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Breeding and Recording Strategies in Small Ruminants in the U.S.A.

David Notter

Dept. of Animal & Poultry Sciences

Virginia Tech

drnotter@vt.edu

The U.S. National Sheep Improvement Program (NSIP)

- Established in 1987
- Within-flock evaluation only
- Funded by American Sheep Industry Assn.
- Some Federal and University support
- Across-flock evaluations began in 1995; VT took over all operations in 2000
- Now financed exclusively by farmers' fees

NSIP Clients

- Targhee (TA)
- Polypay (PP)
- Suffolk (SU)
- Katahdin (KT)

Big 4

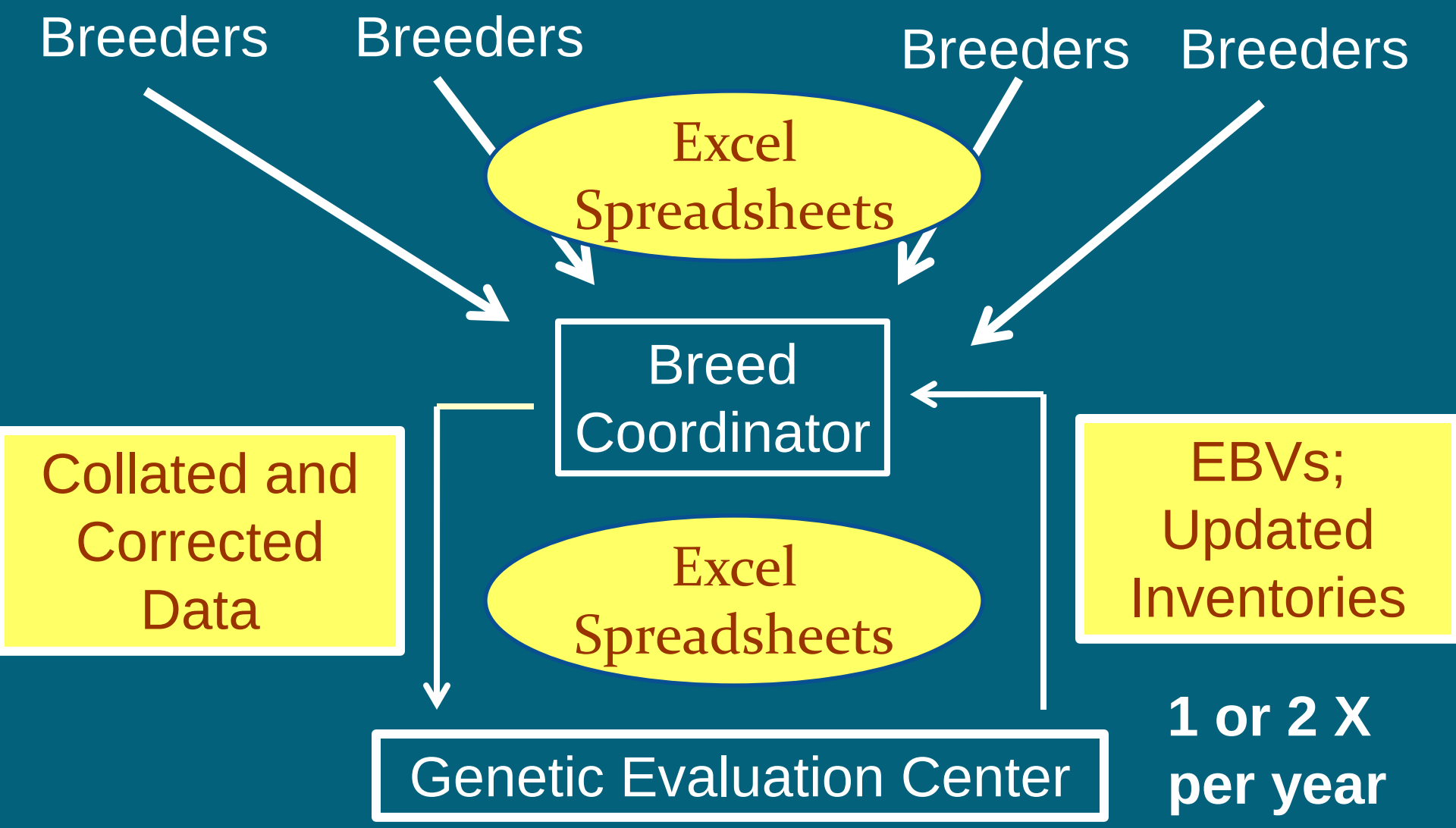
- Dorset (DO)
- Hampshire(HA)
- Columbia (CL)
- Rambouillet (RA)
- Other (Romney, Dorper, White Dorper, Coopworth, Shropshire, Blue-faced Leicester)

