




Report: Feed Efficiency Symposium
 Kansas City December 14-15
 National Beef Cattle Evaluation Consortium




Report Outline

- ✓ Resource Persons and their Topics
- ✓ “Take-home” Message from each person
- ✓ <http://ansci.colostate.edu/content/view/360/>
- ✓ Future Directions




Paul Arthur--NSW Dept. of Prim. Ind.--Australia 

- ✓ Australian research experience: divergent selection for Residual Feed Intake (Actual – Predicted) in growing bulls
- ✓ Australians use “Net Feed Intake” and “Net Feed Efficiency” because they believe producers are more comfortable with “Net” than “Residual”




Paul Arthur--NSW, Australia continued

- ✓ Daily Feed Intake = $a + b_m (Wt^{0.75}) + b_g (ADG) + Res.$
- ✓ Each animal has its own Res. or RFI
 - Want animals that have negative RFI—eat less relative to their gain and size
- ✓ Heritability ~ 0.35




Paul Arthur--NSW, Australia continued

- ✓ Australians have settled on a 70-day test period—mainly to minimize measurement error in ADG and Wt rather than in feed intake
- ✓ Divergence in the high and low selection lines totals 1.25 kg/day and is fairly symmetric




Paul Arthur--NSW, Australia continued

- ✓ Australians are using serum concentration of IGF-I, measured on both heifers and bulls, as an indicator trait for RFI and calculation of EBV
- ✓ Positive genetic correlation being realized between RFI and rib fat, but not cow weight or cow condition



Gordon Carstens Texas A & M

- ✓ Described various measurements relating to efficiency of feed utilization
- ✓ Output/Input (gain/feed)
- ✓ Maintenance Efficiency (Feed for M/MBW)
- ✓ Residual Feed Intake = **RFI**
 - Actual Intake minus Predicted Intake
(regression on $Wt^{0.75}$ & ADG)




Gordon Carstens TAMU, continued

- ✓ Reviewed many data sets with RFI
 - showed independence of RFI with ADG
- ✓ Relationship of RFI with several biological measures
- ✓ RFI – cow/calf, feeding, carcasses




Denny Crews AAFC, Alberta, Canada

- ✓ Reasons to select to improve RFI
- ✓ Correction of cost of gain to reflect composition difference
- ✓ Expensive: \$150-175 per feeding space for equipment



Denny Crews Alberta, continued

- ✓ Reasonable level of variability to make change through selection
- ✓ Data collection in Lethbridge study
- ✓ EPD for Feed Intake and RFI, accounting for Wt, ADG and fatness




Denny Crews Alberta, continued

- ✓ Genetic correlation estimates of RFI with carcass traits mostly low
- ✓ Multiple-Trait Selection Index development
- ✓ Index component alternatives




David Casey PIC

- ✓ Selection in the Swine Industry
- ✓ Improvement in Gain/Feed has also been achieved without measurement of feed through lean-growth selection
- ✓ FIRE Electronic feeders--costs




David Casey PIC, continued

- ✓ Measurement and errors—strategies for getting good data
- ✓ 2 pens share the same electronics—alternate the electronics/collection weekly
- ✓ Heritability of Daily Feed Intake ~ 0.35



David Casey PIC, continued

- ✓ Selection on an index:
 - Daily Feed Intake
 - ADG
 - Backfat
 - Ribeye
- ✓ Future: Adding feeding behavior??




