

GROWTH IN FRIESIAN CALVES DURING THE FIRST YEAR OF AGE (52 WEEKS).

By

S. KASSAB* AND TH. STEGENGA†

SUMMARY

Growth data on 100 heifers and 52 Friesian bull calves were used to determine the effects of birth weight, season of birth, sex and age of dam on weight gains to 52 weeks of age.

Calves that were heavier at birth were able to maintain their weight advantage through 52 weeks of age in both sexes, particularly bull calves. It must be considered that bulls were usually kept on a somewhat better feeding system than heifers. Correlation of birth weight with weight at 12, 24, 36 and 52 weeks of age were 0.514, 0.375, 0.438 and 0.443, respectively. All these correlations were highly significant. There are wide variations in the growth of calves born in autumn or in the other seasons. Average weight of autumn heifer calves at birth and at 12 months was heavier than that of other seasons. The average differences between male and female calves for birth weight and weight at 52 weeks of age were 4.1 and 44.9 Kg., respectively, in favour of male calves. Bulls gained 0.112 Kg per day more than heifers, from birth to 52 weeks of age. Average gain per day from birth to 52 weeks of age, for calves born from dams 2—2½ years of age, was 0.712 Kg and for those from the dams 2½ years and over was 0.756 Kg.

INTRODUCTION

In the light of modern requirements for beef, in many countries there is an increased interest in the production of beef from dairy cattle. When dealing with domestic animals with such long generation intervals as cattle, it is important to determine the breeding value of the individual animals at a very early stage. It is obvious that observations made at or soon after birth, give a good indication about future performance of beef calves.

Efforts have been made to select dual-purpose stock at an early stage. It is obviously of great importance to be able to avoid the cost of rearing calves which subsequently turn out to be unprofitable producers. For Example, if the animal production is low, considerable losses are to be expected before a decision has been made to cull it. Therefore breeding animals must be selected at an early age.

* Lecturer, Higher Institute of Agriculture, Kafr-El-Sheikh — U.A.R.

† Professor of Animal Breeding, University of Agriculture, Wageningen — The Netherlands.

MATERIAL AND METHODS

Calves used in this study were pure-bred Dutch Friesian, raised on six experimental farms in the Netherlands.

A calf's first weight was estimated within 24 hours after birth. Because the authors did the weighing on fixed days once every 4 weeks, the second weight was taken at an age somewhere between birth and one month. Subsequent weights would follow at 4 week intervals till one year old (52 weeks). The weight of each calf was corrected to exactly four week intervals from birth till 52 weeks of age, using the weights and average daily gains found for the approximate four weeks interval which bracketed the age to which it was desired to standardize. A calf was weaned on the day closest to its being 5 to 8 months of age, on five farms, and on one farm weaning took place at 10 weeks of age. The data analysed were gathered from 152 calves born during the period from 1959 to 1962.

The data included all live weights available at each age. There were 100 heifers and 52 bulls. The 52 bulls were raised on three farms only, because on the other farms, male calves were removed from the herd between a week and 3 weeks of age, thus reducing further the number of bulls available. All calves used were single born.

The seasons of birth were divided into :

Winter : January, February and March.

Spring : April, May and June.

Summer : July, August and September.

Autumn : October, November and December.

Since bull calves were only dropped in winter and spring, heifer calves were treated separately in this study to know the effect of season of birth on growth of calves, from birth till 52 weeks of age, using only three seasons (Winter, Spring and Autumn) in which there were weights available of calves in all the ages studied. In the comparison between traits of ages of dam and between sexes, the animals included in this study, 138 calves (46 males and 92 females), had all of the following information available : birth weight, every 4 weeks, weight till 52 weeks of age.

In the analyses, dams were classified into 2-2⁶ years old and older dams (2⁶ and over). This was done because the number of dams within each age group (2-2⁶, 2⁶-3, 3-4, 4-5, 5-6 and 6 and over) was too small. Males were compared with females. Gain was the difference between each two subsequent corrected weights.

