A B S T R A C T

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THE VITAMIN A NUTRITION OF PREPARTUM HEREFORD HEIFERS FED DRY LAND RATIONS WITH OR WITHOUT SUPPLEMENTS OF ALFALFA OR FISH LIVER OIL

Submitted by

Dean B. Selleck

In partial fulfillment of the requirements
for the Degree of Master of Science
Colorado
Agricultural and Mechanical College
Fort Collins, Colorado

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ABSTRACT

Dean B. Selleck
Fort Collins, Colorado

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Master of Science

Is vitamin A supplement necessary for the growth of beef heifers under dryland feeding conditions? If vitamin A supplement is needed, can fish liver oil be replaced by small amounts of alfalfa, which is grown extensively in Colorado? What results, as judged by gross observation, may be obtained through moderate vitamin A supplementation in the conditioning of heifers for future reproduction? To secure information pertinent to the above questions, this research was undertaken.

The effect of vitamin A deficiency in the bovine has been studied extensively. No information relative to vitamin A nutrition in preparation of eastern Colorado range heifers for reproduction is available, however. Although many and varied symptoms due to vitamin A deficiency appear, the diagnosis, especially in the mild forms of deficiency, may be difficult. Hart, Mead and Guilbert, 1933, found the degree of deficiency varied in the same herd due to differences in previous feed supply and the amount of reserves stored by the animals. The onset of vitamin A deficiency symptoms was also influenced by the stage of maturity, gestation, production, and rate of

growth. Keener, Bechdel, Guerrant and Thorp, 1942, reported that the carotene requirement for calves during severe winter weather was more than twice as great as during warm weather.

Various figures, dependent upon different criteria of evaluation, have been reported for the carotene and vitamin A requirements of cattle. Guilbert, Howell and Hart, 1940, stated that 953 to 1226 I. U. of vitamin A or 1180 to 1500 micrograms of carotene per 100 pounds live weight was the minimum daily requirement for beef cattle. For the growing calf, a ration containing 3000 micrograms carotene per 100 pounds was reported as satisfactory by Boyer et al., 1942; and Moore, Berry and Sykes, 1943. Lewis and Wilson, 1945, were able to maintain growth in calves on 32 U.S.P. units of vitamin A daily per kilogram of body weight. Maximum growth was obtained on an intake of 64 U.S.P. units per kilogram. Blood level and liver storage were low, however, in all calves receiving up to 128 units. From the standpoint of both maximum growth and liver storage, the daily requirement of vitamin A of young calves was considered to be about 250 U.S.P. units, or eight times the minimum requirement.

Gestation presents an added nutritional demand. The requirement of a pregnant heifer for vitamin A is greater than that of a nonpregnant female. The pregnant heifer stores many substances beyond the requirements for herself and fetus. If the need for these reserves fail to develop, the excess is

excreted after calving. Water, nitrogen and vitamin A are well known examples of such storage. Because of this phenomenon, it is difficult to classify the diet of any pregnant female within narrow limits or to make dogmatic statements concerning minor deviations. This yet unmeasured, increased demand of the pregnant female has provided the opportunity for unwarranted advertising and sales claims. According to Kuhlmann and Gallup, 1940, and Moore, 1944, 4000 to 5000 micrograms per 100 pounds body weight was the daily amount of carotene necessary for reproduction, while Davis and Madsen, 1941, stated that a daily intake of 2.72 milligrams of carotene per 100 pounds body weight was sufficient previous to and throughout the gestation period. Recent work at the Beltsville station has apparently confirmed these findings.

Forty Hereford heifer calves were allotted with respect to weight, type, condition, and color, and were fed the experimental rations shown in Table 1.