- Kiko Goat
- International Alpaca Community (Huacaya & Suri)

Genetic Improvement in Kiko Meat Goats

Genetic Evaluation of Fiber Traits in Alpaca

Data Management
U.S. National Sheep Improvement Program



NSIP Sheep Records

Numbers of flocks, ewes and lambs processed in 2009

Number of:		
Flocks	**Ewes**	**Lambs**
129	7,613	11,357

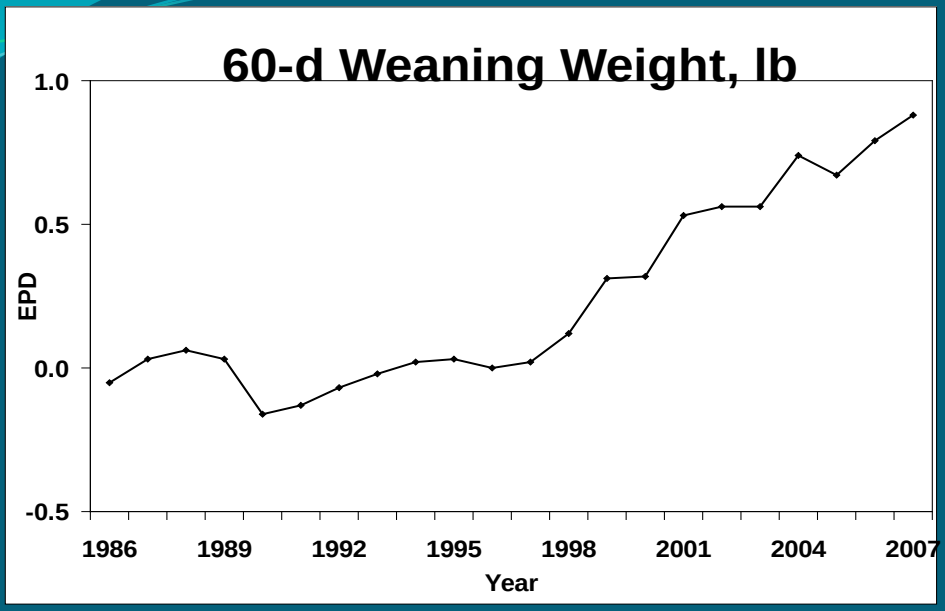
Milk Recording in Dairy Goats

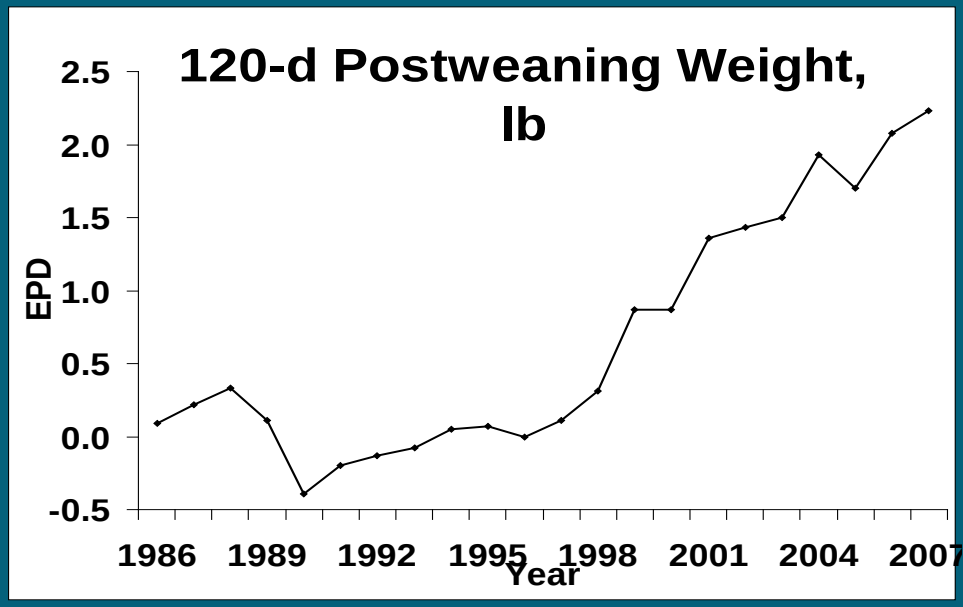
- **Done by US Dept. of Agric. Animal Improvement Programs Laboratory**
- **Standard protocols for cattle milk recording, with minor adjustments**
- **Includes an optional program for type evaluation**
- **Not yet extended to dairy sheep**

