

ELLIS W. RANNEY



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THESIS
on
STEER FEEDING

by E. W. Ranney.

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W. W. Ranney.

THESIS

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Steer Feeding.

The results of this thesis are based on a twelve weeks trial made by me
during the winter of 1899 - 1900.

When the Angus steers, Wiggins, Roxie, and Johnson~~an~~ arrived at the Agricultural College, they were in the best of condition, and ready for the market with the exception, perhaps, of Wiggins. They were purchased of Smith and Wiggins of Corning, Michigan, and were prize winners at the State fair in September 1899. When I began this experiment in feeding these steers I was of the opinion that it would not be a financial success, but thought that I might obtain some results which would be beneficial.

At the beginning Roxie was in such good condition that Professor Mumford thought improvement in him would be slight, if any at all, but he was of the opinion that Wiggins and Johnson could be improved in some degree. The ages of the three steers were as follows,- Roxie, two years; Wiggins, two years; and Johnson one year.

The season was not a favorable one for feeding, and this fact must be taken into consideration. The barn where the animals were kept was warm and convenient, but had the disadvantage of containing pigs. The odor from the pig pens must have been disagreeable to the steers. The food used in this experiment was of the best, and in entirely sufficient quantities. The animals were fed regularly three times a day. In the morning and at night the sugar beets were fed, after the steers had eaten their mixed grain and hay and the mangers had been cleaned out.

The schedule of meals was as follows:-

<u>Morning 6-30.</u>	<u>Noon 12-20.</u>	<u>Night 5:00.</u>
Cut Clover Hay.	Sugar Beets.	Same as
Mixed Grain.		morning.
Sugar Beets.		

The steers were watered twice a day, in the morning and at noon, before feeding. When weather permitted the animals were turned out of doors, in a small yard, during the greater part of the day. Rock salt was kept in the mangers at all times. The stables were kept clean, and the animals carefully groomed. The care of the animals was better than that given by most farmers, but was not so extraordinary as to make it impracticable for every stockfeeder to adopt.

The following are the three different combinations of grain used in the three successive periods, of four weeks each, of our trial. The second is the richest and the third is the most economical.

Mixture No. 1 for the first four weeks.

By Weight.-

1/2 Corn Meal.
1/4 Wheat Bran.
1/8 Oil Meal.
1/8 Oat Meal.

Mixture No. 2 for the second four weeks.

By Weight.-

3/8 Corn Meal.
3/8 Wheat Bran.
1/4 Oil Meal.

Mixture No. 3 for the third four weeks.

By Weight.-

1/2 Corn Meal.
1/2 Wheat Bran.

Table showing Digestible Nutrients in 100#.

Feeding Stuff.	Dry Matter.	Digestible Nutrient			Nutritive Ratio.
		Protein.	Carbo- hydrates,	Ether Extract.	
Corn Meal	89.1	7.9	66.7	4.3	
Wheat Bran	88.1	12.2	39.2	2.7	
Oil Meal	91.8	25.8	43.3	11.0	
Oat Meal	92.1	11.5	52.1	5.9	
Clover Hay	84.7	6.8	35.8	1.7	
Sugar Beets	13.5	1.1	10.2	0.1	
W. L. German Standard.	30.0	2.5	15.0	0.5	1 : 6.5

The above table shows the average coefficients of digestibility of the respective feeding stuffs used in this experiment. Oil meal is used very extensively by scientific feeders in order to balance their ration, but it was entirely omitted in the third period of our trial, in order to reduce the economic value of the ration.

Wiggins and Roxie. First Week.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient			Nutritive Ratio.
			Protein.	Carbo-hydrates.	Ether Extract.	
Corn Meal	6	5.346	.474	4.002	.258	
Wheat Bran	3	2.643	.366	1.176	.081	
Oil Meal	1 1/2	1.377	.387	.650	.165	
Oat Meal	1 1/2	1.382	.173	.782	.089	
Clover Hay	9	7.623	.612	3.222	.153	
Sugar Beets	36	<u>4.860</u>	<u>.396</u>	<u>3.672</u>	<u>.036</u>	
		23.231	2.408	13.504	.782	
W.L. Standard		30.000	2.500	15.000	.500	1 : 6.5

The above table shows the first ration for the first week. It falls much below the standard.

