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THESIS
ON THE DAILY YIELD OF
FAT AND MILK
H. E. VAN NORMAN

1897.

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THESIS
ON
CAUSES INFLUENCING THE DAILY YIELD OF FAT AND MILK.

By H. H. VanKorssen.

Michigan Agricultural College, 1895.

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THIS

Thesis

On Causes Influencing the Daily Yield of Fat and Milk.

The progress of Scientific Agriculture in the United States has been very rapid during the last twenty years. The establishment of experiment stations and the publication of their bulletins has and is bringing the practical man and the theoretical, scientific man to a better understanding of their relation; of the part each must play in the others field of labor.

Science has been defined as "the truth." The scientific man or method, therefore, must be the truthful man or method. They are seeking for the truth, the "why"; that rules and laws may be established that will always hold true under the same conditions, and thereby be helpful to the average worker, the man who has neither time nor training to deduct the law, but could use it to advantage, if established.

While this is true, there is probably no branch of investigation where, as yet, the results warrant so few "laws" or positive assertions as along the line of influence of feed on the production of milk and butter. The feeder of steers, hogs, and birds labors under much more exact conditions than the milk and butter producer.

There is much less individual variability in the tendency to fatten, than there is in the production of milk and butter. The hog is so constituted that the feeder may select two pens of ten or twenty each, of similar age, weight, and breeding, and treat them alike except the feeds and at the end of the feeding period the probability is that he will have a uniformity in results, which will warrant him in forming

a conclusion as to their relative value as fat producers.

Not so the feeder of dairy cows: he has a more intricate problem. In an average sized herd it is seldom that any two cows will eat the same amount of food, eat it with the same avidity, or yield a uniform amount of milk for the food consumed. One has a voracious appetite, another a dainty one; one, a phlegmatic temperament which is seldom alarmed or annoyed, while the next is startled and worried by every unusual noise or occurrence. In fact the idiosyncrasies of the cow often seem to neutralize the effect of feed.

There has been a marked improvement in methods of experimentation. The approximation of the churn has given place to the exactness of the Babcock test, thus giving the cow credit for all the butter she puts in the milk, instead of only that amount which man is able to get out of it by means of churn, etc.

But this exactness in the results of feeding experiments ^{has} not yet been attained and at present seems a long way in the future. Meantime, the onslaught against the wall of mystery and uncertainty continues. Here and there a crack is made which sooner or later will result in an opening enabling us to see the knowledge lying beyond this seemingly impenetrable wall.

With the hope of deepening some one of these cracks, if only an imperceptible amount, the observations which are here recorded, were made.

The animals selected from the college herd as the basis of this study were as follows:-

Aida 2d. C112 A.S.C.C. Born Jan.12, 1902. Dropped her last calf Nov.2,06.

College Houwtje. 28232 H.F.H.B. Born Apr.13,1881. Calved May 8, 1886.
 Cara, 8393 R.P.C.C. Born July 27,1883. Calved Dec.30, 1886.

Aida II and Cara were fed three times a day and College Houwtje was fed but twice. On pleasant days she (College Houwtje) was turned out from about 10 A.M. to 2.30 P.M.; on stormy days she was only out long enough to drink. The other two were turned out at the same time, but were put in the stable and fed at noon and if a pleasant day, turned out for water again in the afternoon.

During the first six weeks they were fed a practically constant ration as follows:-

	Silage.	Hay.	Roots.	Grain.
Aida II 3 Feeds.	45 $\frac{1}{2}$ "	2 $\frac{1}{2}$ "	15 $\frac{1}{2}$ "	15 $\frac{1}{2}$ "
College Houwtje. 2 Feeds.	50 $\frac{1}{2}$ "	15 $\frac{1}{2}$ "	C.S. (corn stalks)	10 $\frac{1}{2}$ "
Cara. 3 "	30 $\frac{1}{2}$ "	2 $\frac{1}{2}$ "	15 $\frac{1}{2}$ "	15 $\frac{1}{2}$ "

The grain throughout the period was the following combination mixed by weight:- 1 part Oilmeal, 2 parts Corn Meal, 3 parts Bran, and 4 parts Oats.

The effort was made to feed as nearly a constant quantity as possible and have external conditions as uniform as practicable, that the variation in milk and fat yielded, due to that cause might be eliminated and other variation noted.

Explanation of Chart.

Lines 1, 2, and 3 represent graphically the number of days that College Houwtje, Aida II, and Cara respectively, had milked since calving at the close of the period of observation. (Mar.24,1887) Line 4 shows the portion of the period of lactation covered by this observation. Line

5 is the number of pounds of dry matter consumed each day by College Houwtje. Line 6 is the same for Aida II. Line 7 shows the daily variation in Cara's milk yield. Line 8 shows Cara's consumption of dry matter. Line 9 shows the daily variation of milk yield of College Houwtje.

