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# THE COST OF PASTURE

Adapted from a thesis entitled  
"An Economic Study of Pasture in New York" by H. M. Love  
and from Cost Account Records on New York Farms

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Pasture yielded about 600 pounds of digestible nutrients per acre at a cost of about \$3. The cost of 100 pounds of digestible nutrients derived from pasture was about 50 cents. The cost of nutrients in hay at \$10 per ton is \$1.00 per hundred pounds; and in a dairy ration at \$30 per ton nutrients cost \$2.00 per hundred pounds.

THE COST OF PASTURE

"The parts of the earth's surface used for crops of all kinds are only as large as the United States and the inhabited southern part of Canada."<sup>1</sup> Since most of the earth's surface is untillable, one of the primary problems of agriculture is how best to use the untillable land. Nutrients produced on untillable land and harvested by the animals themselves form the cheapest source of animal feed. Cattle and sheep industries are based largely on the use of untillable pasture. When tillable land is used for pasture, it competes with the untillable land of which the world has a surplus. It will not pay a farmer to use tillable land for pasture unless such land will furnish pasture feed that he cannot obtain from untillable land. Even though the tillable land may produce more nutrients in the form of pasture than in harvested crops, still the harvested crop will usually be worth more since it is the scarce article in the world's economy.

Pasture is one of the great natural resources of the northeast. Feed which the cow harvests herself costs about half as much as hay, and one fourth as much as purchased cow feed. Most northeastern dairymen find it necessary to feed some grain or roughage in the barn during the pasture season. Some supplemental feeding is necessary for high producing cows under the best of pasture conditions, but on most farms better pastures would materially reduce the amount of this feeding. A good New York dairy pasture has feed available throughout the season especially in July and August, herbage close enough together so that the cow can gather about 150 pounds in a day, and herbage which is palatable and nutritious.<sup>2</sup> This report gives some

1. Huntington, Williams and Van Valkenburg. "Economic and Social Geography". Wiley. Page 333.
2. Johnstone-Wallace, D. B., "Pasture Improvement and Management" Cornell Extension Bulletin 393.

information on costs and returns from New York pastures which should be helpful to individual farmers in planning their pasture programs.

#### SOURCE OF DATA

In the summer and fall of 1936, pasture records were secured from 576 New York dairy farmers; approximately 60 in each of ten areas (figure 1). These records are for the 1935 pasture season.<sup>1</sup>

The information secured in this special study of pasture costs and returns has been supplemented by information obtained from New York Cost Account farmers.

#### DAYS ON PASTURE

Dairy cows spent an average of 159 days on pasture (table 1). They were turned on pasture May 19th and stabled for the winter October 24th. Although these average dates are for 1935, most of the farmers said that 1935 was a typical year in so far as pasture was concerned.

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1. This study was made possible through a cooperative agreement between the Bureau of Agricultural Economics in the United States Department of Agriculture, and the Department of Agricultural Economics and Farm Management, New York State College of Agriculture at Cornell University.

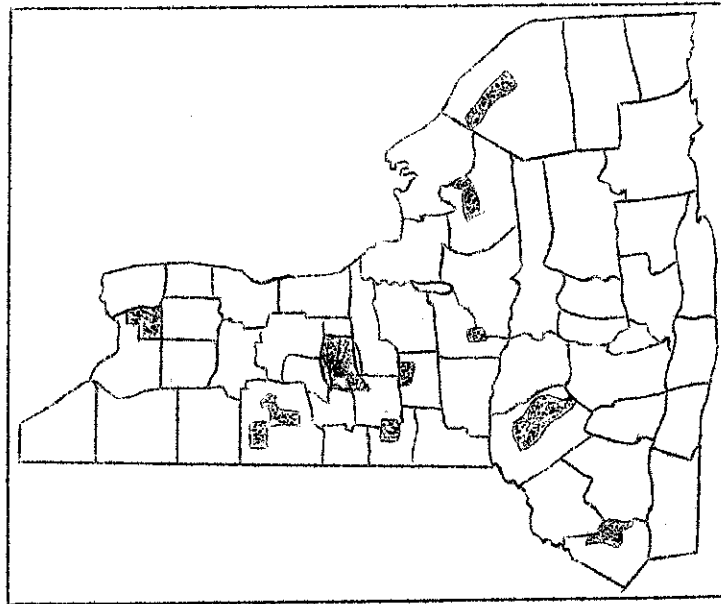


Figure 1. LOCATION OF AREAS STUDIED

Records of the cost and use of pasture were obtained from about 60 farms in each of these ten areas.

