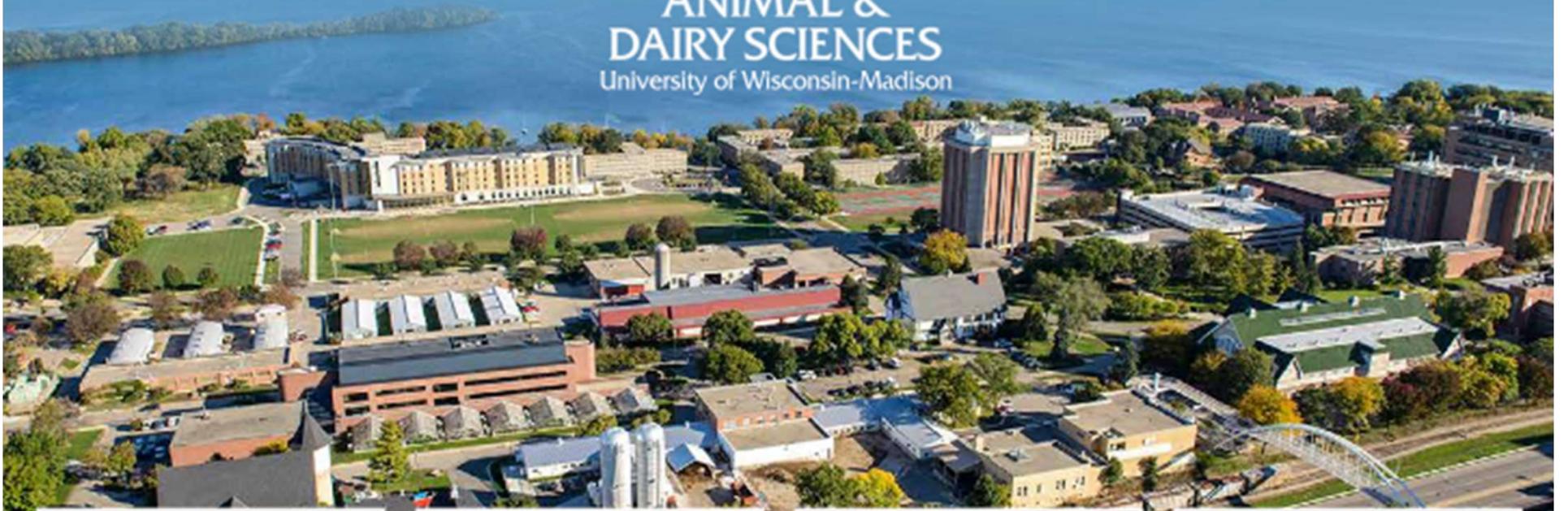




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Feed Efficiency Update & Feed Saved Trait Definition

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Introduction

- Feed is the largest single expense on most dairy farms
- Small improvements in feed efficiency are impactful
 - Financial performance (feed costs)
 - Environmental impact (manure, greenhouse gases)
 - Land utilization (growing crops, spreading manure)
- Improving the biological efficiency of feed utilization requires daily intake data for individual animals
- Measuring individual intakes is difficult and expensive



Building a Reference Population

- Initial USDA-NIFA grant (\$5M) → 5,000 cows
Genomic selection and herd management to improve feed efficiency of the dairy industry
- Subsequent CDCB-FFAR grant (\$2M) → 3,600 cows
Improving dairy feed efficiency, sustainability, and profitability by impacting farmer's breeding and culling decisions

