EXTENSION

Finish Weights in the U.S. Cattle Industry: Applications for the Cowculator Beef Cattle Diet Evaluation Program

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The amount of feed energy and protein required for a given level of weight gain in growing and finishing cattle is highly dependent on their body composition and degree of maturity. For example, cattle that are extremely fat require more feed energy per unit of weight gain compared to cattle that are thin. Primary factors influencing body composition at a given level of maturity in growing cattle include:

1) Sex (heifers, steers, bulls)
2) Previous plain of nutrition, rate of weight gain and length of stocker phase
3) Mature body weight and frame size
4) Genetic potential for growth
5) Use of growth promoting implants and feed additives

The Cowculator ration evaluation program uses published equations (NASEM, 2016) to calculate the amount of energy and protein needed for each unit of weight gain in growing cattle using an estimated weight at which cattle reach a standard stage of maturity and fatness. The user-provided input for the "Finish Weight" entry (see Fig. 1 below) should represent the "pay weight" (after pencil shrink) at which the cattle are expected to reach 0.6 inches of back fat during the finishing phase.

Historical finish weight data from similar genetics and management should be used when available. However, if historical data is not available, the following guidelines can be used to estimate finish weight at 0.6 inches of back fat. Consider that annual average finished cattle weights and carcass weights are increasing at the rate of approximately 6 pounds per year and therefore, this estimate may need to be adjusted accordingly.

Placement Weight and Sex

The following tables provide guidance for the effect of initial weight of feeder steers (Table 1) and feeder heifers (Table 2) on finishing performance and weight at harvest. These data were provided by Hitch Enterprises and represent closeouts in the six-year period from 2016 through 2021. Cattle in these lots were implanted and were fed ionophores and beta agonists. These data represent weighted averages across a wide range in age and management system and therefore initial maturity and body composition.

Inputs for Growing and Finishing Cattle

Number of Cattle	Initial Weight, lb	Desired Weight, End of Feeding Period, lb	Finish Weight, lb	Genetic Potential for Growth and Feed Efficiency	Ionophore	Implant	Initial Body Condition
100	300	400	1400	Above Average	Rumensin	Yes	5

Finish Weight Table

Fig. 1 Inputs for Growing and Finishing Cattle

Table 1. Influence of steer placement weight on feedlot performance and finish weight[1]							
	Initial Weight Class						
Item	**600**	**650**	**700**	**750**	**800**	**850**	**900**
# Lots	229	539	670	702	575	345	197
Purchase Weight	625	675	725	775	818	863	908
Initial Weight	603	652	701	751	799	847	897
Finish Weight	1343	1383	1402	1422	1445	1458	1483
ADG*	3.22	3.31	3.44	3.52	3.56	3.64	3.73
Feed/Gain**	6.05	6.13	6.15	6.25	6.35	6.36	6.43
DMI	19.5	20.3	21.2	22.0	22.6	23.2	24.0
Days on Feed***	223	214	197	184	176	163	154
[1]Hitch Enterprises and Dr. Britt Hicks, pen closeouts for years 2016 through 2021.							

Table 2. Influence of heifer placement weight on feedlot performance and finish weight[1]							
	Initial Weight Class						
Item	**550**	**600**	**650**	**700**	**750**	**800**	**850**
# Lots	268	499	612	671	567	303	62
Purchase Weight	576	623	673	721	761	806	861
Initial Weight	553	601	648	702	747	798	846
Sale Weight	1216	1243	1267	1277	1295	1317	1358
ADG*	2.92	3.02	3.18	3.22	3.28	3.29	3.46
Feed/Gain**	6.31	6.31	6.28	6.46	6.54	6.71	6.70
DMI	18.43	19.08	19.95	20.80	21.46	22.10	23.19
Days on Feed***	219	205	187	173	163	155	144
[1]Hitch Enterprises and Dr. Britt Hicks, pen closeouts for years 2016 through 2021.							

Physiological maturity of bulls is delayed compared to steers, meaning fat deposition (or the amount of body fat) is less for bulls than steers at any given harvest weight. If the diet being evaluated is intended for bulls, "Finish Weight" at 0.6 inches of back fat should be increased by 150 pounds compared with the steers in Table 1.

Implants, Finishing-phase Antibiotics, Ionophores, and Beta Agonists

The Nutrient Requirements for Beef Cattle (2016) recommends the following adjustments for use of these technologies (Table 3).