Wiggins and Roxie. Second and Third Weeks.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient			Nutritive Ratio.
			Protein.	Carbo-hydrates.	Ether Extract.	
Corn Meal	5	4.455	.395	3.335	.215	
Wheat Bran	2 1/2	2.203	.305	.980	.068	
Oil Meal	1 1/4	1.148	.321	.541	.138	
Oat Meal	1 1/4	1.351	.144	.651	.074	
Clover Hay	9	7.623	.612	3.222	.153	
Sugar Beets	36	<u>4.860</u>	<u>.396</u>	<u>3.672</u>	<u>.036</u>	
		21.640	2.173	12.401	.684	

The above table shows the first ration for the second and third weeks.

Wiggins and Roxie. Fourth Week.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient		
			Protein.	Carbo-hydrates.	Ether Extract.
Corn Meal.	4	3.564	.316	2.668	.172
Wheat Bran	2	1.762	.244	.784	.054
Oil Meal	1	.918	.258	.433	.110
Oat Meal	1	.921	.115	.521	.059
Clover Hay	6	5.082	.408	2.148	.102
Sugar Beets	36	<u>4.860</u>	<u>.396</u>	<u>3.672</u>	<u>.036</u>
		17.107	1.737	10.226	.533

The above table shows the first ration for the fourth week.

This ends the first period.

Wiggins and Roxie. Second Period of four weeks.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient			Nutritive Ratio.
			Protein.	Carbo-hydrates.	Ether Extract.	
Corn Meal	3	2.673	.237	2.001	.129	
Wheat Bran	3	2.643	.366	1.176	.081	
Oil Meal	2	1.836	.516	.866	.022	
Clover Hay	6	5.082	.408	2.148	.102	
Sugar Beets	37 1/2	<u>5.048</u>	<u>.413</u>	<u>3.821</u>	<u>.038</u>	
		17.282	1.940	10.012	.372	
W.L.Standard		30.000	2.500	15.000	.500	1 : 6.5

The above table shows the second ration for the second period. This ration also falls below the standard, however it is richer than the first.

Wiggins and Roxie. Third Period of four weeks.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient.			Nutritive Ratio.
			Protein.	Carbo-hydrates.	Ether Extract.	
Corn Meal	4	3.564	.316	2.668	.173	
Wheat Bran	4	3.524	.488	1.568	.108	
Clover Hay	6	5.082	.408	2.148	.102	
Sugar Beets	42	<u>5.670</u>	<u>.462</u>	<u>4.284</u>	<u>.042</u>	
		17.840	1.674	10.668	.424	
W.L.Standard		30.000	2.500	15.000	.500	1 : 6.5

The above table shows the third ration for the third period.

This is the cheapest of the three rations.

Johnson. First three Weeks.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient			Nutritive Ratio.
			Protein.	Carbo-hydrates.	Ether Extract.	
Corn Meal	3	2.673	.237	2.001	.129	
Wheat Bran	1 1/2	1.322	.183	.588	.045	
Oil Meal	3/4	.689	.204	.325	.083	
Oat Meal	3/4	.691	.086	.391	.044	
Clover Hay	6	5.082	.408	2.148	.102	
Sugar Beets	18	<u>2.430</u>	<u>.198</u>	<u>1.836</u>	<u>.018</u>	
		12.887	1.316	7.289	.421	
W.L.Standard		30.000	2.500	15.000	.500	1 : 6.5

The above table shows the first ration for the first three weeks.

