

SELF FEEDER FOR DAIRY COWS

Major Thesis

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By

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Self Feeder for Dairy Cows.

Self feeders have proven very successful for feeding swine of various ages where the maximum gains are desired and where the greatest gains are desired with the smallest amount of feed in the least number of days. Prof. Evvard of the Iowa Experiment Station, in discussing the Free-choice system of feeding swine gives the following: -

"A self feeding scheme is appropriate and applicable to swine husbandry.

The natural way of eating is the self-feeding way.

Extraordinary gains may be made with swine by constantly allowing them to select their own feeding stuffs, or when they are permitted to balance their own ration. Some judgment and experience are of advantage in determining which feeds to give.

Pigs fed in dry lot according to "Free choice" feeding weighed in 1914, 316 pounds when 248 days old.

The self-fed pigs did not select their crude nutrients in accordance with the requirements of either the Illinois standard of Deitrich or the Wolff-Lehmann standard. They "blazed a trail" largely their own.

The palatability of feed is relative and changeable, being a matter of appetite satisfaction; the ration which is palatable today may be unpalatable on the morrow or months hence.

Appetite seems to be governed to a considerable extent by the bodily needs. Since it changes daily as the animal develops, grows and fattens.

Pigs suddenly allowed a variety of new feeds according to the self-feeding scheme, seem to undergo a short period of readjustment. It takes a little time, presumably, for pigs to gain experience, that is, to learn what feeds best satisfy their appetite.

The possibility that the appetite of swine may be a reliable guide as to bodily needs opens an enticing, promising field for research."

Weaver, of the Missouri Experiment Station, makes the following conclusions:

"Fattening hogs fed with a self-feeder gain more rapidly than when hand-fed in the usual manner.

There is no difference in the economy of gain which can be accredited to the method of feeding. This statement applies only to the amount of feed necessary to produce a given amount of pork. If the self-feeder decreases the amount of labor involved, then it would be a factor in cheapening the cost of production.

It is apparent that the advantage which the self-feeder method will have in any specific instance over hand-feeding, in regard to rate of gain, will depend to a large degree upon the ability of the person doing the hand-feeding to feed so that the hogs will consume a maximum amount of feed. In practically all cases, when the self-fed hogs gained more rapidly than those which were hand-fed, they also consumed more feed.

In a similar manner the relative efficiency of the self-fed ration and the same feeds hand-fed, will depend upon the ability of the feeder to properly combine the feeds used."

Prof. Mumford, of Illinois makes the following conclusions concerning self-feeders for fattening beef cattle:-

"Mixed feed, when fed through a self-feeder, is especially advantageous for accustoming cattle to a heavy grain ration in a short time.

By the use of mixed feed and the self-feeder, the necessity of a

skilled feeder is reduced.

Cattle fed chopped hay mingled with concentrates through a self-feeder will consume larger quantities of feed than when the same feeds are fed separately at regular periods twice per day.

By chopping the hay, mingling it with the grain and feeding through a self-feeder, more rapid gains were secured and at slightly less cost per pound than when these same feeds were fed separately twice per day.

The larger gain resulted in better finish, 15 cents per hundred weight higher selling price, and \$2.05 per steer more profit, (not including pigs)."

From the above you will note that the self-feeder has proven very satisfactory with swine and fairly satisfactory with the fattening of beef cattle. The following experiment was an attempt to find a satisfactory method of feeding high producing dairy cows. An experiment was planned to study the effects of feeding dairy cows by the "free-choice" system. Self feeding racks were built for the silage and the cows were fed all of the corn and silage that they would eat. The silage racks were filled once each day with an amount that would last the cows during the next 24 hours and not have any waste from spilling. A self-feeder for the concentrate was built very much on the plan used for swine, only adapting the height and dimensions suitable for the cows. This type of feeder did not prove satisfactory for such concentrates as cottonseed meal, linseed meal, and peanut meal would absorb some moisture, even when the self-feeder was under a good shed and well protected from the elements, causing the concentrate to form an arch above the opening where the feed should gradually feed out, making it impossible for the cows to get the feed desired. This difficulty was overcome by making a feeder as illustrated below.