Michigan State

Wisconsin

Iowa State

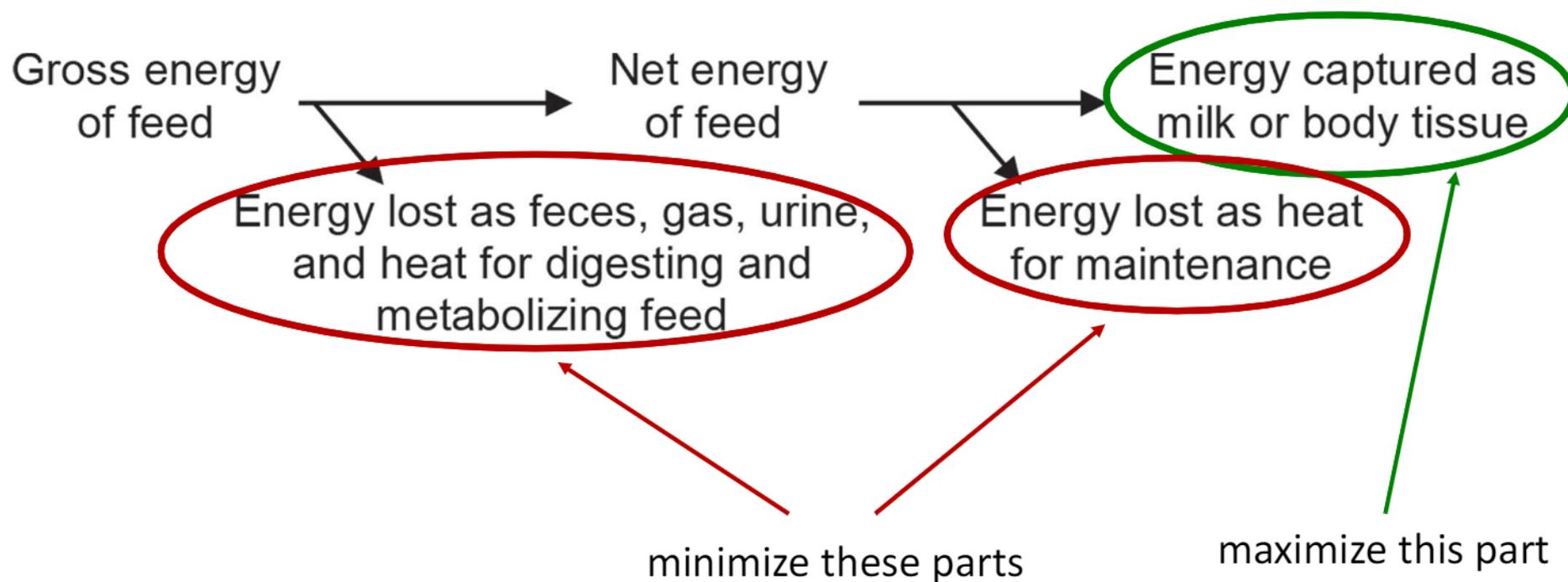
Florida

USDA-AGIL

CDCB

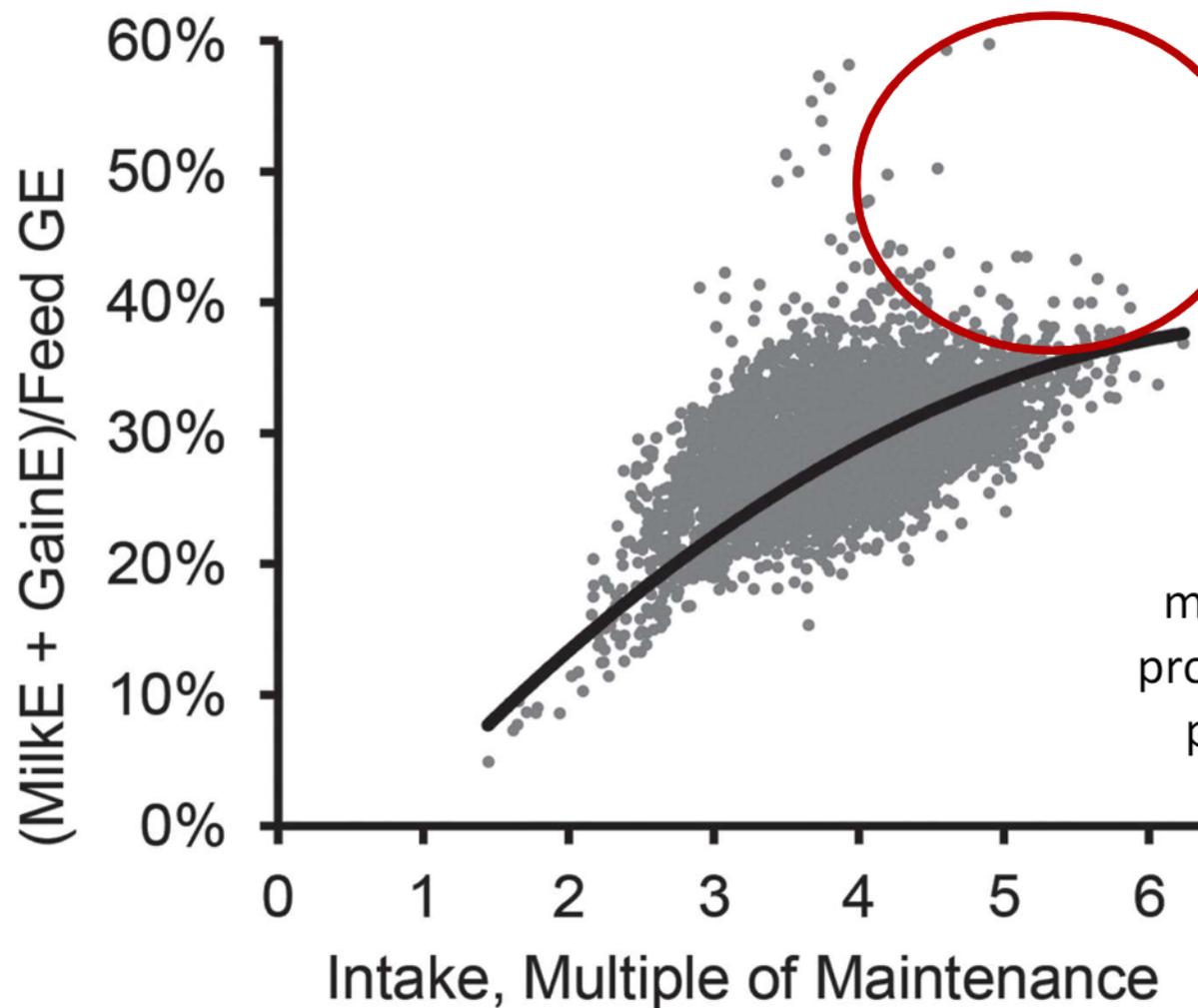


Understanding Feed Efficiency





Understanding Feed Efficiency



we want to select cows with high milk yield, low maintenance costs, and high proportion of captured energy per unit of feed consumed