" 10	"	"	"	"	"	"	"	"	Aida II.
Line 11	"	"	"	"	"	fat	"	"	"
" 12	"	"	"	"	"	"	"	"	Cara.
" 13	"	"	"	"	"	"	"	"	College Houwtje.
" 14	"	"	water drunk by College Houwtje.						
" 15	"	"	"	"	"	"	"	"	Aida II.
" 16	"	"	"	"	"	"	"	"	Cara.

Table I gives the yield of fat, the dry matter consumed, and the pounds of dry matter to make pound of fat, by weekly periods during the last seven weeks when the feed was weighed each day.

It is noticeable that the pounds of dry matter per pound of fat is reasonably constant throughout the period, for Aida II and College Houwtje, while Cara required an increasingly large amount of food each week over that of the preceding. For the week ending March 10, Aida required nearly 2% more of dry matter per pound of fat than for several weeks preceding, or even the succeeding weeks. The falling off in the yield of fat, might be charged to the change of milkers. But a reference to lines 6 and 11 on the chart, shows that the consumption of food fell off before the decrease in the yield of fat. This suggests the possibility that there was some influence at work which affected the appetite. Some physical indisposition, and the falling off in the fat yield and also the milk (see line 7) was a result due to this condition rather

than to the change of milkers.

TABLE I.

Weekly yield of fat and consumption of dry matter.

Aida II.

Week ending.	Fat.	Dry Matter.	Dry Matter to 1% Fat
Feb. 10,	8.02	196.22	24.46
" 17	8.34	193.80	23.33
" 24	8.64	193.80	23.01
Mar. 3	8.37	194.84	23.23
" 10	6.73	172.72	25.66
" 17	6.90	164.95	23.91
" 24	7.50	180.17	24.02

College Houwtje.

Feb. 10,	4.05	199.03	49.13
" 17	4.03	202.60	49.66
" 24	4.16	195.63	47.74
Mar. 3	4.32	203.73	47.83
" 10	4.26	196.03	46.02
" 17	4.24	203.36	47.96
" 24	4.33	206.83	47.77

Cara.

Feb. 10,	8.16	170.66	20.86
" 17	8.39	173.90	20.73
" 24	8.14	170.03	20.89

Table I Continued.

Cara. Week ending.	Fat.	Dry Matter.	Dry matter per lb Fat.
Mar. 3	8.02	169.24	21.10
" 10	7.85	170.03	21.66
" 17	6.33	157.90	22.25
" 24	6.73	170.22	25.13

Individuality of the cows.

This is the point in converting feed into butter where the skill of the feeder shows itself, i.e. in his ability to recognize these variations and deal accordingly. The three cows under consideration are good examples of this individuality.

On only four days in thirteen weeks is there a rise in the milk yield of all three cows. These were Jan.20, 23, Feb.16, and Mar.14. On some of these dates the rise is so slight as to suggest a doubt as to whether the same influences caused the increased yield in each case. On other days, two cows show an increased yield, while the third has fallen off. But it is not the same two, as Jan.14 Cara and College Houwtje increase one pound each while Aida falls off in yield. On the 30th, Aida II and Cara show an increase of nearly two pounds over the previous days' yield, while College Houwtje falls off, but yields an increase the two succeeding days while Aida II and Cara fall off the same two days. On Jan.25, 29, Feb.10, and Mar.3 there is a fall in the yield of milk from all three. On Jan.25 there is a decrease of fat yield by Aida II and College Houwtje but Cara's is more than the preceding day. On the 28th there is a smaller fat yield by each of the three.

But on Feb. 10th there is practically no variation. On Mar. 3 Aida II falls off, Cara holds her own, and College Houwtje shows the most marked increase of any day in four weeks.

From this chart we cannot conclude that the same influences which cause the decreased milk yield affect the same result on the fat. Nor can the statement be made and proved that the fat is less variable than the milk; on Jan. 14, Cara and College Houwtje give more milk, Cara less fat and College Houwtje the same, that they did the preceding, while Aida gives less milk and more fat. Throughout the period there is this constant evidence of lack of variation due to a general rule, an influence having a similar effect on all three cows.

The marked uniformity in the yield by College Houwtje may be characteristic of the cow and may also be due to the fact that it is late in her period of lactation and that her yield is rather a minimum one.

None of the cows show any variation which might reasonably be laid to the change of milkers on March 2d.

It is unfortunate that a change from three to two feeds a day was made with Cara and Aida II on March 11th as it adds a very disturbing factor to the problem, the cause of the marked rise and decline in Cara's yield between Mar. 5 and 14th.

Consulting the weather records kept by Dr. Kedzie's department, we find the coldest weather of the period of this experiment was from the 23d to the 27th of January, when at no time did the thermometer register above 17 degrees and two days it did not go above five. The minimum during this time varied from -1 on the 27th to -17 on the 24th. The fat

yield during this time, by none of the cows, shows any unusual variations which might be charged to the influence of the weather. Cara makes her highest milk yield on the 28th, which was a warm day ^{compared} with the several preceding. It was followed by two or three days when the mercury was down close to the zero mark.

While an effort was made to note the time the cows were out doors, and subject to cold, raw wind or warm, bright weather, the demands of studies and class work prevented the following out of these observations with sufficient detail and accuracy to warrant inserting them here.