Jack Dekkers Iowa State

- ✓ RFI Selection Experiment – Yorkshires
- ✓ Low (or negative) RFI line and Control
- ✓ Four generations
- ✓ Heritability of RFI ~ 0.33




Jack Dekkers ISU, continued

- ✓ After 4 generations, daily feed intake adjusted for ADG, Wt, BF has been reduced 124 g/d
- ✓ INRA (France) experiment
- ✓ Heritability ~ 0.15




Charles Williams US MARC

- ✓ Modelling to predict feed intake in cattle
- ✓ Using animal performance (Wt, ADG, composition) to predict feed intake
- ✓ USMARC model (DECI) and Cornell model (CVDS)




Charles Williams US MARC

- ✓ Both models, and more so for DECI, predicted actual feed intake well from animal performance
- ✓ Thus, with predicted quite close to actual feed intake, there was little variation in RFI, and heritability of RFI was also near zero




David Kirschten Cornell

- ✔ Use of Actual vs Predicted Feed Intake: RFI and Cornell VDS
- ✔ Possible responses in growth and carcass traits with selection to reduce feed intake




David Kirschten Cornell, continued

- ✔ Among animals in the best 25% of breeding value for RFI there existed a wide range of breeding values for growth and carcass characteristics
- ✔ Use multiple-trait selection—strategies to do initial selection on weight measure so feed is not recorded on all animals



Dorian Garrick Colorado State

- ✔ Decision support and “efficiency”
- ✔ Efficiency vs Profitability
- ✔ Profit = (output * value) – (input * cost)




Dorian Garrick CSU, continued

- ✔ Biological efficiency (output/input) and \$Profit are positively correlated
- ✔ But, Profit also considers relative values of outputs and costs of inputs



Dorian Garrick CSU, continued

- ✔ If we have evaluation (breeding value or EPD) for output and input, then we do not need evaluation for efficiency
- ✔ To use profit selection, we can start without all the “pieces” for inputs; part are the predicted feed and part are RFI




Dorian Garrick CSU, continued

- ✔ Cost vs benefit of measuring feed as compared to the cost vs benefit of measuring other phenotypes that influence profit (efficiency)




Joe Cassady
North Carolina State

- ✓ New research plan measuring feed intake, including feeding behavior
- ✓ Relationship between measurements on bulls during postweaning gain test and brood cows



Joe Cassady
NCSU, continued

- ✓ More efficient (gain/feed) bulls eat more quickly and have calmer temperament
- ✓ Behavior explains part of feed intake



Wade Shafer
American Simmental Assn

- ✓ First beef EPD for input (Cow Maintenance Energy) by RAAA based only on indicator traits—not feed intake
- ✓ ASA economic indexes include inputs that are predicted from indicator traits:
 - ADG and fatness for steers
 - Mature Wt and Milk for cows



Merlyn Nielsen
Nebraska

- ✓ Selection to change feed intake for maintenance in mice using heat loss as the measurement and selection criterion
- ✓ 25 generations of divergent selection




Merlyn Nielsen
Nebraska, continued

- ✓ Changed cost of maintenance for a given size: High line 35% more than Low
- ✓ Changed behavior greatly
- ✓ Changed litter size, but not conception rate




Merlyn Nielsen
Nebraska, continued

- ✓ Changed body fatness—lower maintenance line has greater fat
- ✓ Changed milk production
- ✓ No important interaction with thermal environment



Mark Thallman US MARC

- ✓ DNA-based EPDs
- ✓ Interim EPDs using DNA data could be done early in life
- ✓ Many challenges: allelic effects and frequencies, etc.




Jerry Taylor Missouri

- ✓ Genome discovery in the Circle A data base
- ✓ Large data base for discovery of QTL genotypes for feed intake and carcass characteristics




Future Directions

- ✓ BIF Committee – Feed Intake Recording Guidelines (D. Crews, Chair)
- ✓ Go after variation in feed intake that is not explained by performance or can not be predicted by characteristics that are easily measured



Future Directions, continued

- ✓ Feed intake probably best incorporated in an economic selection index—but that is true of all traits!
- ✓ Can start with prediction of intake that we can do from indicator measures (like Shafer, Garrick, others propose)



Future Directions, continued

- ✓ Benefit of measuring and then including in our index the the extra feed intake variation (RFI) is real and will be pursued
- ✓ Thus, need measurement of feed intake and standard procedures in seedstock selection