Northern NY Agricultural Development Program
2016-2017 Project Report

NNY Beef Cow Size-for-Profitability Evaluation:
Abundant Forage & Quality: Cow/Calf Profitability

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Cooperating Producers:

- Clinton County: Peter Hagar
- Jefferson County: David Hawthorne
- Lewis County: Sean and Dan Harney, Larry Laribee
- St. Lawrence County: Adam Cook, George Erdman

Background

The size of the most efficient and profitable beef cow has been the subject of much debate in the popular press, and among academics and farmers. The argument is that in restricted environments lighter weight cows are more efficient than heavier cows.

This is an important issue on Northern New York beef farms where producers work for more than 6 months of the year in cold temperatures and, in most years, with abundant snow cover. During this time, stored feeds account for greater than 65% of the cost to carry a cow for the year. As the majority of the energy goes to cow maintenance and the greatest driver of maintenance is body weight, it is easy to assume that small cow size would be preferable. Yet, for the remainder of the year, the Northern New York region has abundant forage providing an unrestricted environment, leading to the idea that larger cows producing heavier calves may be more profitable.

The objective of this project was to compare efficiency of farms with different cow sizes.

Methods:

We collected animal and pasture inputs on 6 farms: one each in Jefferson and Clinton counties, two each in St. Lawrence and Lewis counties. Educators and a summer intern worked with each farm to collect inputs, e.g., animal measurements: body weight and body condition score, feed quantity: rising plate meter measurements, and feed quality; and animal outputs: weaning weight, cow body weight, and body condition score.

This data was used to populate the COWHERD computer model that optimizes profitability of different animal and land production scenarios. The value of this project is that in using the localized farm-level data the COWHERD model works with individual farms to answer farmer questions relative to the best strategies for their individual resources.

Results:

Six farms (Table 1) cooperated in this project, providing animal and pasture measurements. Finding farms with small frame cows (≤ 1200 lb) was more difficult than anticipated. Generally, as beef operations are in business to sell pounds, bigger is better.

Data was input into the COWHERD (Perry, Fox et al. 1998) computer model to compute energy requirements for each farm except Farm #6 which was unable to provide weaning weight data. Model-computed energy requirements and observed weaning weights were used to compare efficiency of each farm.

Table 1. Profile of participating farms, NNY Beef Cow Size-for-Profitability Project, 2017.

Farm	Acres[1]	Cows, n	Cow wt, lb ave.	Frame size	Calves, n	Calf weaning wt (WW), lb	WW Age, d	Adjusted 205-day WW, lb
1	28	22	1404	L	20	550	176	626
2	173	62	1400	L	61	562	193	592
3	57	65	1400	L	61	440	132	639
4	40	18	1200	M	15	463	167	550
5	50	38	1200	M	30	491	193	515
6	5.8	20	1475	L	11	na	na	na

[1]Grazing acres

Biological efficiency of the cow up to the point of weaning can be evaluated in three ways (Ritchie 2001) (Table 2):
(1) lb calf weaned per cow exposed,
(2) lb calf weaned per cow exposed per lb cow weight;
(3) lb calf weaned per cow exposed per unit of feed energy consumed.

All three measures are based on weaning weight. The first (lb calf weaned per cow exposed) is calculated as the total pounds of weaned calf divided by the number of cows exposed to breeding (bull and/or artificial insemination). This measure takes into account farm-level reproductive efficiency. For example, if 25 cows were exposed to breeding, but only 20 weaned cows are produced, then, the lower number indicates less efficiency.

The second measure (lb calf weaned per cow exposed per lb cow weight) is lb calf weaned per cow exposed divided by cow weight. Heavier cows should wean more pounds of calf. If not, they are considered less efficient.

The third measure (lb calf weaned per cow exposed per unit of feed energy consumed) is lb calf weaned per cow exposed divided by the amount of energy required to produce the pounds of weaned calf. The lower the number, the less energy required, therefore, the herd is considered more efficient.

Table 2. Measures of feed efficiency of participating farms, NNY Beef Cow Size-for-Profitability Project, 2017.

Farm		Efficiency measure (rank)		
	Frame	1	2	3
1	L	523 (2)	0.37 (3)	8.83 (4)
2	L	553 (1)	0.39 (2)	9.68 (2)
3	L	447 (4)	0.32 (4)	8.86 (3)
4	M	381 (5)	0.32 (4)	7.65 (5)
5	M	491 (3)	0.41 (1)	9.82 (1)

(1) lb calf weaned per cow exposed
(2) lb calf weaned per cow exposed per lb cow weight
(3) lb calf weaned per cow exposed per unit of TDN consumed
TDN: Total digestible nutrients

Across all three measures of efficiency, Farms #2 and #5 rank as the most efficient farms. The large frame cows of Farm #2 produced greater amount of calf weaning weight per cow exposed, while the medium frame cows of farm # 5 posted higher efficiencies when measured on a weight basis. Calves from Farms #3 and #4 were the youngest at weaning, and these farms had the lowest weaning percentage (Table 1). Biological efficiency is based on weight. Younger calves lighter at weaning reduce the pounds produced. As Farms #3 and #4 weaned fewer calves, total pounds are less. Therefore, less total weight from a reduction in weaning weight and fewer calves at weaning reduce efficiency.