Johnson. Fourth Week.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient		
			Protein.	Carbo-hydrates.	Ether Extract.
Corn Meal	3	2.673	.237	2.001	.129
Wheat Bran	1 1/2	1.322	.183	.588	.045
Oat Meal	3/4	.691	.086	.391	.044
Oil Meal	3/4	.689	.204	.325	.083
Clover Hay	4	3.388	.272	.143	.068
Sugar Beets	18	<u>2.430</u>	<u>.198</u>	<u>1.836</u>	<u>.018</u>
		11.193	1.180	5.284	.387

The above table shows the first ration for the fourth week.

Johnson. Second Period of four weeks.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient			Nutritive Ratio.
			Protein.	Carbo-hydrates.	Ether Extract.	
Corn Meal	2 1/4	2.006	.178	1.501	.097	
Wheat Bran	2 1/4	1.982	.275	.882	.061	
Oil Meal	1 1/2	1.377	.387	.650	.165	
Clover Hay	4 1/4	3.600	.289	1.522	.072	
Sugar Beets	19 1/2	<u>2.633</u>	<u>.215</u>	<u>1.989</u>	<u>.020</u>	
		11.598	1.344	6.544	.415	
W.L.Standard		30.000	2.500	15.000	.500	1 : 6.5

The above table shows the second ration for the second period.

Johnson. Third Period of four weeks.

Feeding Stuff.	lbs.	Dry Matter.	Digestible Nutrient			Nutritive Ratio.
			Protein.	Carbo- hydrates.	Ether Extract.	
Corn Meal	3	2.673	.237	2.001	.129	
Wheat Bran	3	2.643	.366	1.176	.081	
Clover Hay	5	4.235	.340	1.790	.085	
Sugar Beets	24	<u>3.240</u>	<u>.264</u>	<u>2.448</u>	<u>.024</u>	
		12.791	1.207	7.415	.319	
W.L. Standard		30.000	2.500	15.000	.500	1 : 6.5

The above table shows the third ration for the third period.

Table showing the Mean Rations of each animal for each period and for the whole time.

Name of Steer.	Ration.	Period.	Dry Matter.	Digestible Nutrient			Gain per Day.
				Protein.	Carbo-hydrates.	Ether Extract.	
Wiggins	No.1	1st.	21.904	2.124	12.133	.671	2.04
	No.2	2nd.	17.282	1.940	10.012	.372	1.07
	No.3	3rd.	<u>17.840</u>	<u>1.674</u>	<u>10.668</u>	<u>.424</u>	<u>3.21</u>
	Average		19.009	1.913	10.938	.489	2.11
Roxie	No.1	1st.	21.904	2.124	12.133	.671	1.29
	No.2	2nd.	17.282	1.940	10.012	.372	1.00
	No.3	3rd.	<u>17.840</u>	<u>1.674</u>	<u>10.668</u>	<u>.424</u>	<u>1.57</u>
	Average		19.009	1.913	10.938	.489	1.29
Johnson	No.1	1st.	12.464	1.282	6.788	.413	.96
	No.2	2nd.	11.598	1.344	6.544	.415	1.36
	No.3	3rd.	<u>12.791</u>	<u>1.207</u>	<u>7.415</u>	<u>.319</u>	<u>2.07</u>
	Average		12.284	1.301	6.916	.382	1.46
Mean Average			16.767	1.709	9.597	.453	1.62

The above table shows that the mean average ration of the animals, for the whole time, was as follows,- 16.767# dry matter, 1.709# protein, 9.597# carbohydrates, and .453# ether extract, and that the average gain per day was 1.62#.

Results of Trial.

Weekly Weight of Steers during 12 Weeks Trial.