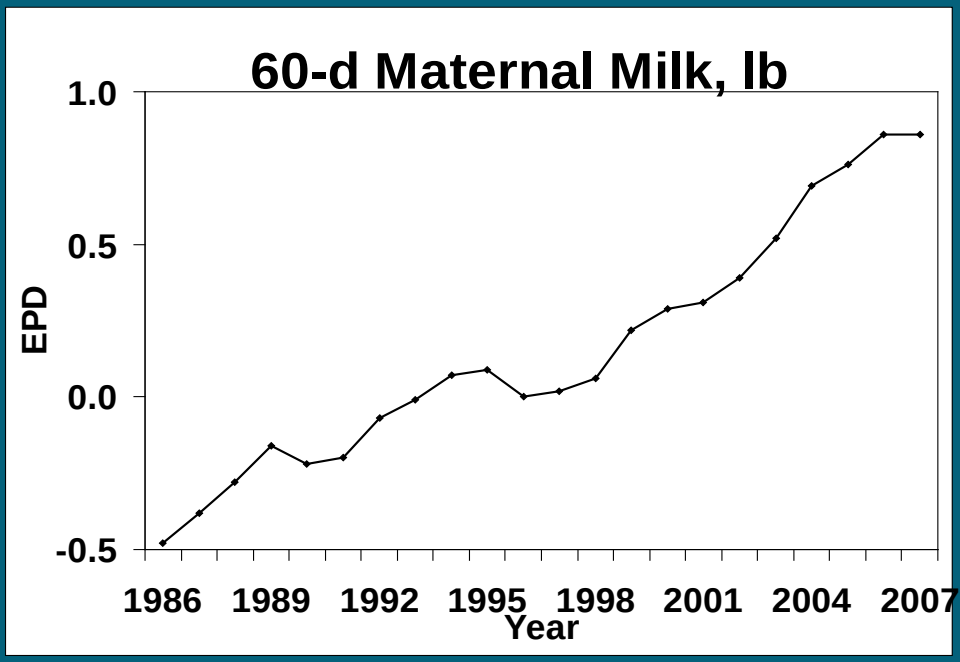
NSIP
Base Performance Records

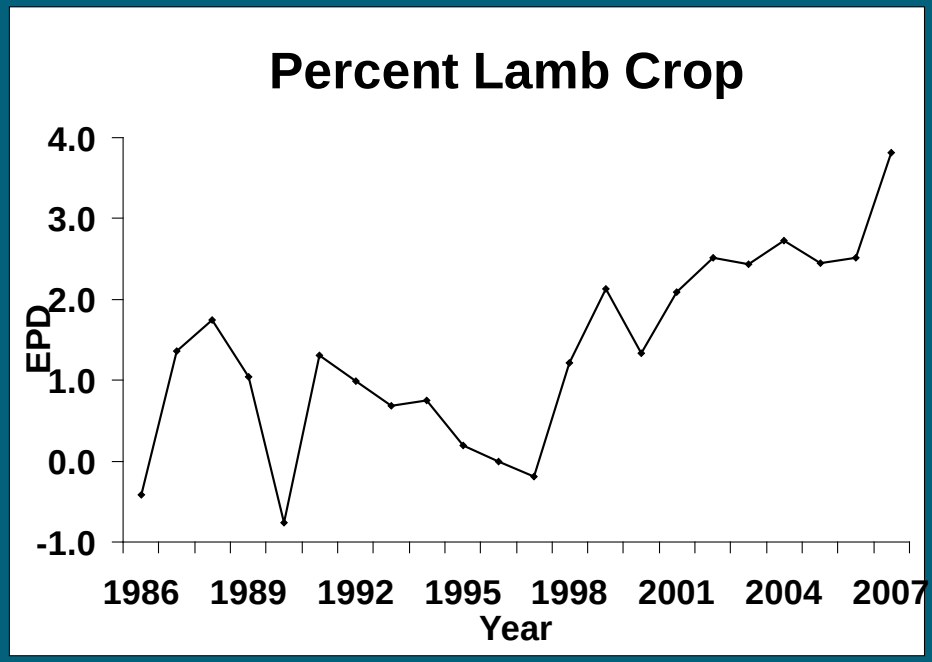
- **Number of lamb born—all breeds**
- **Weaning wt—all breeds**
- **120-d postweaning wt—farm-flock breeds (SU, PP, CL, DO, KT, HA, RO group)**
- **Yearling wt—TA, RA**
- **Fleece wt, grade and staple length—range breeds (TA, CL, RA) and RO**