Table 1.--ALLOTTING AND FEEDING PLAN

Lot No.	I	II	III	IV
Winter Rations	Chopped cane Soybean meal Mineral mix Salt	Chopped cane Soybean meal Mineral mix Salt Vit. A oil	Chopped cane Soybean meal Mineral mix Salt Alfalfa hay	Soybean meal Mineral mix Salt Native pasture
Summer Rations	During the summer of 1947, 1 to 4 heifers in each lot were periodically interchanged between crested wheatgrass and native pasture near Sterling, Colorado. All other heifers were pastured on native pasture. Moorman's mineral mixture was fed. During the summer of 1948, all heifers were pastured on native pasture near Idalia, Colorado, and bonemeal was used as the mineral supplement.			

During the wintering periods, all lots received concentrates once and roughages twice daily. All feeds and refuse were weighed each day. Feed samples taken every 28 days throughout the two years of the experiment, were reduced to an air-dry basis in a large drier, then ground in a Wiley mill and preserved for chemical analysis in air-tight glass jars.

The vitamin A oil was mixed with the protein supplement daily and fed in a manner to insure equal distribution to all animals in the lot. Alfalfa hay was

fed to Lot III at a level to provide carotene equivalent in vitamin A value to that received as oil concentrate by the animals of Lot II. Vitamin A equivalent intake was calculated by dividing the carotene intake by the factor 3.5.

Dry matter consumption by heifers on winter range was calculated according to Morrison's recommendations. Dry matter consumption on summer range was computed from values obtained for steers on pasture by Garrigus and Rusk.

Two day weights of each heifer were obtained at the beginning and end of each phase, and individual single day weights were taken each 28 days. All animals were graded for type at the beginning of each phase, and for condition at the beginning of the experiment and the end of the second wintering period. In grading the heifers for both type and condition, individuals were given the regular market grades from common minus to choice plus, then the grades were assigned a numerical value of 0 to 10 in order to determine the average of the lot. All heifers were number branded during the spring of 1947, and were then clipped at frequent intervals to facilitate identification and the keeping of individual records.

Blood samples were taken from the jugular vein of each animal at intervals not exceeding 56 days. The

samples were refrigerated until analyses could be made, and care was taken to analyze as quickly as possible. Serum carotene and vitamin A were determined colorimetrically by the Kimble method, using an Aminco type F photoelectric colorimeter. A factor was applied in the computation of vitamin A to correct for the blue color developed by carotene. Serum calcium was determined by the Tisdall method as modified by Clark and Collip, and serum phosphorus was measured by a modification of the Bell-Doisy phosphate method as described by Briggs.

The vitamin A content of the oil fed to Lot II was determined colorimetrically by the Carr-Price method as modified by Dann and Evelyn. Feed samples were analyzed for dry matter, total carotenoids and total nitrogen. Carotenoids were determined by the method described by Peterson, and nitrogen analysis was carried out by the Kjeldahl method. All analyses were conducted in the nutrition laboratories in the Animal Investigations Section at Colorado A & M College.

In the absence of classical vitamin A deficiency symptoms, together with evidence of growth and parturition performance currently considered as normal in practical beef herd maintenance, it may be concluded that common dryland rations, of the quality observed during this experiment, support adequate vitamin A nutrition. Within

the limitation of this study, one may also conclude that alfalfa hay is equal to, and in some cases superior to, fish liver oil as a vitamin A supplement in the maintenance of serum carotene and vitamin A levels, weight gains, type, and condition grades, vigor, and general appearance.

Limited observations indicate that an advantage was derived from the feeding of alfalfa hay supplement in that calving time for the lot was appreciably shorter than that of the other lots, being completed in the interval of one estrus cycle of 21 days. Seventy per cent of the calves of this lot were dropped in nine days. Furthermore, the calves dropped by the alfalfa supplemented lot were by far the most vigorous of all.