Date.	Weight of Wiggins.	Gain or loss.	Weight of Roxie.	Gain or loss.	Weight of Johnson.	Gain or loss
Dec. 9, 1899.	1553#	----	1630#	----	965#	----
" 16, "	1590	37#	1618	-12#	956	-9#
" 23, "	1580	-10	1640	22	970	14
" 30, "	1604	24	1660	20	984	14
Jan. 6, 1900.	1610	6	1666	6	992	8

Total Gain for Four Weeks	57#	36#	27#
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Jan. 13, 1900.	1600#	-10	1654#	-12	994#	2
" 20, "	1638	38	1674	20	1000	6
" 27, "	1622	-16	1682	8	1018	18
Feb. 3, "	1640	18	1694	12	1030	12

Total Gain for Four Weeks	30#	28#	38#
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Feb. 10, 1900.	1670#	30	1700#	6	1030	---
" 17, "	1700	30	1730	30	1050	20
" 24, "	1724	24	1730	--	1078	28
Mar. 3, "	1730	6	1738	8	1088	10

Total Gain for Four Weeks	90#	44#	58#
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This table shows that we get the best results with the third ration during the third period. The results of this period may be due to climatic conditions, which were more favorable than during the previous two periods.

The first period shows better results than the second, with the exception of Johnson, who makes a gain of 38# in the second period against 27# during first period. It is my opinion that if the weights

at first had been as accurate as those afterwards the results of the first period would not have showed better gains than the second. The first two weights that we made of the animals were after they had been watered. After the second week the weights were all made once a week, at the same hour, before the animals had water. The first weights given in this table are averages of two weights taken.

Table showing the different Gains in the different Periods.

Name of Steer.	Period of 28 da.	Total Gain for Period.	Average Gain per wk.	Average Gain per da.	Total Gain.	Average Gain per wk.	Average Gain per da.
Wiggins.	No.1	57#	14.25#	2.04#	177#	14.75#	2.11#
	No. 2	30	7.50	1.07			
	No.3	90	22.50	3.21			
Roxie	No.1	36	9.00	1.29	108	9.00	1.29
	No.2	28	7.00	1.00			
	No.3	44	11.00	1.57			
Johnson	No.1	27	6.75	.96	<u>123</u> 136#	<u>10.25</u> 11.33#	<u>1.46</u> 1.62#
	No.2	38	9.50	1.36			
	No.3	58	14.50	2.07			
Average							

This table shows the total and average amount of gain by each animal during the three successive periods.

Table showing the amount of feed consumed for 100# gain and cost of same during each period, according to the different rations.

Name of Steer.	Rat- ion.	Per- lod.	Gain in 28 da. per head.	Gain per head per da.	Amt. of grain for 100# gain.	Amt. of hay for 100# gain.	Amt. of roots for 100# gain.	Cost for 100# Gain.
Wiggins.	No.1	No.1	57#	2.04#	492.3#	405.3#	1768.4#	# 7.86
Roxie.	No.1	No.1	36	1.29	777.7	641.7	2800.0	12.44
Johnson.	No.1	No.1	<u>27</u>	<u>.96</u>	<u>622.2</u>	<u>570.4</u>	<u>1866.6</u>	<u>9.67</u>
	Average		40	1.43	630.7	505.8	2145.0	9.99
Wiggins.	No.2	No.2	30	1.07	746.6	560.0	3500.0	12.65
Roxie.	No.2	No.2	28	1.00	800.0	600.0	3750.0	13.55
Johnson.	No.2	No.2	<u>38</u>	<u>1.36</u>	<u>421.6</u>	<u>313.2</u>	<u>1436.8</u>	<u>6.57</u>
	Average		32	1.14	656.1	491.1	2895.6	10.92
Wiggins.	No.3	No.3	90	3.21	248.8	186.6	1366.6	4.03
Roxie.	No.3	No.3	44	1.57	509.1	386.4	2673.4	8.25
Johnson.	No.3	No.3	<u>58</u>	<u>2.07</u>	<u>289.7</u>	<u>241.4</u>	<u>1158.6</u>	<u>4.33</u>
	Average		64	2.18	349.2	271.5	1732.9	5.54

The above table shows that the cost of feeding during the third period was much lower than during the two previous periods.

Table showing the average cost for 100# gain, live weight, for each animal.

