetics Tools Type Chart

Type Evaluation For: TEMPO AQUILA FREELANCE - A001271542 (AM Buck SG)

SG	Registry	DOB	States	Herds	Daus	Appraisals	AvgFS	PTAFS	Rel
SG	AM	2003.05.13	11	21	50	102	88.5	-0.3	89

Trait	5	TraitAvg	45			PTA	REL
Stature	Short	29.6	Tall			1.9	94
Strength	Weak	28.3	Powerful			-0.5	90
Dairyness	Coarse	33.6	Sharp			1.3	89
Rump Angle	Steep	31.7	Level			1.8	91
Rump Width	Narrow	29.1	Wide			-0.8	90
Rear Legs, Side-View	Posty	27.3	Angled			-1.0	88
Fore Udder Attachment	Loose	35.7	Tight			-0.3	89
Rear Udder Height	Low	38.3	High			0.7	89
Rear Udder Arch	Narrow	29.0	Wide			-1.6	87
Udder Depth	Deep	31.9	Shallow			-0.5	89
Medial Suspensory Ligament	Weak	28.3	Strong			2.5	91
Teat Placement	Wide	22.9	Close			2.2	91
Teat Diameter	Narrow	22.7	Wide			2.3	91

- Type charts are found on the goat detail page if a type evaluation has been done
- Negative PTAs on some traits are not necessarily "bad" but reflect the biological range of a trait
- Some criteria for interpretation:
  - Breeding priority (production, show or both)
  - Daughter trait Average (for bucks)
  - Personal trait preferences
  - Reliability of PTAs

Practical Application / Tips and Tricks

- Choosing a sire for milk production
- Choosing a sire for cheese
- Choosing a sire for a specific type trait
- Using MyGenetics and Sire Compare
- Viewing actual DHI records for a doe
- Have questions or need help?
  - Choose the Help menu item on the menu bar for context sensitive help or access the Support Forum

Resources

- ADGA Genetics website
  - http://adgagenetics.org
- American Dairy Goat Association website
  - http://adga.org
- USDA Goat Evaluation Details
  - http://aipl.arsusda.gov/reference/goat/goatsfs.html
- Excellent articles by Michel A. Wattaiux
  - Basic Genetics Concepts
    - https://federated.kb.wisc.edu/images/group226/52745/de_14.en.pdf
  - Principles of Selection
    - https://federated.kb.wisc.edu/images/group226/52745/de_15.en.pdf
  - Predicted Transmitting Ability and Reliability
    - https://federated.kb.wisc.edu/images/group226/52745/de_16.en.pdf
- Interpreting Linear Type Trait STAs
  - http://www.holsteinusa.com/genetic_evaluations/ss_interpret_linear.html
- ADGA Sire Development Program
  - https://adga.org/performance-programs/sire-development-program/

Questions?