Average daily gain at each period studied was the difference in weight between each two subsequent weights divided by 28 days. Yearling daily gain was calculated by subtracting birth weight from weight at 52 weeks of age, and dividing this by the number of days from birth to 52 weeks of age (364 days).

The simple correlation coefficients determined were the weights of calves at birth compared with the weights of the same calves at 12, 24, 36 and 52 weeks of age.

Calves received their mother's colostrum for the first three days. After this they were fed on whole milk, except at one farm where calves were fed on synthetic milk. At the end of the third or sixth week according to the management of each farm, the calves were gradually changed over to skim milk or powder milk and buttermilk. They were fed hay ad libitum and were given a small amount of grass silage starting at 3 weeks of age. They were also allowed a good supplementary diet of calf meal special to each farm. The diet of concentrates was gradually increased by the time that skim milk and powder milk were discontinued.

This study aims at evaluating the relationship between age of dam, sex and season of birth and growth. It is also desirable to know whether birth weight has a significant positive correlation with weight at 12, 24, 36 and 52 weeks of age, or not.

RESULTS AND DISCUSSION

Birth weight :

In this study a special attention was directed towards the relationship between birth weight and growth of Friesian calves till 52 weeks of age. Results given in tables 1,2 and 3 show that heavier calves at birth were able to maintain their weight advantage throughout the first 52 weeks of their lives in both sexes, but particularly in bull calves. The same results were found for different ages of calves by many workers e. g. Joubert and Hammond (1954) and Neville (1962). The correlation between birth weight and the various combinations of weights are listed in table 4. In the total (males and females) the correlation reached a figure of more than 0.37. These values are all highly significant. The results in table 4 show that there is a positive relation between birth weight and the other weights. These figures are in general agreement with some of the figures reported by Dawson et al. (1947), Grogory et al. (1950) Martin (1956), Drewry et al. (1959) and Martin et al. (1962) for different ages, of various breeds. So, the highly significant positive correlation between birth weight and weights at different ages studied may justify selection on the basis of higher birth weight in Friesian calves particularly for fattening purposes.

Season of birth :

From table 1 a wide variation can be observed in the growth between calves born in autumn and in the rest of the year. Autumn calves were heavier than winter and spring calves in almost all ages comparisons. In the case of gain per day till 52 weeks of age heifer calves born in autumn gained 0.123 and 0.049 kg more than those born in spring and winter respectively (Table 5). Effects of season of birth were highly significant in the analysis of gain per day from birth till 52 weeks of age. This may be due to the fact that calves

born in Autumn had heavier birth weights than those born in Spring and Winter (Table 1). They probably also resulted from seasonal variations in feeding and management practices during the period of study, because calves studied in this work were not under a stable system of feeding for the whole period of study.

The animals received their rations according to the management and also to the forage and pasture available on every farm. The same results were also obtained by Brown (1960), and Martin et al. (1962) viz. that the season of birth affects the growth of calves.

Sex :

In this study males were heavier at birth and maintained this advantage throughout the experimental work (till 52 weeks of age). The average differences between male and female calves for birth weight and weight at 52 weeks of age were 4.1 and 44.9 Kg, respectively, in favour of male calves (Table. 2). As for gain per day, bulls gained 0.112 Kg. per day more than heifers from birth till 52 weeks of age (Table 6). These differences were highly significant. The sex effect on gain per day was partially dependent on sex difference in birth weight and also due to the fact that bulls were usually kept on a somewhat better feeding system than heifers. The differences in the growth between male and female calves are in agreement with previous results reported by Rollins and Gilbert (1954), Nelms and Bogert (1956), Brown (1960), De Vree (1961), and Neville (1962).

Age of dam :

There was an increase in the weight of calves associated with an increase in age of dam in both sexes. This was evident in calves of all ages at which weights were recorded (Table 3). The differences obtained here were statistically highly significant. The suggestion of an age of dam effect on gain per day, is that 2-2⁶ year old dams gave lighter birth weight to their calves than nature cows do. The results of the present investigation revealed that calves from young mothers 2-2⁶ years old) were on the average less developed than the calves born from mothers 2⁶ years old on over. This finding is in agreement with the observation of Stegenga (1961). It is probable that calves born from young animals reach the same average growth as calves born from adult mothers but they reach this stage later. Therefore, breeding with young and not with adult animals caused a certain degree of late maturing in the herd. Apart from this, calves with the ability to gain more rapidly or to finish in less time will produce a greater net return to the breeder, if used for fattening.