TABLE 1. USE OF PASTURE BY DAIRY COWS IN DIFFERENT AREAS  
576 New York Farms, 1935

Area	Number of farms	Date on pasture	Date off pasture	Days on pasture
Cortland	52	May 23	Oct. 18	149
Steuben	57	May 16	Oct. 28	166
Tioga	60	May 17	Oct. 27	164
Delaware	57	May 18	Oct. 25	161
Orange	54	May 16	Oct. 25	163
Erie	58	May 29	Oct. 21	146
Seneca	60	May 19	Oct. 26	161
Lewis	60	May 21	Oct. 23	156
Madison	61	May 18	Oct. 21	157
St. Lawrence	57	May 17	Oct. 24	161
Total or average	576	May 19	Oct. 24	159

The pasture period for dairy cows was longest in Steuben County, averaging 166 days. This was probably due to the extensive system of dairy farming and scarcity of barn feed. In Erie County, cows were pastured 146 days, which is the shortest period for any area. This was probably due to the relative scarcity of permanent pasture and the need for maintaining an even production of milk when selling on a base-surplus plan.

Heifers averaged 167 days on pasture. They usually went on pasture a little earlier than cows and remained out later in the fall. Sheep were pastured for an average of 196 days, which was the longest period on pasture for any class of livestock. The average date of turning sheep out was April 30, and the average date of bringing them in was November 11.

#### PASTURE USED BY COWS

Cows used an average of about two and three-quarters acres of pasture (table 2). An acre of pasture was considered to be the equivalent of open pasture after deducting the farmer's estimate of waste caused by woods, rock outcrop, stone, bushes, swamp or swale. "Aftermath", which refers to pasturing the second or third growth on hay fields, was converted to pasture equivalent on the basis of the number of days it was used.

The importance of untillable land as pasture is indicated by the relative importance of permanent pasture on these farms. Sixty-nine percent of the permanent pasture had never been plowed.

Cows in Steuben, Tioga, Delaware and St. Lawrence Counties used more than 3 acres per head. The smallest acreage of pasture per cow was in Erie County, averaging slightly less than two acres.

TABLE 2. ACRES OF OPEN PASTURE EQUIVALENT PER COW,  
576 New York Farms, 1935

Area	Acres per cow			Total
	Permanent	Rotation	Aftermath	
Cortland	2.34	0.05	0.07	2.46
Steuben	3.23	0.34	0.09	3.66
Tioga	3.09	0.24	0.25	3.58
Delaware	2.87	--	0.37	3.24
Orange	1.87	0.08	0.27	2.22
Erie	0.59	0.78	0.58	1.95
Seneca	1.26	0.95	0.48	2.69
Lewis	1.45	0.79	0.52	2.76
Madison	1.52	0.52	0.03	2.07
St. Lawrence	2.71	--	0.47	3.18
Average of all areas	2.09	0.38	0.31	2.78

Cropland used for pasture in 1935, referred to as "rotation pasture", was most important in the areas studied in Erie, Lewis, Madison, and Seneca Counties.

Only 30 per cent of the acreage of cow pasture in the area surveyed in Erie County was permanent, 40 per cent was rotation, and 30 per cent was aftermath. Owing to high land values, the relative scarcity of permanent pasture and the practice of using a large proportion of the land for hay and grain, most Erie County farmers fenced practically all fields so that aftermath could be used when available.

Through the Black River valley in Lewis County, the topography was such that cheap permanent pasture was not equally available to all the farms. Those farms located along the extreme west side of the valley usually pastured the steep rise to the Tughill Plateau. The others faced the problem of either setting aside fertile valley land for permanent pasture or practicing rotations which included pasture.