Genetic Trends in Polypay Sheep









Genetic Trends in Polypay Sheep % per year

Population	Weaning Weight Trend	Maternal WWt Trend	Final Weight Trend
Polypay Sheep	0.46%	0.26%	0.66%

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Six Largest Beef Breeds	0.36%	0.18%	0.42%

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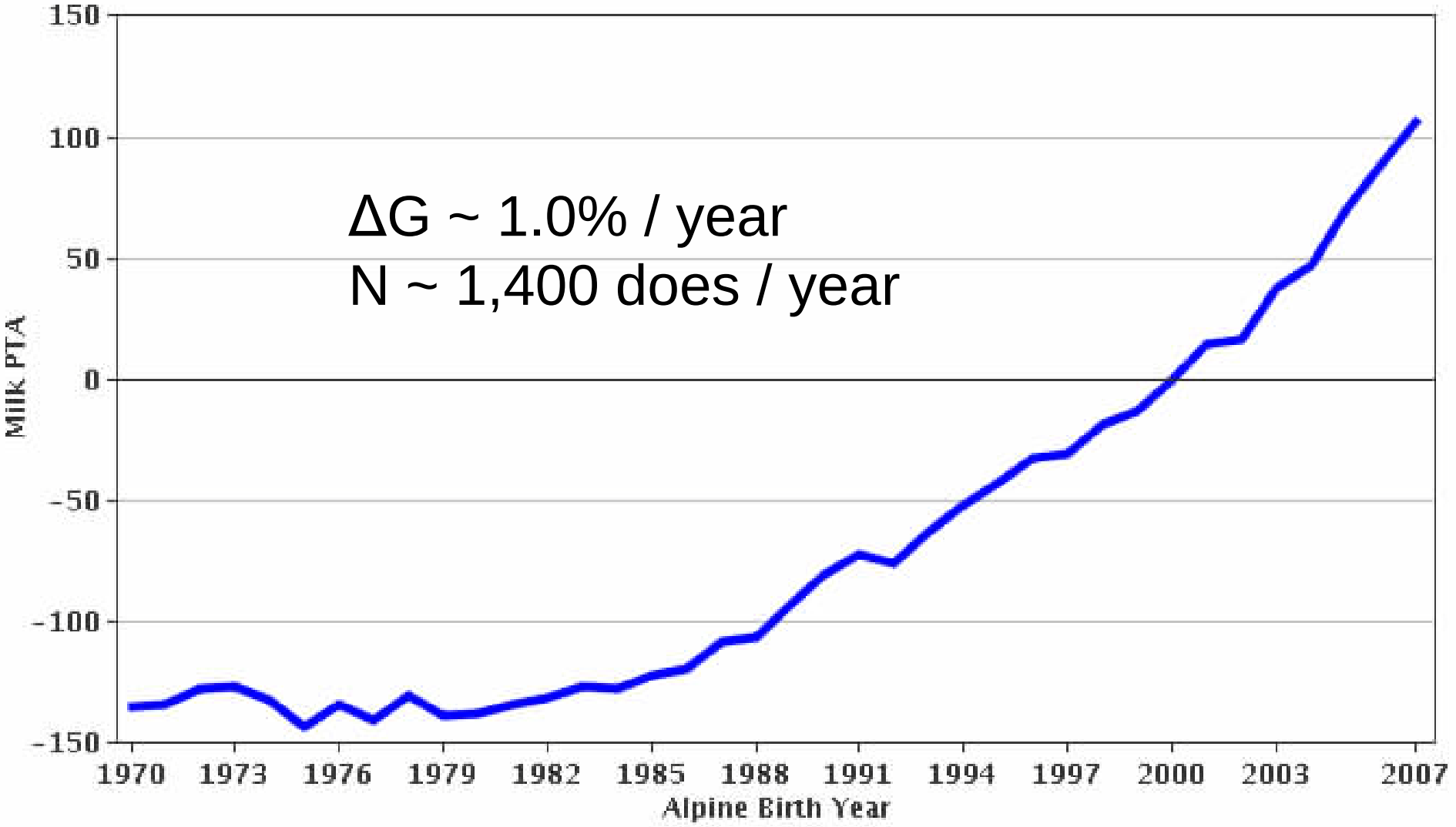
Polypay Sheep	0.46%	0.26%	0.66%
Six Largest Beef Breeds	0.36%	0.18%	0.42%
Angus Cattle	0.52%	0.32%	0.60%