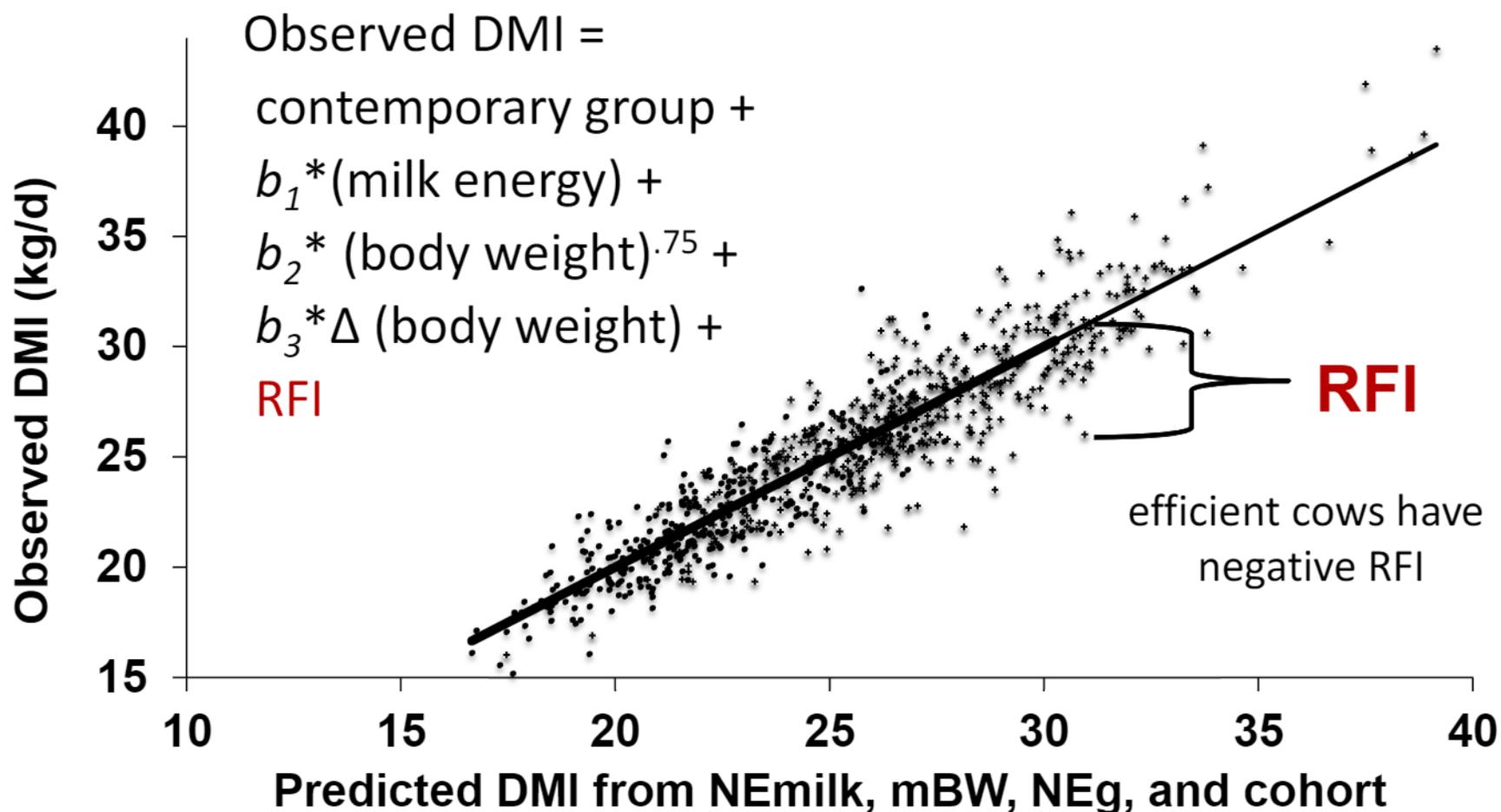


Measuring Feed Intakes

- 42-day recording period between 50 to 200 days in milk
 - dry matter intake (DMI)
 - body weight
 - body condition score
 - milk yield
 - milk composition
 - feed analysis
- Data checked for errors, missing values, etc.
- Residual feed intake (RFI) computed within research station x experiment x diet contemporary group
- Data passed to CDCB for use in genomic evaluations



Calculating Residual Feed Intake





Publishing Results

- RFI as a stand-alone trait
 - + Independent of milk yield
 - + Independent of body size
 - Interpretation can be confusing
 - Reliabilities are much lower than other key traits
- DMI as a stand-alone trait
 - + Interpretation is simple
 - + Reliabilities are higher than for RFI
 - Very strong positive correlation with milk yield PTA



Publishing Results

- Feed Saved
 - + Interpretation is relatively simple
 - + Captures energy wasted due to biological inefficiency
 - + Captures energy wasted due to excessive body size