Hill land in the Stockbridge valley section of Madison County was generally as productive as the valley land. In addition, some of the hill soils were so well drained that they did not hold pasture grasses in dry seasons. As a result of these conditions, about one-fourth of the pasture was rotated. Permanent pasture was usually on land which was wet, excessively steep, or irregular.

Aftermath was an important type of cow pasture in 7 of the areas studied. Erie County farmers were more dependent on aftermath pasture than farmers in any other area. The proportion of aftermath was least in the Stockbridge valley section of Madison County since most of the hay in that area is alfalfa.

COST OF OWNING PASTURE

The average cost per acre of owning pasture was \$3.14 per year for all areas (table 3). Of this amount, \$1.20 per acre was chargeable to fence costs through interest on capital in fences, and repairs and depreciation. The balance of \$1.94 was charged to land costs through interest on capital, taxes, and improvements such as cutting brush, applying manure, and fertilizing.

TABLE 3. COST PER ACRE OF PASTURE OWNED \*  
576 Farms in New York, 1935

Fences:	
Interest on \$4.80 at 5%	\$0.24
Depreciation and repairs	0.96
Total	\$1.20
Land:	
Interest on \$23.40 at 5%	\$1.17
Taxes	0.45
Improvements	0.32
Total	\$1.94
Total cost per acre	\$3.14

\* Includes only permanent and rotation pasture. Does not include aftermath.



During the year covered by this study pasture improvement was done on only a very small proportion of the permanent pasture acreage. The most common practice was cutting brush which was done on about one acre out of every forty of open permanent pasture. Slightly more than one-half of the total expense for pasture improvement on these farms was for manure. About one out of every sixty acres of open permanent pasture was manured. This study covered a period prior to the Agricultural Conservation Program under which the Federal Government pays a considerable proportion of the cost of certain pasture improvements.

The cost of \$3.14 per acre of pasture was only 4 cents more than the cost on farms keeping cost accounts in 1939 (table 4). About three-fourths of the land used for pasture on these farms was classified as permanent. This land was valued at \$14 per acre. Interest and taxes amounted to 95 cents and pasture improvement to 60 cents an acre. The average cost of all fencing charged to animals was 87 cents per acre of pasture. Pasture and fence costs amounted to \$2.42 per acre for the permanent pasture as compared with a little more than twice this amount for the crop land used for pasture.

TABLE 4. ANNUAL COST PER ACRE OF OWNED PASTURE LAND  
4,173 acres on 71 New York Cost Account Farms, 1939

	Permanent pasture	Rotated pasture	All pasture
Per cent of total acreage	77	23	100
Cost per acre of pasture for the year:			
Interest and taxes	\$0.95	\$2.73	\$1.37
Grass seeding	.04	.72	.20
Fertilizer	.09	.11	.09
Lime	.03	.07	.04
Manure	.24	.82	.37
Labor	.19	--	.15
All else	.01		.01
Total	\$1.55	\$4.45	\$2.23
Average cost per acre for fences	.87	.87	.87
Cost per acre for pasture and fences	\$2.42	\$5.32	\$3.10

It cost \$6.53 per acre per year to own pasture in Erie County (table 5). This high cost was owing to a combination of high priced pasture land much of which was cropland rotated in pasture, and the extensive use of woven wire fences. The fields were usually accessible through a central lane from the barn. This was necessary in order to utilize the various fields in rotation and aftermath pasture. It was also necessary to keep fences in better condition than in most other areas since practically all pasture bordered crops.

It cost only \$1.70 per acre to own pasture in Delaware County and keep it fenced. Only a small portion of the pasture land bordered cropland, so cheap fences were used. Pastures were frequently not fenced across the back, which was densely wooded and steep.