TABLE 1.—Average Weights of Friesian Heifer Calves at 4 Weeks Intervals according to Season of calving.

Age in weeks	Season					
	Winter		Spring		Autumn	
	No.	Mean kg.	No.	Mean kg.	No.	Mean kg.
Birth	53	33.8	15	33.0	30	35.6
4	53	46.1	15	43.7	30	48.7
8	53	62.6	15	59.3	33	70.2
12	53	83.4	15	78.1	36	102.5
16	52	105.6	15	95.8	42	118.8
20	52	127.6	15	117.3	42	140.4
24	51	150.7	14	140.1	42	158.0
28	51	176.0	14	161.5	42	176.1
32	51	201.0	14	179.0	42	196.5
36	50	221.7	14	194.1	42	215.6
40	50	239.8	14	306.9	42	239.3
44	50	253.9	14	224.3	39	261.2
48	50	267.9	14	242.0	37	280.6
52	50	280.0	11	251.6	29	299.5

TABLE 2.—Average Weights of Friesian Calves at 4 Weeks Intervals.

Age in weeks	Sex				Total		Daily gain kg.
	Males		Females		Mean kg.	Gain in 4 weeks kg.	
	No.	Mean kg.	No.	Mean kg.			
Birth	52	36.9	100	32.8	34.8	—	—
4	52	48.0	99	44.9	46.4	11.6	0.41
8	52	65.9	102	62.8	64.3	17.9	0.63
12	52	85.2	105	85.3	85.2	20.9	0.75
16	52	105.4	112	108.2	106.8	21.6	0.77
20	52	129.4	121	129.5	129.4	22.6	0.81
24	52	155.2	119	150.8	153.0	23.6	0.84
28	52	180.9	119	172.6	176.7	23.7	0.85
32	52	207.0	119	194.8	200.9	24.2	0.86
36	51	231.2	117	215.2	223.2	22.3	0.80
40	50	255.0	117	234.8	244.9	21.7	0.78
44	49	278.4	114	252.7	265.5	20.6	0.74
48	49	303.8	112	270.1	286.9	21.4	0.76
52	46	325.9	102	281.0	303.4	16.5	0.59

TABLE 3.—Relation Between Age of dam and Growth of their Calves

Sex	MALES						FEMALES						TOTAL	
	2-2 ^s		2 ^s and over		2-2 ^s		2 ^s and over		2-2 ^s		2 ^s and over		2-2 ^s	2 ^s and over
	No.	Mean kg.	No.	Mean kg.	No.	Mean kg.	No.	Mean kg.	No.	Mean kg.	No.	Mean kg.	Mean kg.	Mean kg.
Birth	13	33.5	39	40.3	25	30.8	75	34.9	32.1	37.6	32.1	37.6		
4	13	44.5	39	51.6	25	41.8	74	48.1	49.1	49.8	49.1	49.8		
8	13	61.0	39	70.7	25	59.5	77	66.2	60.2	68.4	60.2	68.4		
12	13	78.0	39	92.5	26	81.9	79	88.8	79.9	90.6	79.9	90.6		
16	13	95.9	39	114.9	26	106.2	86	110.1	96.0	112.4	96.0	112.4		
20	13	118.0	39	140.8	31	125.6	90	132.4	122.3	136.6	122.3	136.6		
24	13	143.2	39	167.1	31	148.2	88	153.5	145.7	160.3	145.7	160.3		
28	13	166.8	39	194.9	31	169.5	88	175.8	168.1	185.3	168.1	185.3		
32	13	193.4	38	220.6	31	191.6	88	197.9	192.5	209.2	192.5	209.2		
36	12	217.7	39	244.6	31	210.5	86	219.9	214.1	232.2	214.1	232.2		
40	12	242.1	38	267.9	31	230.2	86	239.4	236.1	253.6	236.1	253.6		
44	12	267.4	37	289.4	31	248.6	83	256.9	258.0	273.1	258.0	273.1		
48	12	292.2	37	315.4	30	266.1	82	274.2	279.1	294.8	279.1	294.8		
52	11	308.7	35	343.1	28	273.9	74	288.1	291.3	315.6	291.3	315.6		