Genetic Trends in Milk Production in Alpine Dairy Goats



NSIP Performance Records (New trait development)

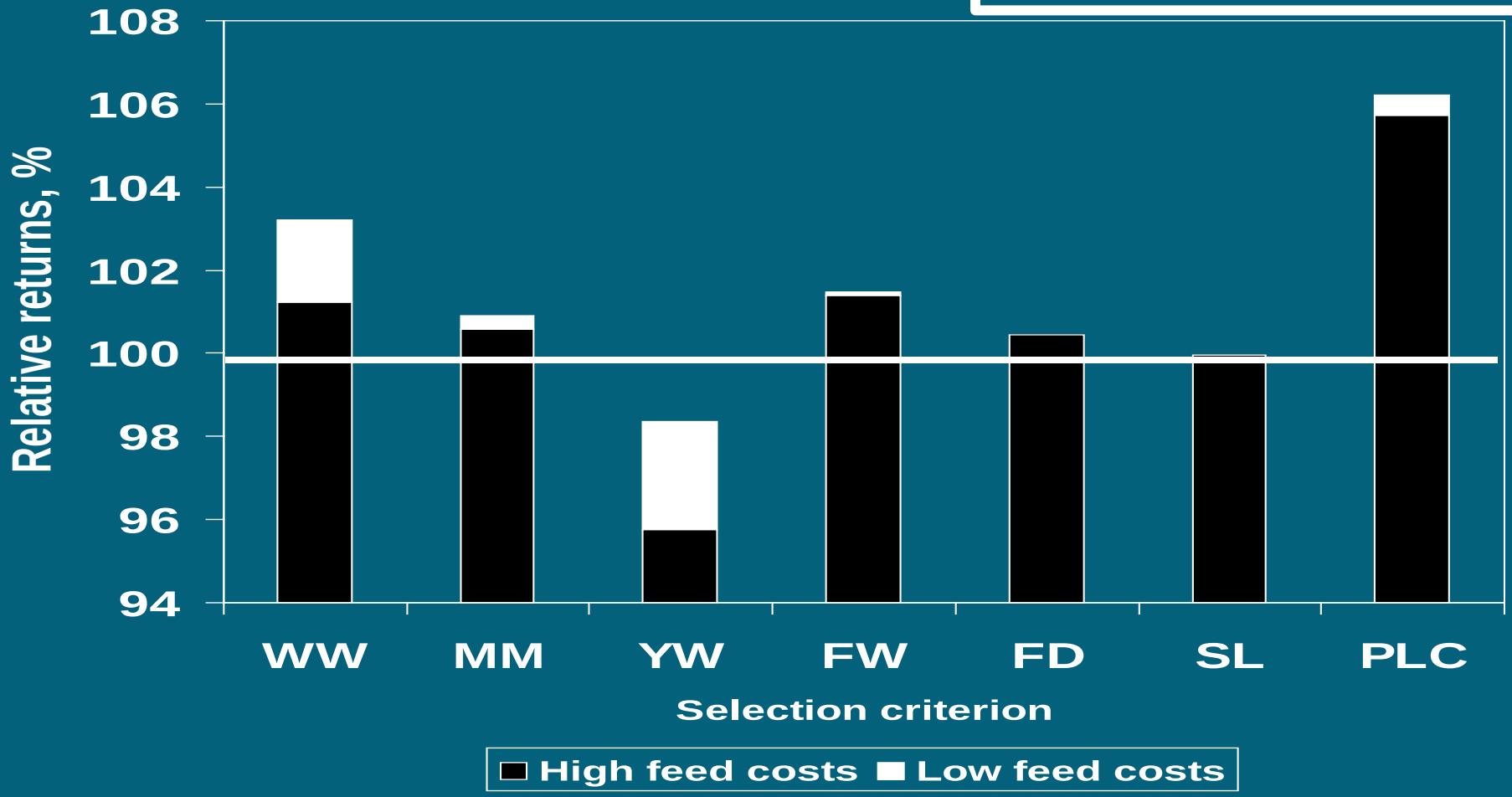
- **No. weaned (KT, PP)—r_G w/ No. born = 0.5**
- **Ewe productivity—Pounds of lamb weaned per ewe lambing (KT, PP)**
- **Western Range Selection Index (TA)**
- **Fecal Egg Count—worm resistance (KT)**
- **Ultrasonic backfat and loin-eye area (SU)**
- **Detailed annual fiber characteristics (Alpaca)**