To sum up in a few words; these observations seem to emphasize the fact that each cow's daily variation of fat and milk yield are influenced by other things than feed; that each possess an individuality which responds differently to the same feed, and differently on succeeding days though the feed is the same in kind, quality, and quantity.

On only two days do these cows all seem to respond to a common influence. The first was on Jan 20th, but no apparent cause was noticed. On the 28th the rise of some 15 degrees in the temperature, after a spell of severe weather, is suggestive. But on Feb. 16th there is no such condition. The fact is emphasized that after eliminating all external conditions, the largest part of the problem is still left for solution. When the food does reach the stomach, we don't know what its influence is on the ^{mammary} ~~mammary~~ glands or how it is exerted or how quickly the effect may be noticed. Here is the mystery, the solution of which we are seeking.

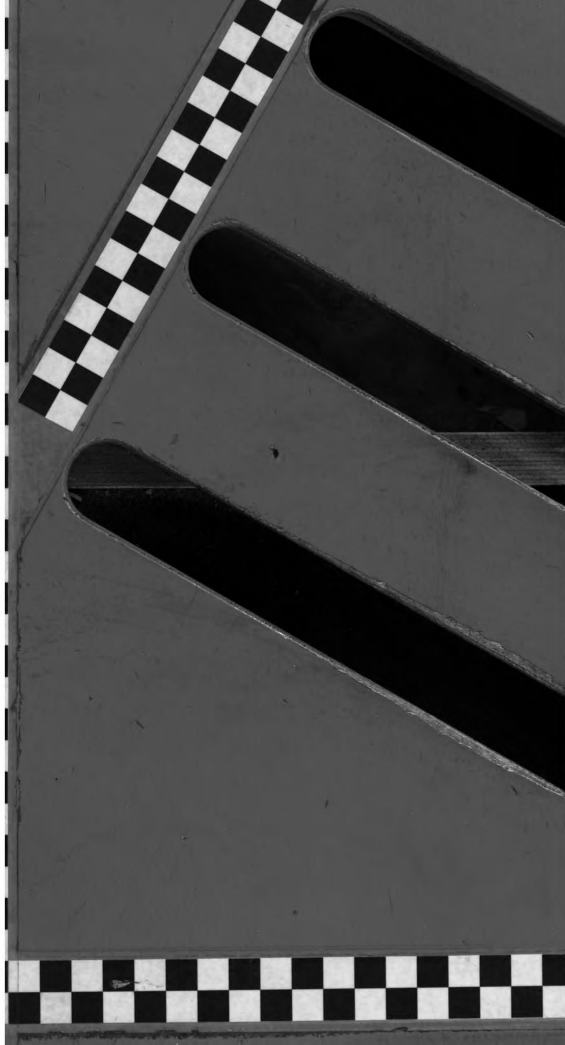
Farther observations along this line with a group of cows which are more nearly uniform as to period of lactation and daily food requirement, where all conditions man can control are as uniform as possible, and a keen and more constant observation of those influences beyond his control

should yield interesting data.

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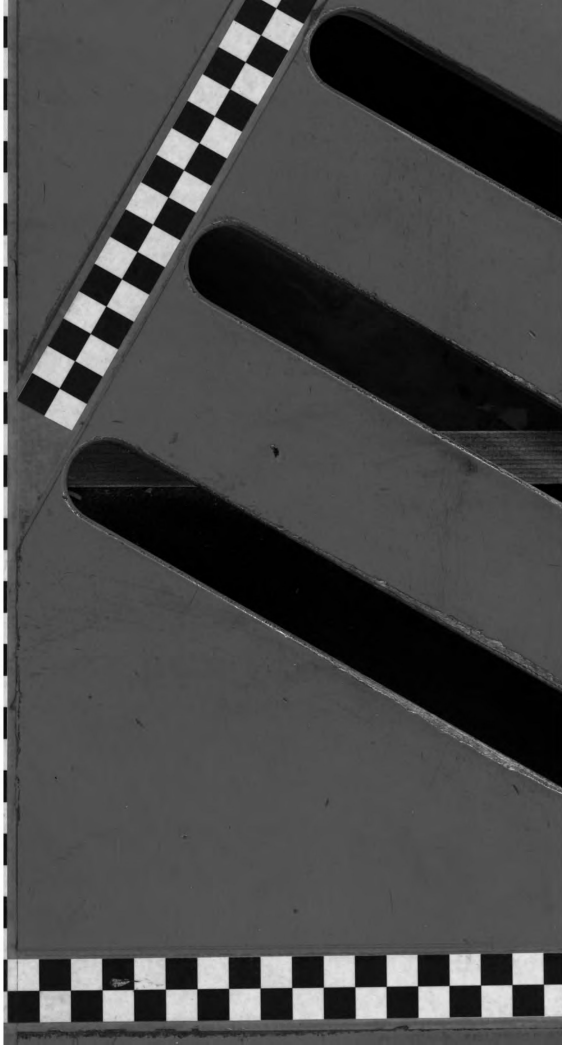




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