Table 2.--COMPOSITE DATA OF VITAMIN A NUTRITION AND REPRODUCTION

Lot		I	II	III	IV
		Control	Fish liver oil	Alfalfa	Pasture
Total Gains	(Winter 1946-47	119.75	127.75	131.25	104.75
	(Summer 1947	147.80	156.45	160.00	190.66
	(Winter 1947-48	197.45	200.80	200.00	124.06
	(Summer 1948	114.00	117.50	103.75	180.83
	(Overall	579.00	602.50	595.00	600.30
Initial weight (12-12-46)		303.50	305.25	304.25	292.75
Final weight (11-6-48)		882.50	907.75	899.25	892.77
Serum carotene Mcgms/100 ml.	(Maximum	637.35	576.90	610.65	874.83
	(	(7-8-48)	(7-8-48)	(7-8-48)	(7-8-48)
	(Minimum	39.72	35.88	41.40	68.70
		(5-6-48)	(5-6-48)	(5-6-48)	(12-12-46)
Serum vitamin A I.U./100 ml.	(Maximum	438.96	418.62	527.07	579.23
	(	(11-5-48)	(1-8-48)	(6-12-47)	(5-6-48)
	(Minimum	100.87	115.77	118.77	156.81
		(4-2-47)	(4-2-47)	(4-2-47)	(4-2-47)
Vitamin A equivalent Intake (Units/100# Da.)	(Maximum	45,177	44,604	44,155	45,984
	(	(5-15 to	(5-15 to	(5-15 to	(5-15 to
	(	6-12-47)	6-12-47)	6-12-47)	6-12-47)
	(Minimum	857	873	878	328
		(4-8 to	(9-30 to	(9-30 to	(2-5-to
		5-6-48)	11-5-48)	11-5-48)	3-4-48)
Per cent of live calves		80	80	100	100
Days required for 70% of calves in lot to be dropped		25	10	9	17
Days required for complete calving		56	35	21	49
Average birth weights (pounds)		72.6	72.1	71.9	68.6
Cows requiring assistance at calving		2	2	0	0

T H E S I S

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COLORADO AGRICULTURAL AND MECHANICAL COLLEGE

May 28, 1949

WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR SUPERVISION BY DEAN B. SELLECK

ENTITLED THE VITAMIN A NUTRITION OF PREPARTUM HEREFORD HEIFERS FED DRY LAND RATIONS WITH OR WITHOUT SUPPLEMENTS OF ALFALFA OR FISH LIVER OIL

BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE.

CREDITS 15

Committee on Graduate Work

L. E. Washburn — Major Professor
R. F. Bourne — Minor Professor
[illegible]

[signature] — Head of Department
[signature] — Dean of Division

Committee on Final Examination

Examination Satisfactory

[illegible]
C. W. Bagley
R. F. Bourne
L. E. Washburn
[signature]
[signature]

David A. Morgan
Dean of the Graduate School

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INTRODUCTION

Is vitamin A supplement necessary for the growth of beef heifers under dryland feeding conditions? If vitamin A supplement is needed, can fish liver oil be replaced by small amounts of alfalfa, which is grown extensively in Colorado? What results, as judged by gross observation, may be obtained through moderate vitamin A supplementation in the conditioning of heifers for future reproduction? To secure information pertinent to the above questions, the research reported in this thesis was undertaken.

Previous work has shown that at times it may be necessary to supply beef cattle with a vitamin A supplement. Following analysis of several hundred samples of winter forage, which comprises a major part of the annual feed consumed by beef cattle, Washburn (55) stated, "Many animals in Colorado may suffer from prolonged "borderline" carotene intake, resulting in reduced resistance to infections, impairment of growth, reproduction and lactation." Based on this analysis, calculations indicated that it was impossible for cattle to consume sufficient amounts of some poor quality sorghum forages, alfalfa, and

native hays and most of the winter range grass to meet minimum requirements for vitamin A.

The importance of beef production as an agricultural enterprise in Colorado emphasizes the need for finding a practical, economical, and efficient method of supplementing vitamin A if and when such is needed.

Chapter II

REVIEW OF LITERATURE

The effect of vitamin A deficiency in the bovine has been studied extensively. These studies reveal that the carotene and vitamin A requirements may be altered by many conditions such as growth, reproduction, lactation, source of carotene, weather, previous feed conditions, age, sex, and breed.

