BIF Feed Intake Guideline Challenges

Matt Spangler, Ph.D.
State Ext. Specialist-Beef Genetics
University of Nebraska
402.472.6489
mspangler2@unl.edu

Bob Weaber, Ph.D.
Cow-calf Ext. Specialist
Kansas State University
785-532-1460
bweaber@k-state.edu

Current Situation

- The infrastructure to collect FI is increasing, but relative to other traits is still sparse
- The collection of feed intake is also expensive
- As more cattle move through a collection facility in a given period of time, the cost per animal declines
- Testing more animals allows for more candidates for selection thus increasing selection intensity
- Leverage growth data from NCE

Current Guidelines

- BIF recommends a 70 day test with 21 days of "warm up" for acclimation
- This length is principally due to the length of time required to accurately measure gain
- To accurately measure feed intake, the length of time can be reduced
- If the data entering NCE is not confined to the paradigm of "residuals" this decoupling is possible

Literature Review

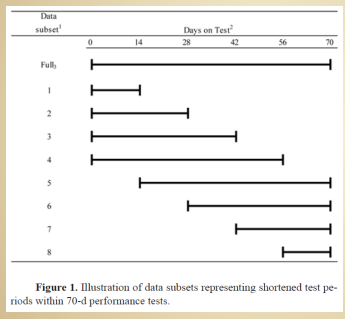


Figure 1. Illustration of data subsets representing shortened test periods within 70-d performance tests.

Culbertson et al., JAS 2015.93:2482-2487 doi:10.2527/jas2014-8363

Literature Review

Table 4. Regression coefficients, R^2, and correlations for average daily DMI (ADMI) and residual feed intake (RFI) for d 0 to 70 RFI and ADMI regressed on shorter tests within the 70-d test. All estimates and correlations were significant ($P < 0.0001$)

Data subset	d 0 to 70 values regressed on	ADMI					RFI				
		Estimate[2]	SE	R^2	Pearson[3]	Spearman[4]	Estimate	SE	R^2	Pearson	Spearman
1	d 0 to 14	0.66	0.03	0.85	0.89	0.91	0.50	0.03	0.29	0.54	0.54
2	d 0 to 28	0.89	0.02	0.93	0.94	0.95	0.84	0.03	0.63	0.79	0.77
3	d 0 to 42	0.99	0.01	0.97	0.97	0.97	0.95	0.02	0.77	0.88	0.87
4	d 0 to 56	1.02	0.01	0.99	0.99	0.99	1.00	0.01	0.89	0.94	0.95
5	d 14 to 70	0.95	0.01	0.99	0.99	0.99	0.91	0.01	0.92	0.96	0.96
6	d 28 to 70	0.87	0.01	0.98	0.98	0.97	0.79	0.01	0.87	0.93	0.91
7	d 42 to 70	0.77	0.01	0.96	0.94	0.94	0.69	0.02	0.78	0.88	0.86
8	d 56 to 70	0.63	0.02	0.92	0.85	0.85	0.52	0.02	0.60	0.78	0.74

[1]Data subset is the length of test for the data used to calculate ADMI and RFI. Subsets 1 to 4 represent data collected from d 0 increasing by 14-d intervals to d 56. Subsets 5 to 8 represent data collected from d 14 to 70 and shortened by 14-d intervals from the beginning of each interval to d 70.
[2]Estimates are the regression coefficient for d 70 regressed on shorter test lengths.
[3]Pearson's correlation.
[4]Spearman's rank correlation.

Culbertson et al., JAS 2015.93:2482-2487; doi:10.2527/jas2014-8363

Literature Review

Table 5. Regression coefficients, R^2, and correlations for ADG and metabolic midweight (MMWT) for d 0 to 70 ADG and MMWT regressed on shorter tests within the 70-d test. All P-values were significant ($P < 0.0001$)