Table 3. Adjustment factors for finish weight for growth promoting technologies[1]			
Item	**Direction of Adjustment**	**Adjustment Factor**	**Range**
Non-use of implants	Decrease	66 pounds	55 to 99 pounds
Use of combination implant with trenbolone acetate and estrogenic hormones	Increase	66 pounds	55 to 99 pounds
Use of beta agonist (Optiflex or Zilmax)	Increase	45 pounds	15 to 80 pounds
[1]Adapted from NASEM (2016)			

The adjustment factors are supported by research conducted at Oklahoma State University. Angus-sired steers were either managed for an all-natural program (no implants, ionophores, antibiotics or beta agonists) or a conventional system (implanted, fed ionophores, antibiotics for liver abscesses and beta agonists during finishing). Steers in the all-natural program weighed 141 pounds less at harvest than the steers managed with growth promoting technologies (Maxwell et al., 2014; Journal of Animal Science 92:5727). These increases are also seen whether cattle are fed as calves or yearlings. A series of experiments (Barham et al., 2012; The Professional Animal Scientist 28:20; Williamson et al., 2014; The Professional Animal Scientist 30:485) in Arkansas showed that implanting calf-feds increased slaughter weight by 46 to 63 pounds and implanting cattle fed as yearlings increased slaughter weight by 77 to 111 pounds.

Length of Stocker Phase

Days from weaning at approximately 205 days of age until feedlot placement has a significant impact on weight when cattle reach 0.6 inches of back fat during finishing. In general, finish weight in cattle increases approximately 0.75 to 1.25 pound per day of stocker phase. The faster the rate of stocker phase gain, the lower response and vice versa.

Results from four experiments (three from Arkansas and one from Oklahoma) show these relationships. The Oklahoma State University experiment (Gill et al.,1993; OSU Animal Science Research Report 197 – Table 4) compared feedlot performance and harvest weights of steers fed as calves and yearlings following grazing wheat pasture. In this experiment, grazing steers on wheat pasture increased finish weight by 81 pounds or 0.71 pounds per day of stocker period.

In research conducted in Arkansas (Williamson et al., 2014 –Table 5) steers from a spring calving cowherd were finished as calves or placed on wheat pasture for 175 days stocked to have gains of 1.56 or 2.34 pounds per day before shipping to Texas Panhandle feedlots for finishing. Even though the yearlings managed for higher gains while grazing wheat pasture gained 0.78 pounds per day more before finishing, performance during finishing was the same and both were more than Calf-Feds. For each day on pasture, slaughter weights of calves managed for low gain had 0.17 heavier weights at slaughter, while when managed for high gains on pasture slaughter weights were 0.64 pound greater for each day of the grazing season. In another experiment from Arkansas (Barham et al., 2012 – Table 6) finishing performance of steers finished as with growth promoting implants increased slaughter weights for Calf-feds by 63 pounds and slaughter weights of yearlings was increased by 77 pounds. Yearlings were 118 (non-implanted) to 132 (implanted) pounds heavier at harvest than calves.

An accurate estimate of beef cattle finish weight at a constant biological end point (back fat thickness) is an important component in accurately determining nutrient requirements in growing cattle. Hopefully, the large data set provided, along with research results presented, will assist producers and beef cattle nutrition advisors to accurately estimate finish weight at 0.6 inches of back fat. This should lead to more precise ration formulation, cost savings and (or) improved animal performance.

Table 4. Effect of stocker program and age of finishing on finish weights of steers[1]

Item	Calf-Fed	Wheat Pasture
Age at feedlot entry	8 months	12 months
Stocker phase, days	-	112
Stocker ADG	-	2.0
Feedlot in weight	540	765
Finishing ADG	3.22	3.70
Finish Weight	1178	1259

[1]Gill et al., 1993

Table 5. Effect of stocker program and age on finish weights of steers[1]			
	Calf-Fed	**Low Gain Wheat Pasture**	**High Gain Wheat Pasture**
Age at feedlot entry	8 months	13 months	13 months
Stocker phase, days	-	175	175
Prefinishing ADG	-	1.56	2.34
Feedlot in weight	630	745	882
Finishing ADG	2.80	3.39	3.41
Finish weight	1170	1201	1283
[1]Williamson et al., 2014			

Table 6. Effect of stocker program and age on finish weights of steers[1]				
	Calf, No Implant	**Calf, Implant**	**Yearling, No Implant**	**Yearling, Implant**
Age at finishing	9.7	9.7	14.1	14.1
Stocker phase, days	63	63	132	132
Prefinishing ADG	2.52	2.81	1.22	1.23
Feedlot in weight	662	643	793	823
Finishing ADG	3.55	4.17	4.30	4.87
Finish weight	1128	1191	1246	1323
[1]Barham et al., 2012				

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