Name of Steer.	Ration.	Period.	Cost per 100# gain.	Average cost per 100# gain.	Average cost per lb.
Wiggins.	No.1	No.1	\$ 7.86	\$ 8.18	\$.082
	No.2	No.2	12.65		
	No.3	No.3	4.03		
Roxie.	No.1	No.1	12.44	10.41	.104
	No.2	No.2	13.55		
	No.3	No.3	8.25		
Johnson.	No.1	No.1	9.67	6.86	.069
	No.2	No.2	6.57		
	No.3	No.3	4.33		
Average				8.38	.084

This table shows that the average cost for 100# gain for three periods of three animals separately, was \$8.18 for Wiggins; \$10.41 for Roxie; and \$6.86 for Johnson.

Table showing the amount of Feeding Stuffs consumed.

Name of Steer.	Period.	Average wt. of animal.	Average daily gain.	Feed fed each animal daily.		
				Mixed Grain.	Clover Hay.	Sugar Beets.
Wiggins.	1st.	1587.4#	2.04#	10.5#	8.25#	36#
	2nd.	1622.0	1.07	8	6	37.5
	3rd.	1692.8	3.21	8	6	42
Roxie.	1st.	1642.8	1.29	10.5	8.25	36
	2nd.	1674.0	1.00	8	6	37.5
	3rd.	1718.4	1.57	8	6	42
Johnson.	1st.	973.4	.96	6	5.5	18
	2nd.	1006.8	1.36	6	4.25	19.5
	3rd.	1055.2	2.07	6	5	24

Table showing the Amount of Feed consumed by each by periods.

Name of Steer.	Period.	per period.			per week.			per day.		
		Clover Hay.	Mixed Grain.	Sugar Beets.	Hay.	Grain.	Beets.	Hay.	Grain.	Beets.
Wiggins.	1st.	231#	280#	1008#	57.75#	70#	252#	8.25#	10#	36#
	2nd.	168	224	1050	42	56	262.5	6	8	37.5
	3rd.	<u>168</u>	<u>224</u>	<u>1176</u>	<u>42</u>	<u>56</u>	<u>294</u>	<u>6</u>	<u>8</u>	<u>42</u>
	Average	189	241.3	1028	47.25	61.6	269.5	6.75	8.66	38.5
Roxie.	1st.	231	280	1008	57.75	70	252	8.25	10	36
	2nd.	168	224	1050	42	56	262.5	6	8	37.5
	3rd.	<u>168</u>	<u>224</u>	<u>1176</u>	<u>42</u>	<u>56</u>	<u>294</u>	<u>6</u>	<u>8</u>	<u>42</u>
	Average	189	241.3	1078	47.25	61.6	269.5	6.75	8.66	38.5
Johnson.	1st.	154	168	504	38.5	42	126	5.50	6	18
	2nd.	119	168	546	29.75	42	136.5	4.25	6	19.5
	3rd.	<u>140</u>	<u>168</u>	<u>672</u>	<u>35.0</u>	<u>42</u>	<u>168</u>	<u>5.00</u>	<u>6</u>	<u>24</u>
	Average	137.7	168	574	34.42	42	143.5	4.92	6	20.5
Total Average		171.9	216.9	910	42.97	55.1	229.5	6.11	7.77	32.5

The above table shows the average amount of feeding stuffs consumed by the three animals, and by each, during the three periods of the trial. On an average each consumed 6.11# hay, 7.77# grain, and 32.5# sugar beets to give 1.62# daily gain.

Table showing the total amount of feed consumed for 100# gain, and cost of same.

Name of Steer.	Gain in 84 days per head.	Gain per head per day.	Total Cost of feed per head.	Grain for 100# gain.	Hay for 100# gain.	Roots for 100# gain.	Cost for 100# gain.
Wiggins	177#	2.11#	\$11.90	411#	320#	1827#	\$ 6.72
Roxie.	108	1.29	11.90	673	525	2994	11.00
Johnson.	<u>123</u>	<u>1.46</u>	<u>7.63</u>	<u>409</u>	<u>307</u>	<u>1400</u>	<u>6.12</u>
Average	136#	1.62#	\$10.28	498#	384#	2074#	\$ 7.88

These calculations were made according to the following prices:

	Per Ton.	Per Pound.
Corn Meal	\$14.00	.7 c
Oil Meal	25.00	1.25 c
Oat Meal	25.00	1.25 c
Wheat Bran	12.50	.625 c
Clover Hay	8.00	.4 c
Sugar Beets	2.50	.125 c

Table showing the Economic Value of the trial.