TABLE 5. COST PER ACRE OF PASTURE OWNED BY AREAS\*  
576 Farms in New York, 1935

Area	Fence	Land	Total
Cortland	\$0.83	\$2.05	\$2.88
Steuben	0.89	0.97	1.86
Tioga	0.89	1.12	2.01
Delaware	0.47	1.23	1.70
Orange	1.29	2.52	3.81
Erie	3.23	3.30	6.53
Seneca	1.59	2.37	3.96
Lewis	0.87	1.51	2.38
Madison	1.36	2.79	4.15
St. Lawrence	0.62	1.48	2.10
Average of all areas	\$1.20	\$1.94	\$3.14

\* Includes only permanent and rotation pasture. Does not include aftermath.

COMPARATIVE COST OF OWNING AND RENTING PASTURE

The average cost of renting an acre of pasture in 1935 was only \$1.16, which was only 37 per cent of the cost of owning it. In terms of animal units pastured the carrying capacity of the rented pasture was about the same as the

owned pasture. However, rented pasture was probably not as good as the home pasture. It was usually used for young stock and dry cows. This stock is able to get along on poorer pastures than are milking cows. It is not often possible to rent pasture which is convenient to the buildings. Hence rented pasture is seldom used for the milking cows.

COST OF FEED PER COW

The cost of pasture on cost account farms was about \$9 per cow for the season, or 9 per cent of the feed cost (table 6).

TABLE 6. COST OF PASTURE AND BARN FEED  
New York Cost Account Farms, 1937-39

	1937	1938	1939	Average 1937-39
<u>Cost per cow</u>				
Pasture	\$9.52	\$8.97	\$7.40	\$8.63
Barn feed	89.90	81.16	85.83	85.63
Total feed	\$99.42	\$90.13	\$93.23	\$94.26
<u>Percent of cost of feed</u>				
Pasture	10	10	8	9
Barn feed	90	90	92	91
Total	100	100	100	100

PASTURE YIELDS

As an example of the calculation of pasture yields, the record of a Lewis County farm has been summarized. This farmer had 33 Holstein cows on pasture for 164 days. Measurements of their heart girth indicated that they weighed about 1100 pounds per cow. During the pasture season these cows produced 153,287 pounds of 3.2 per cent milk.

An 1100 pound cow needs 8.61 pounds of digestible nutrients per day to maintain her body weight, according to feeding standards.<sup>1</sup> To produce one pound of 3.2% milk requires 0.286 pounds of digestible nutrients. The pasture yield was determined as follows:

Maintenance of 33 - 1100 pound cows for 164 days	46597 lbs. of T.D.N.
Production of 153,287 pounds of 3.2 milk (production May 15 to October 25)	<u>43840 lbs. of T.D.N.</u>
Total requirement <sup>2</sup>	90437 lbs. of T.D.N.

Of this total requirement, part was derived from supplement:

9.5 tons of dairy ration (1460 lbs. T.D.N. per ton)	13870 lbs.
20. tons of green corn fodder (326 lbs. T.D.N. per ton)	<u>6520 lbs.</u>
Total requirement derived from supplement	20390 lbs.
Balance derived from 77 acres of pasture	70047 lbs.

The average yield of digestible nutrients per acre of pasture was 910 pounds, or the equivalent of about 20 bushels of corn or 1800 pounds of hay.

No data were obtained on the change in weight of cows during the pasture season. If a herd lost weight, this method of calculation would overstate the amount of feed derived from pasture. In the case of a gain in weight, this method would understate the yield.

Since the yield of pasture is arrived at by subtracting the barn feed from the total feed requirements, the total yield of pasture is understated by the amount of any waste in barn feed. A comparison of experimental feeding standards with farm practices indicates that the waste is considerable, especially of roughage.

1. Computations involving total digestible nutrients are based upon the feeding standards in "Feeds and Feeding" (Morrison, F. B., Feeds and Feeding, 20th edition, Morrison Publishing Co., Appendix tables I and III, 1936).
2. The letters T.D.N. refer to total digestible nutrients. "Nutrient requirements" as used here means the amount required to maintain the cows' weights and to produce the amount of milk which was actually produced. The cows could have used more feed and produced more milk.

Some pastures were undergrazed for part of the season. The yield as calculated in this study includes only the herbage consumed by the animals. Feed which was not eaten was not included in the yield.