Note:

On account of the cut of the self-feeder having been sent to the printer, it is impossible to insert it here.

You will note that the feeder is built V shaped and about 10 feet long, being divided into five separate compartments so that each concentrate was placed in a compartment by itself and the cows could select the feed most desired. Each compartment has a sliding door at the bottom so as to regulate the size of opening for the different feeds. The size of the opening varied from .5 inch to 1.5 inches depending upon the feed. Corn meal and bran required an opening of only .5 inch while peanut meal, cottonseed meal, and linseed meal should have openings of from 1.25 to 1.5 inches. The feeder was supported by a single rod at each end, thus allowing the feeder to swing free and particularly the bottom. Under the feeder was an ordinary feed trough with a "bump board" 2.5 inches back of the bottom of the V shaped hop or when hanging naturally. When the feed does not come down into the feed trough the cows will work at the V shaped hopper and in less than 24 hours will learn that by pushing or bumping the V shaped hopper with their heads they will knock it back against the "bump board" and the jar will cause the feed to work down as it should, but will not cause the feed to come down into the feed trough too fast.

Table I. Giving description of cows used on self-feeder experiment.

Name of Cow	V.P.I. Narci Eminent.	Petia Emin- nent.	V.P.I. Lady Johanna Dekol.	Dione Dekol.
Herdbook No.	237793	237792	201397	76684
Breed.	Jersey	Jersey	Holstein- Friesian.	Holstein- Friesian.
Advanced Registry Number.	1933	1934	38673	12932
Advanced Registry Records, Age -	2y.1m.0d.	2y.3m.0d.	2y.3m.17d.	5y.10m.15d.
Milk -	5,528	6,050	13,381	15,822
Fat -	318	381	504	578
Age -	4y.2m.0d.	3y.6m.03.		8y.4m.26d.
Milk -	7,035	6,052		17,992
Fat -	413	387		773
Age at last freshening,	7y.2m.17d.	7y.5m.6d.	4y.0m.12d.	12y.1m.12d.
Date of last freshening,	6-1-16	11-2-16	11-29-16	10-9-16
Number of days in milk previous to be- ginning of test, Feb. 17, 1917.	253	102	75	125
Total milk produc- tion to Feb.17, '17	5887	2698	4297	5024
Total fat production to Feb. 17, 1917.	303.9	149.8	134.9	151.7
Average daily milk pro- duction to 2/17/17.	23.2	26.5	57.3	40.2
Average daily fat pro- duction to 2/17/17.	1.20	1.47	1.80	1.21
Weight of cow, Feb.7/17.	850	915	1360	1320
Date of Breeding.	Jan. 1, '17.	May 15, '17.	Feb.24, '17.	

The cows used on this experiment were all Register of Merit or Advanced Registry cows with yearly records. It can be safely said that these cows were much above the average for three of them had two yearly records and the fourth cow was only a young cow in second lactation period during this experiment and later qualified for her second yearly record. These cows were in good milking condition, the two Jersey cows had averaged 23.2 and 26.5 pounds of milk for 253 and 102 days respectively, and the two Holstein-Friesian cows had averaged 57.3 and 40.2 pounds of milk for 75 and 125 days respectively, previous to the experiment.

Table 2. Showing Feeds Fed, Average amount of Feeds Consumed, per Head Per day for Periods of Four Weeks.

Periods of four weeks each.	1 Pounds.	2 Pounds.	3 Pounds.	4 Pounds.	5 Pounds.
Corn silage	45.36	40.12	41.83*	Blue grass	Blue grass
Cracked corn.	5.16	5.00	7.10	6.57	8.93
Wheat bran.	5.15	9.64	4.52	4.50	3.60
Cottonseed meal.	.464	.714	.926	1.214	2.700
Linseed meal.	3.73	5.00	6.95	Discontinued.	Discontinued.
Peanut meal.	.250	.256	.300	.414	3.440
Total grain.	14.75	20.61	19.80	12.70	18.67

* Corn silage fed during first half of period and cows turned on grass second half of period.

Quality of feeds fed:

Corn silage was of good quality from corn that would have made 35 to 40 bushels of corn per acre.