In Table 3, the calves are all adjusted to 205-day weaning age, but leaves weaning percentage as reported. Doing so, the large frame cows all show higher biological efficiency than the medium frame cows.

Table 3. Measures of feed efficiency adjusted to 205-day weaning age of calves of participating farms, NNY Beef Cow Size-for-Profitability Project, 2017.

Farm		Efficiency measure		
	Frame	1	2	3
1	L	626 (1)	0.45 (1)	9.88 (2)
2	L	582 (3)	0.42 (3)	9.87 (3)
3	L	600 (2)	0.43 (2)	10.17 (1)
4	M	458 (4)	0.38 (4)	8.59 (4)
5	M	434 (5)	0.36 (5)	8.54 (5)

(1) lb calf weaned per cow exposed
(2) lb calf weaned per cow exposed per lb cow weight
(3) lb calf weaned per cow exposed per unit of TDN consumed
TDN: Total digestible nutrients

In Table 4 all calves are adjusted to 205 days of age at weaning and the weaning percentage of the farms is set to 100%.

Table 4. Measures of feed efficiency adjusted to 205 day weaning and 100% calving of participating farms, NNY Beef Cow Size-for-Profitability Project, 2017.

Farm		Efficiency measure		
	Frame	1	2	3
1	L	626 (2)	0.45 (2)	9.88 (5)
2	L	592 (3)	0.42 (4)	10.03 (4)
3	L	639 (1)	0.46 (1)	10.84 (1)
4	M	550 (5)	0.46 (1)	10.30 (2)
5	M	515 (4)	0.43 (3)	10.14 (3)

(1) lb calf weaned per cow exposed
(2) lb calf weaned per cow exposed per lb cow weight
(3) lb calf weaned per cow exposed per unit of TDN consumed
TDN: Total digestible nutrients

With these adjustments the conclusions are less straightforward. The large frame cows are most efficient when evaluating weight of calf per number of cows exposed. This makes sense as the measure of efficiency is based on weight alone. All things being equal, larger cows should produce larger calves.

When weaning weight is expressed as pounds of calf per cow exposed weight or on a unit of Total Digestible Nutrients (TDN) basis, there is no difference in the average efficiencies of the large and medium frame cows.

Forage Production

The pasture plate meter (FILIPS Folding Pasture Plate Meter) integrates pasture height and density into an equation that estimates available forage for grazing. Results of the dry matter (DM) yield using the pasture plate meter are shown in Table 5. The average estimate was positive on 4 of the 6 farms.

Table 5. Estimated forage available for grazing using Pasture Plate Meter[1], NNY Beef Cow Size-for-Profitability Project, 2017.

		DM/ac, lb			Stocking rate	Wean weight
Farm	Frame	Average	Low	High	Cow/ac	lb/ac
1	L	660	429	845	0.79	393
2	L	403	59	711	0.36	198
3	L	-5			1.14	471
4	M	660	353	800	0.45	174
5	M	668	153	1705	0.76	295
6	L	-70			3.45	

[1] FILIPS Folding Pasture Plate Meter

Hay was fed during the summer on Farm #6 because there was not enough pasture to support the cow inventory; therefore, this farm was not considered in the analysis.

While the average DM available for grazing on Farm #3 was negative, this farm did not supplement hay. This could explain the low weaning weight (Table 1), though the study group was creep fed. As Farm #3 did not have sufficient acreage to support the cow herd, it was dropped from the comparison. Doing so, there was no difference in the average number of cows supported by the given acreage regardless of frame size. This is unexpected, as one would assume that large frame cows would consume more DM, therefore, requiring more acreage. Body condition score was not recorded on these farms. It could be that the large frame cows finished the grazing season with less fat accumulation as compared to the medium frame cows. Even with ignoring the production of Farm #3, large frame cows produced more pounds of weaned calf per acre as compared to the medium frame cows

Conclusions/Outcomes/Impacts:

1. Reproduction and weaning percentage has a greater effect on efficiency than frame size or weaning weight.
2. When compared at the same weaning age and weaning percentage:
    a. Large frame cows are more efficient on a per cow basis
    b. There is no difference in large and medium size cows on a cow weight or unit of TDN basis.
3. Stocking rate in cows/acre was not affected by frame size.

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