NSIP Sheep Research and Development Projects

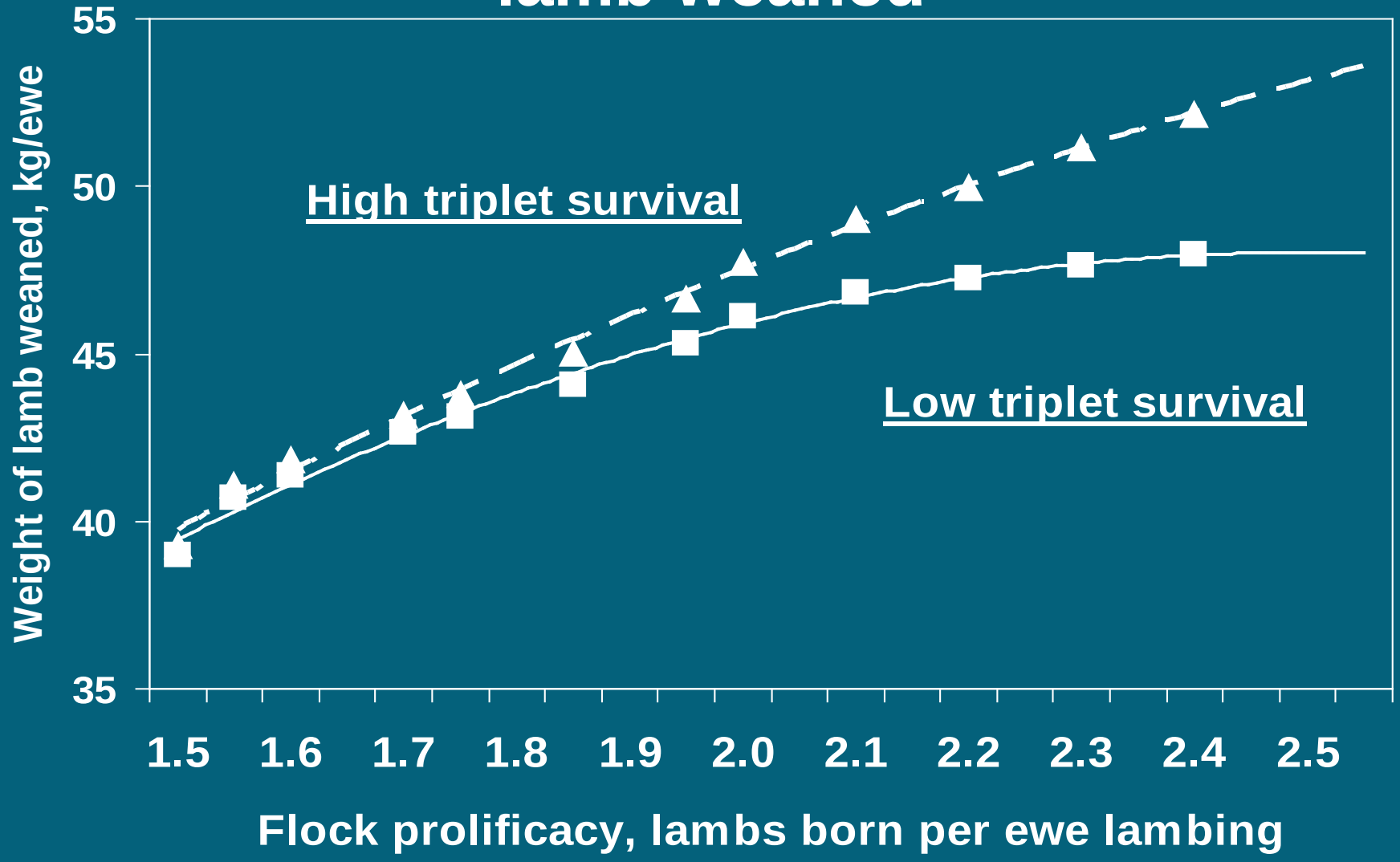
- **Breeding Objective for Targhee Sheep**
- **Development of a Fecal Egg Count EPD for Katahdin sheep**