Corn cracked that would have graded No.2 market corn.

Guaranteed Analysis.

	Protein percent.	Fat Percent.	Carbohydrates Percent.	Fiber. Percent.
Wheat bran	14.5	4.2	54.9	9.6
Cottonseed meal.	38.6	6.9	22.0	12.0
Linseed meal (O.p.)	33.0	6.0	43.0	10.0
Peanut meal.	45.0	8.0	28.7	5.2

The amount of corn silage is about what would naturally be fed to cows of this size and production under the usual method of hand feeding. The amount of concentrate is very much above what would usually be fed and much

more than what is recommended or called for by the different standards. These cows consumed an average of 17.3 pounds of concentrate per day and produced 25.6 pounds of milk per day, or to put it in a different form, the cows consumed 1 pound of concentrate for every 1.47 pounds of milk produced testing 4.18% fat. Average weight of the cows during the test was 1168.5 pounds.

Table 3. Requirements for Cows used in this Experiment Producing 25 pounds of 4 percent milk (Armsby's Standard).

	Digestible Protein Pounds.	Net Energy Therms.
Maintenance for cows weighing 1250 pounds	.63	6.96
Nutrients required to produce 25 pounds of 4% milk.	<u>1.225</u>	<u>6.625</u>
Total nutrients required for cows.	1.855	13.585

Table 4. Nutrients Consumed during First Four Week Period.

Amount of feed consumed. Pounds.	Feed.	Digestible Protein Pounds.	Net Energy Therms,
45.36	Silage	.499	7.212
5.16	Corn	.387	4.412
5.15	Bran	.644	2.730
.464	Cottonseed meal	.155	.418
3.73	Linseed meal	1.126	3.316
.25	Peanut meal	<u>.106</u>	<u>.234</u>
Total Nutrients consumed	-	2.917	18.322
Standard required.	-	<u>1.855</u>	<u>13.585</u>
Excess nutrients consumed	-	1.062	4.737

Table 5. Nutrients Consumed During Second Four Week Period.

Amount of Feed Consumed.		Digestible Protein	Net Energy
Pounds	Feed	Pounds.	Therms
40.12	Silage.	.441	6.379
5.00	Corn.	.375	4.275
9.64	Bran	1.205	5.109
.71	Cottonseed meal.	.237	.639
5.00	Linseed meal	1.510	4.446
2.56	Peanut meal	1.096	2.395
Total nutrients consumed -		4.864	23.243
Standard required-		1.855	13.585
Excess nutrients consumed -		3.009	9.658

Table 6. Nutrients Consumed During Third Four Week Period.

Amount of Feed Consumed.		Digestible Protein	Net Energy
Pounds.	Feed.	Pounds.	Therms.
41.83	Silage *	.460	6.651
7.10	Corn.	.533	6.071
4.52	Bran.	.565	2.396
.926	Cottonseed meal.	.309	.833
6.95	Linseed meal.	2.099	6.179
.30	Peanut meal.	.128	.281
Total nutrients consumed.		4.094	22.411
Standard required.		1.855	13.585
Excess nutrients consumed.		2.239	8.826

* Corn silage fed two weeks out of four.

Table 7. Nutrients Consumed During Fourth four week Period.

Amount of Feed Consumed.		Digestible protein	Net Energy
Pounds.	Feed.	Pounds.	Therms
Blue grass.			
6.57	Corn	.493	5.634
4.50	Bran	.563	2.385
1.214	Cottonseed meal	.405	1.093
.414	Peanut Meal.	.177	.387
Nutrients consumed in addition to good blue grass pasture.		1.638	9.499

Table 8, Nutrients Consumed during Fifth four-week Period.