d 0 to 70 values regressed on data subsets[1]	ADG[2]					MMWT[3]				
	Estimates[4]	R^2	SE	Pearson[5]	Spearman[6]	Estimates[4]	R^2	SE	Pearson[5]	Spearman[6]
d 0 to 14	0.13	0.75	0.01	0.65	0.67	1.01	0.99	0.01	0.99	0.98
d 0 to 28	0.29	0.80	0.02	0.61	0.61	1.02	0.99	0.01	0.99	0.99
d 0 to 42	0.55	0.88	0.02	0.83	0.83	1.01	1.00	0.00	1.00	0.99
d 0 to 56	0.80	0.95	0.01	0.95	0.94	1.01	1.00	0.00	1.00	1.00
d 14 to 70	0.85	0.94	0.02	0.95	0.95	1.00	1.00	0.00	1.00	1.00
d 28 to 70	0.50	0.84	0.02	0.82	0.84	0.95	0.99	0.01	0.98	0.98
d 42 to 70	0.26	0.77	0.02	0.71	0.73	0.82	0.95	0.02	0.96	0.96
d 56 to 70	0.09	0.72	0.01	0.19	0.21	0.48	0.87	0.02	0.89	0.85

[1]Data subset is the length of test for the data used to calculate ADG and MMWT.
[2]Calculated by the regression of weight on days on test.
[3]Calculated by raising the midtest weight to the power of 0.75.
[4]Estimates are the regression coefficient for d 70 regressed on shorter test lengths.
[5]Pearson's correlation.
[6]Spearman's rank correlation.

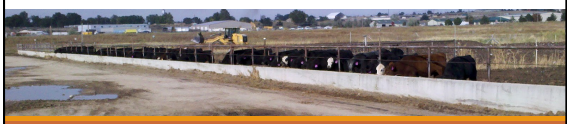
Culbertson et al., JAS 2015.93:2482-2487; doi:10.2527/jas2014-8363

BIF Current Standards

70 Day test for both Gain and Feed Intake

0 — 70

0 — 70



Heritability Estimates & Genetic Correlations

Trait	SADFI	SADG	SPWG	HADFI	HADG	HPWG
Steer ADFI	**0.43** (0.05)	0.46 (0.03)	0.70 (0.03)			
Steer ADG	0.73 (0.12)	**0.09** (0.03)	0.35 (0.03)			
Steer PWG	0.58 (0.06)	0.81 (0.14)	**0.36** (0.05)			
Heifer ADFI	0.71 (0.09)	0.66 (0.20)	0.65 (0.09)	**0.39** (0.05)	0.32 (0.04)	0.49 (0.04)
Heifer ADG	0.51 (0.15)	0.39 (0.27)	0.71 (0.15)	0.64 (0.12)	**0.14** (0.04)	0.37 (0.04)
Heifer PWG	0.47 (0.09)	0.67 (0.20)	0.91 (0.08)	0.77 (0.05)	0.65 (0.12)	**0.42** (0.05)

Steer Unrestricted Index

	91 d Test[a]	56 d Test[b]
Heritability of gain trait	0.09	0.36
Genetic correlation (Gain, Feed Intake)	0.73	0.58
Relative number tested/year	1.00	1.62
Heritability of efficiency	0.15	0.48
Relative cost/tested animal	100%	62%
Selection Intensity (N = 5)	5% i = 2.06	3% i = 2.27
Genetic Change in index per generation	9%	33%

Other Considerations

- Warm up period (21 d)
  - Goal: reduce background variation due to environment/management
  - Compensatory gain
  - Diet energy density difference among inbound test animals
  - Training animals to consume feed from bunk system
    - Feed Intake system influence lengths length of training
      - Calan gate, Insentec, GrowSafe
    - 'Bunk broke'

Other Considerations

- Contemporary grouping
  - Given a general lack of information to the contrary, the most conservative definition should be recommended
  - On-farm test of single source animals
    - More uniform management/environment
    - Maintain on CG structure going on test

Other Considerations

- Contemporary grouping
  - 'Bull test' scenario
    - Multiple sources/management/environment
    - Reduced CG size (potentially lots of single animal CGs)
    - Account for selection bias in selection of animals to put on test
    - Fit on farm CG and test CG to construct nested groups
    - Potentially fit interaction term of last on farm and test CG to build larger groups – atypical adjustment of fixed effects in NCE


Thank You!
Questions?
6/18/15
BIF–Biloxi, MS
13