Name of Steer.	Weight at the beginning.	Cost of each.	Cost of Food during trial.	Market Price.	Profit or loss.
Wiggins	1553#	\$77.65	\$11.90	\$92.96	\$ 3.41
Roxie	1630	97.80	11.90	100.80	-8.90
Johnson	<u>965</u>	<u>57.90</u>	<u>7.63</u>	<u>56.70</u>	<u>-8.83</u>
Average	1383#	\$77.78	\$10.28	\$83.49	\$-3.77

The above table shows very plainly that this experiment was not a financial success. The purchase price of Roxie and Johnson was

6 cents per pound, and of Wiggins 5 cents. The selling prices were as follows: Roxie 6cents; Wiggins 5.40 cents; and Johnson 5.60 cents. Had the selling price per pound remained the same as the purchase price, Wiggins would have lost in cash \$5.90, instead of bringing \$3.41 profit and Johnson would have lost only \$2.53 against \$8.83 actual loss.

Table of Live and Dress Weights.

Name of Steer.	Weight in Buffalo.	Dressed Beef.	Dressed Fat Fat and Tallow.	Dressed Beef, Fat and Tallow %.	Dressed Beef %.
Wiggins	1660#	988#	145#	68.25#	59.51%
Roxie	1680	1083	145	73.93	64.46
Johnson	1050	630	80	67.61	60.00

Table. Per cent of Fat and Tallow in Relation to

Name of Steer.	Live Weight.	Dressed Beef, Fat, and Tallow.	Dressed Beef.
Wiggins	8.73	12.79	14.67
Roxie	8.62	11.80	13.30
Johnson	7.61	11.26	12.71

From Secretary's Coburn's "The Beef Steer" we learn that the best record for "Net Dressed Meat" given, is that of the pure bred Shorthorn Steer, Chaunce Kirk Livingston, which dressed 70%. Roxie dressed 73.93%, which, if not the best result on record, is at least very close to it.

While some experimenters try to show that it pays to feed steers after they are in good marketable condition, it is my opinion that in every case if you take all expenses into consideration, it will prove a losing investment. My experiment goes to show this fact, when I only take into consideration the cost of the food consumed, but perhaps the steers Roxie and Johnson, used in this experiment, are not fair examples, as Roxie, especially, was in the best of condition to be marketed when I began my work. While Wiggins was in good condition at the beginning, he was capable of decided improvement.

In order to make such an experiment as this of any value to the farmer or stock feeder, it should be conducted in such a manner that it could be duplicated on any farm, and all expenses should be taken into account. The expenses of feeding and caring for the animals have not been considered in this thesis, but they would add much to the total cost and hence show more than ever the impracticability of feeding such steers as were used in our experiment. Of course it is possible to add a fraction of a cent to the selling price per pound, by increasing the weight slightly. It is claimed by some that it pays to do this, but in the figures that they produce to establish their claim, they do not account for the time taken in feeding and caring for the animals, but say that the average farmer does not spend much time in doing this. We admit that the farmer does not have to spend as much time in caring for each animal as was spent in our experiment, for the reason that the farmer can have more animals to feed and thus reduce

the actual time spent on each animal. However, the farmer's time is worth something, even in the winter, and we believe that he can spend it more profitably than feeding steers already in good condition for the market.

The conclusions that I draw from this experiment are that it does not pay to feed steers after they are in good marketable condition. We also find that a standard ration is not necessary, and in fact does not produce any better, if as good, results as a cheaper ration, the cost of each being taken into account.

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