 - + Reliabilities are higher than for RFI
 - Educational effort needed to explain trait definition

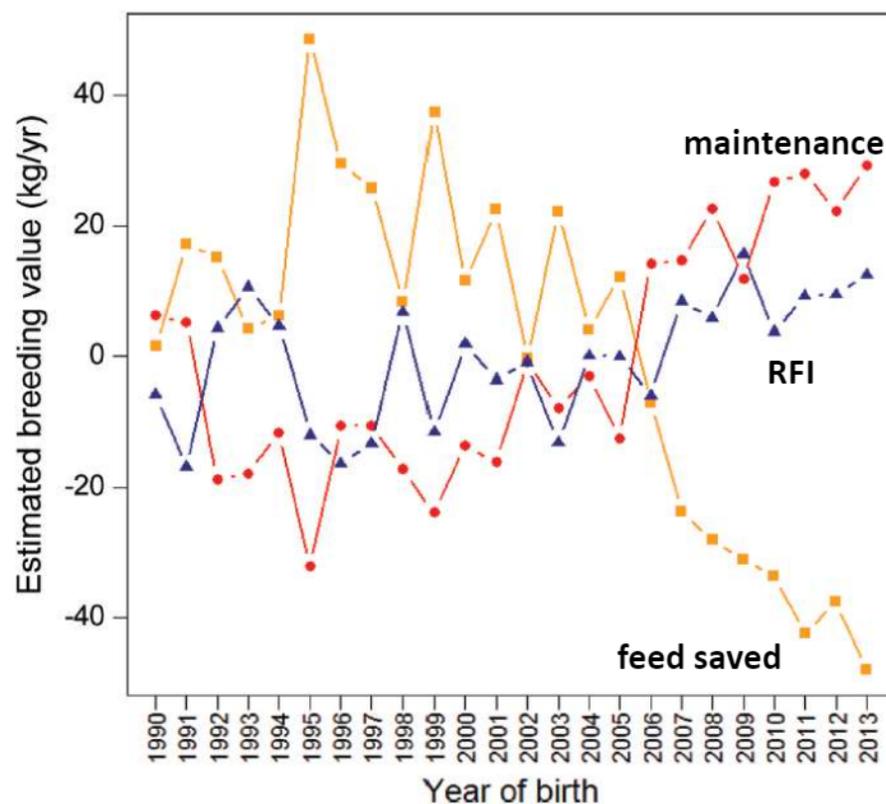


Feed Saved is an estimate of residual feed intake plus excess maintenance costs during the lactating and rearing periods, minus added salvage value



Feed Saved in Australia

- Genetic standard deviation
66 kg/year of DMI
1% of feed consumed
- Range in EBV
worst bull -285 kg/year
best bull +193 kg/year
- Average REL of 37%
- Genetic trend is unfavorable





Roadmap for the Future

- Publish Feed Saved PTAs and put in Lifetime Net Merit
- Add ~750 cows per year to U.S. reference population
- Improve reliability with data of international partners
- Develop proxies for DMI on commercial farms using wearable sensors, 3-D cameras, and AI algorithms
- Describe underlying physiology, immunology, and rumen microbiology of feed efficiency (additional energy sinks?)
- Study genotype by diet interactions for feed efficiency



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Mooving Forward.

Questions?