Returns over feed costs as a percentage of the base flock in Targhee sheep

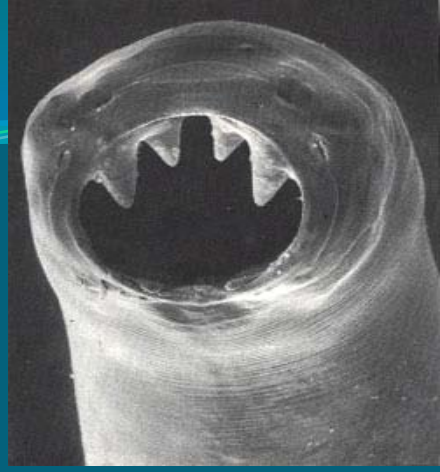
WW = weaning wt
MM = maternal WW
YW = yearling wt
FW = fleece wt
FD = ↓fiber diameter
SL = staple length
PLC = % lamb crop born



Effects of flock prolificacy on weight of lamb weaned



Fecal Egg Count EPDs for Katahdin sheep



- Increasing concern about resistance to anthelmintics in intestinal roundworms
- Heritabilities of FEC and PCV have been shown to be substantial
- Few important genetic antagonisms with production traits
- Programs are already under way in several countries (e.g., NEMESIS in Australia)

Measuring parasite resistance (fecal egg counts) in Katahdin

Spring-born lambs

Monitor parasite Levels

Collect fecal samples at first deworming

Collect a fecal sample 4 to 5 wk after infection

If >10-20% dewormed, then deworm ALL lambs. Otherwise (we will) exclude recently dewormed lambs from the data

Maintain normal parasite mgmt.

Katahdin 2003-05 Fecal Egg Count EPD Study

- Six flocks; each with at least 2 sires and a minimum of 10-12 lambs per sire
- 850 lambs by 26 sires over 3 years
- Average ages of ~8 and ~22 weeks
- Heritabilities for FEC
  - 0.48 at 8 wks
  - 0.54 at 22 weeks
  - Genetic correlation of 0.50.

Katahdin 2006-08 Fecal Egg Count EPD Study

- Data from NSIP Katahdin flocks
- Three different measurement times
  - Early-season FEC (innate resistance) at 35 to 92 d
  - Mid-season FEC shortly after weaning at 65 to 127 d
  - Late-season FEC at 92 to 184 d
- Only groups with Mean FEC > 500 epg