The yield of digestible nutrients per acre of cow pasture averaged 594 pounds for all areas surveyed (table 7). This would be equivalent to about 1200 pounds of hay. The range in area averages was from less than 500 pounds of digestible nutrients per acre in Delaware, Steuben, and Tioga Counties to about 800 pounds in Madison County. On 10 per cent of the farms studied the yield exceeded 1039 pounds per acre.

The amount of total digestible nutrients derived per cow from pasture varied from 1190 pounds in Erie County to 1779 pounds in Tioga County, and averaged 1605 pounds for all areas.

TABLE 7. TOTAL DIGESTIBLE NUTRIENTS DERIVED FROM COW PASTURE  
576 New York Farms, 1935

Area	T.D.N. per cow pastured	T.D.N. per acre of pasture
Cortland	1438	586
Steuben	1748	477
Tioga	1779	497
Delaware	1519	469
Orange	1522	685
Erie	1190	610
Seneca	1662	619
Lewis	1774	644
Madison	1652	799
St. Lawrence	1769	556
Average of all areas	1605	594

MONTHLY VARIATIONS IN PASTURE YIELDS

Pasture yields per cow day varied widely between areas studied and by months within each area (figure 2, and table 8). In each area pasture yields were highest in June. In eight of the ten areas, September yields were lowest. In Cortland and Tioga Counties yields were lowest in August.

TABLE 8. AMOUNT AND SOURCE OF FEED DURING THE PASTURE SEASON  
576 New York Farms, 1935

Area	Pounds of T.D.N. used per cow day				Pounds of T.D.N. derived from pasture per cow day			
	June	July	August	September	June	July	August	September
Cortland	17.4	13.8	12.4	12.3	14.5	8.6	6.8	8.1
Steuben	16.9	13.7	12.9	12.2	14.7	10.9	9.8	8.3
Tioga	17.3	13.4	11.3	11.8	15.4	10.9	8.1	8.2
Delaware	16.1	13.0	11.3	11.3	13.4	10.3	8.0	7.2
Orange	16.0	12.5	11.7	12.8	13.1	9.0	7.1	6.9
Erie	13.5	13.7	13.3	12.3	10.8	9.3	7.5	5.1
Seneca	17.6	14.4	13.7	12.7	15.6	11.9	10.4	7.2
Lewis	17.7	16.1	15.2	13.5	14.9	12.6	11.3	9.3
Madison	18.3	14.3	12.9	11.9	16.3	11.2	8.0	6.0
St. Lawrence	17.3	15.3	13.1	11.6	15.9	13.5	10.3	8.0
Average of all areas	16.8	14.0	12.8	12.2	14.5	10.8	8.7	7.4

The quantity of digestible nutrients used per cow day decreased from June through August because of the decreased average daily milk production per cow. Some of this decrease was a direct result of shortage of feed when the pastures dried up. The exception in Erie County is explained by the fact that market regulations encouraged farmers to maintain a comparatively level production. Although less feed was used in August than in June, pasture supplied a smaller proportion of the total feed in August than it had in June. As the summer progressed it became necessary to feed an increasing amount of barn feed.

The decline in quantity of nutrients derived per cow day from pasture

during June and July was greatest in Cortland County, falling from 14.5 pounds in June to 8.6 pounds in July. For the 4-month period, the decline was greatest in Madison County, where the quantity of nutrients derived from pasture per cow day fell from 16.3 pounds in June to 6 pounds in September, a decrease of 10.3 pounds. Aftermath pasture was used less here than in any other area and the soils pastured were, in many cases, excessively drained.

The yield of digestible nutrients per cow day appears to be a reasonable approximation of the growth pasture grasses made during the season studied. Grass was most abundant in June, but diminished during the remainder of the season, except in Cortland and Tioga Counties during September.

An especially good opportunity to lower feed costs by having better pastures is in areas like the one studied in Erie County, where a large proportion of the feed is barn feed, even in the early summer.

FIGURE 2. AMOUNT AND SOURCE OF FEED DURING THE PASTURE SEASON  
Pounds T.D.N. per cow day 4 Counties, 1935