Amount of Feed Consumed.		Digestible	Net Energy
Pounds.	Feed.	protein	
		Pounds.	Therms.
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Blue grass.			
8.93	Corn.	.670	7.635
6.36	Bran	.795	3.371
2.70	Cottonseed meal.	.902	2.430
3.44	Peanut meal	1.472	3.218
		<hr/>	<hr/>
Nutrients consumed in addition to good blue grass pasture.		3.839	16.654

In looking over the above tables, it will be noted that the cows consumed feed in large quantities in excess of what was really needed for their maintenance and milk production. The first period the excess was 1.06 pounds of digestible protein and 4.7 therms. The second, period the excess was 3.01 pounds of digestible protein and 9.66 therms, showing that the cows learned to eat more feed but they did not make proper use of the feed for dairy cows. During the third period when they were fed corn silage for two weeks and on good blue grass pasture the remaining two weeks, the excess feed consumed was not quite as great as the previous period. In comparing the two periods where the cows had the run of good blue grass pasture, the nutrients consumed in addition to the grass was 1.63 pounds of protein and 9.49 therms, which was undoubtedly in excess of the standard requirements. During the following period the amount of nutrients consumed in addition to the blue grass was 3.83 pounds digestible protein and 16.65 therms, which is in itself an excess of nutrients, showing that other conditions being uniform, the longer that the cows were fed by the self-feeder method the greater would be the consumption of concentrates.

During the experiment there was no sickness of the cows, and their general condition seemed to improve. The cows were fed their usual feed previous to the experiment which was all the corn silage that they would consume and about 1 pound of concentrate for every 4 pounds of milk produced for the Holstein-Friesian cows, and 1 pound of concentrate for every 3.25 pounds of milk produced for the Jersey. The cows were placed in the self-feeder lot immediately after their regular feed and the rack for silage and the five different hoppers were each filled with the different feeds used. On two or three occasions there were very slight indications of scours with some of the animals and it was nearly always noticed that the particular animal affected had eaten large quantities of either linseed meal or bran.

Table 9. Showing Average Production, Feed Consumed,
and Weight of Cows while On Test.

Weeks.	Average Milk per week Pounds.	Average percent fat per week.	Average fat pro- duction per week. Pounds.	Average weight of cows Pounds.	Average Silage Consumed per head. per day Pounds.	Average grain consumed per head per day Pounds.
1	187.5	4.40	7.443	1100)		
2	159.2	4.63	5.995	1173)		
3	172.8	4.00	6.633	1156)		
4	191.8	3.80	7.108	1130)	45.36	14.75
5	194.0	4.38	7.425	1129)		
6	177.6	4.00	6.175	1143)		
7.	179.6	4.25	6.800	1160)		
8	176.6	4.63	7.400	1175)	40.16	20.61
9	197.0	4.40	7.300	1146)		
10	185.9	4.53	7.725	1139)	41.83	19.80
11	171.6	4.05	7.425	1138)	Grass	
12	178.3	3.95	6.850	1175)		
13	182.9	3.80	6.650	1200)		
14	183.8	4.30	7.475	1210)		
15	191.7	4.13	7.275	1208)		
16	170.6	4.40	6.550	1210)	Grass.	12.70
17	174.4	4.08	6.425	1203)		
18	160.1	4.13	6.250	1199)		
19	181.8	4.05	6.575	1196)		
20	162.0	3.70	5.075	1180	Grass	18.67

The average production of milk per cow per week was fairly uniform and for the twenty weeks the decrease was about the natural decrease caused by advancing lactation. From the chart it will be noted that the milk production, fat production, percent fat, and weight of the cows decreased faster during the last period than any other. The only explanation that seems plausible is that of excessive high temperatures during the last week in June or during the 19th week of the test. Maximum temperatures ran as high as 94°F, which is very high for June temperatures. Milk production is a dairy cow's work, which is very trying on the animal because it is work 24 hours a day and 7 days in the week. The cows increased some in weight while being fed on self-feeder, due to the large amount of concentrate consumed.

Conclusions.

No difficulty was experienced with the cows gorging themselves or becoming foundered when placed on the self-feeder when they were properly fed, previous to the "Free-choice" method of feeding, for their production.

The "Free Choice" method is an excellent method to compare the palatability of different feeds and should be used for that purpose.

The self-feeder must be properly built and regulated before it will give satisfactory results.

The "Free-Choice" method of feeding proved very uneconomical.

Other conditions being uniform, the longer that the cows were fed by the self-feeder method the greater would be the consumption of concentrates, within certain limits.

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