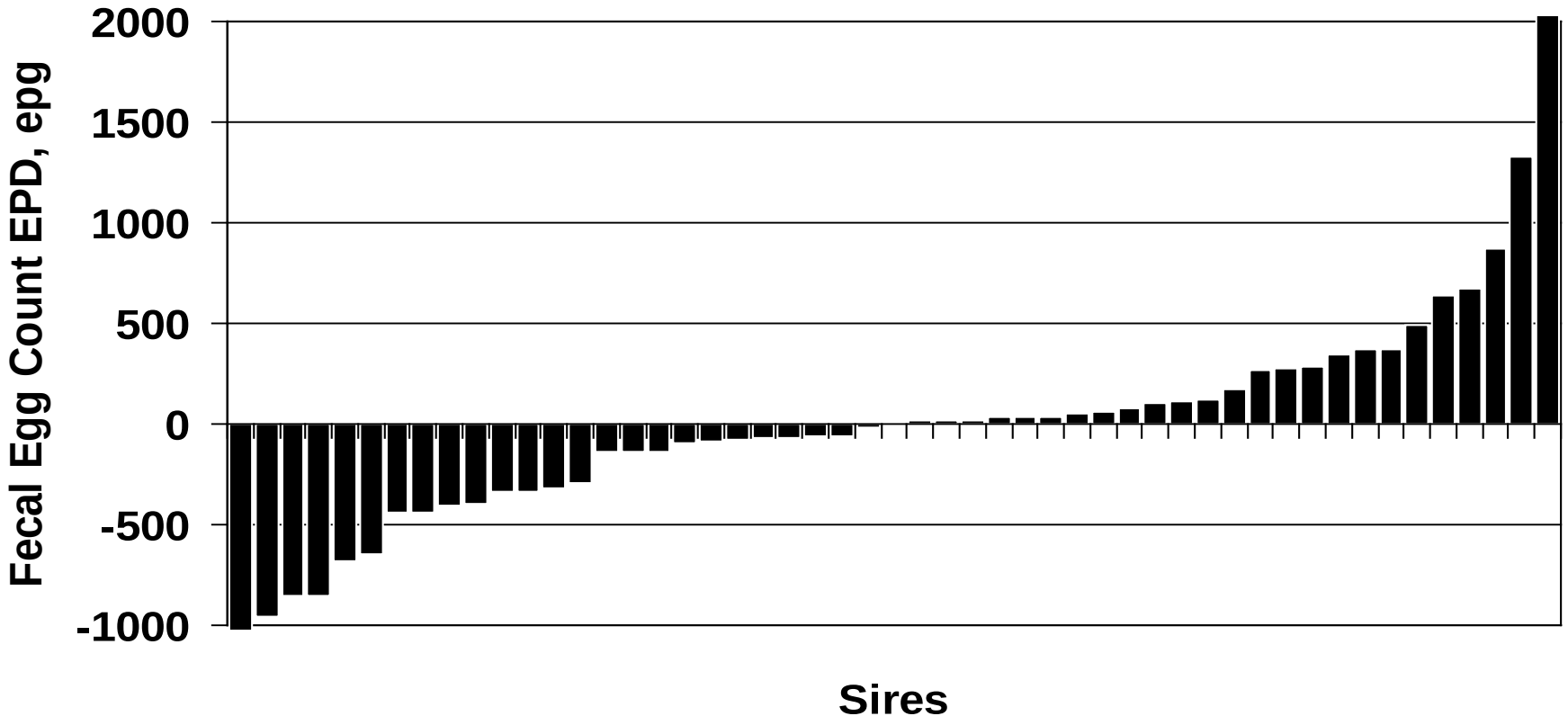
Heritability and Litter (maternal) Variance Components for High FEC Contemporary Groups

	High FEC Data		
	Early (35-92 d)	Mid- (65-127 d)	Late (92-184 d)
Heritability	0.27	0.65	0.51
Litter (Maternal)	0.34	0.11	0.29

Correlations among FEC at different ages

	High FEC Data		
	Early-Mid	Early-Late	Mid-Late
Genetic	0.85	0.76	0.99
Phenotypic	0.55	0.38	0.95

Average FEC EPDs for 51 sires with at least 10 progeny with records in High-FEC Contemporary Groups



Adjusted to a mean fecal egg count at sampling of 2,000 eggs per gram

The Future???

- Without public support, NSIP is no longer sustainable
- Cooperative agreement with LAMBPLAN—Australia will
  - Capitalize on overhead and infrastructure at LAMBPLAN
  - Direct electronic submission of records and return of EBVs
  - Retain U.S. adjustment factors, genetic parameters, and trait definitions
- Increased fees will support some U.S. research, development, and customer service as well as LAMBPLAN fees
- This is not the ONLY model—but one must have some sort of viable, sustainable model

Questions?