TABLE 4.—Phenotypic Correlation Between Birth Weight and Other Weights

Characters correlated	Males		Females		Total	
	No.	Correlation	No.	Correlation	No.	Correlation
<i>Birth weight and :</i>						
12 weeks of age	52	0.464**	100	0.544**	152	0.514**
24 " " "	52	0.526**	97	0.202*	149	0.375**
36 " " "	51	0.456**	96	0.275**	147	0.438**
52 " " "	46	0.483**	92	0.172	138	0.443**

TABLE 5.—Daily Gain from Birth to 52 Weeks of Age, for Heifer Calves According to Season of Birth.

Season	No.	Total gain per day kg.	Mean gain per day kg.
Winter	50	33.82	0.676
spring	11	6.62	0.602
Autumn	29	21.02	0.725
Total	90	61.45	0.683

TABLE 6.—Average Daily Gain of Bull and Heifer Calves From Birth Till 52 Weeks of Age.

Age of Dam (Year)	Sex				Total kg.	Differences between age of Dam
	No.	Bulls Growth per day kg.	No.	Heifers Growth per day kg.		
2 - 2 ⁶	11	0.756	23	0.668	0.712	0.044**
2 ⁶ and over	35	0.824	69	0.689	0.756	
Total		0.790		0.678	0.734	

* Differences between Sexes 0.11%.

** Highly significant (P < 0.01).

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Printed in 1965

دراسة النمو في عجول ماشية الفريزيان الهولندية
في خلال السنة الأولى من عمرها

المخلص

حللت سجلات النمو لـ ١٠٠ عجلة و ٥٢ عجلا من الفريزيان بالنسبة لتأثير وزن الميلاد وموسم الولادة والجنس وعمر الأم على الزيادة في الوزن في خلال ٥٢ أسبوعا الأولى من عمرها .

وقد وجد أن العجول ذات الوزن الكبير عند الميلاد كانت متفوقة في معدل زيادة وزنها طوال مدة الدراسة في الجنسين بصفة عامة وخصوصا في الذكور ويرجع هذا الى أن الذكور تعطى مستوى عاليا من التغذية عادة بالنسبة للاناث .

وكانت معاملات التلازم بين الوزن عند الميلاد والأوزان عند عمر ١٢ ، ٢٤ ، ٣٦ ، ٥٢ أسبوعا هي ٥١٤ ، ٣٧٥ ، ٤٣٨ ، ٤٤٣ على التوالي كما أنها كانت معنوية احصائيا كما لوحظ وجود تباين كبير بين العجول التي تولد في الخريف والتي تولد في فصول السنة الأخرى بالإضافة الى ما لوحظ من أن متوسط وزن العجلات المولودة في الخريف عند الميلاد وعند ١٢ شهر من عمرها كان أكبر مما يقابلها في الفصول الأخرى من السنة .

كما وضح أن متوسط الفرق بين الذكور والاناث في الوزن عند الميلاد والوزن عند ٥٢ أسبوعا بلغ ٤١ر٤ كجم و ٤٤٩ر٤ على التوالي وكان هذا الفرق في جانب الذكور .

وكان فرق متوسط الزيادة اليومية للعجول الذكور ١٢ر١ كجم على الاناث في خلال مدة ٥٢ أسبوعا كما كان متوسط النمو اليومي للعجول المولودة من أمها في عمر ٢ - ٢ر٥ سنة ٧١٢ر٠ كجم مقابل ٧٥٦ر٠ كجم للعجول المولودة من أمهات أكبر من هذا السن .