A blood plasma carotene level of 25 micrograms per 100 milliliters was reported as adequate for health of Hereford and Shorthorn heifers by Davis and Madsen (13). Earlier, Moore (40) found that the plasma carotene of Holstein and Ayrshire calves should be 0.2 micrograms per milliliter or above to maintain fair general health and to prevent nyctalopia. These findings are in agreement with those of Kuhlman and Gallup (35) who obtained satisfactory growth responses in Jersey calves with plasma carotene values ranging from 25 to 100 micrograms per 100 cc. Boyer et al. (1) stated that blood plasma vitamin A is a more delicate measure of the state of vitamin A nutrition than is either growth or blood carotene, and that a blood plasma vitamin A level of 10 micrograms or more per 100 cc. is necessary for adequate vitamin A

nutrition of the growing calf. Blood plasma vitamin A levels below 7-8 micrograms per 100 cc. are definitely inadequate. This work showed that the blood plasma carotene levels of 50-70 micrograms per 100 cc. for Holsteins and 110-140 micrograms per 100 cc. for Guernseys are necessary to maintain adequate blood vitamin A. Hansen and associates (23) confirmed these values by showing that the newborn calf has a very low average blood plasma vitamin A level, and that normal concentrations of the order of 9-10 micrograms per 100 milliliters or more must be quickly attained (1-2 days) for a favorable chance of survival.

Blood plasma carotene levels of 78-96 micrograms per 100 milliliters are required for normal reproduction in Hereford and Shorthorn heifers, according to Davis and Madsen (13) whereas, Kuhlman and Gallup (35) and Gallup and Kuhlman (17) reported that 150 micrograms were necessary for Jersey cows and heifers. Payne and Kingman (48) found that the blood plasma carotene level of first calf range Hereford heifers must be at least 117.75 $\pm$ 7.21 micrograms per 100 ml. to support normal gestation. The requirement for aged cows was 82.88 $\pm$ 4.11 micrograms per 100 ml. Kuhlman and Gallup (33) also reported that the carotene requirements for first calf heifers may be somewhat higher than those for older cows, as the younger animals need carotene for growth in addition to that demanded for maintenance and reproduction.

Many authors have reported carotene requirements on the basis of body weight. Guilbert and Hart (19) published data stating that the minimum daily carotene requirement of the bovine was 26-33 micrograms per kilogram of body weight. Later work by Guilbert, Howell and Hart (21), and Guilbert, Miller and Hughes (22) confirmed the above carotene requirement and set the minimum vitamin A requirement at 5.1-6.4 micrograms per kilogram of body weight. Converse and Meigs (10) started four day old calves on a low vitamin A basal ration supplemented with varying amounts of carotene (29-87 micrograms per kilogram of body weight) in oil or with cod liver oil supplying 7.55-22.6 micrograms per kilogram. Calves at all levels of intake died or developed subnormally. Lewis and Wilson (36) were able to maintain fair growth in calves on 32 U.S.P. units per kilogram of body weight. From the standpoint of both normal growth and liver storage, the daily intake of vitamin A of young calves should be about eight times the minimum requirement. For the growing calf a ration containing 3000 micrograms of carotene per 100 pounds per day was reported as satisfactory by Boyer et al. (1) and Moore, Berry and Sykes (45). Ward, Bechdel and Guerrant (54) were able to maintain growth and prevent usual vitamin A deficiency symptoms in dairy calves by supplying a ration containing 11 micrograms of carotene per pound of body weight.

These authors also stated that the adequacy of carotene level depended largely upon the source of supply.

Gestation and lactation produces an added nutritional demand, and the requirement of a pregnant heifer for vitamin A is greater than that of a similarly healthy but nonpregnant female (11). Converse and Meigs (9) found that when timothy or clover hay was fed without pasture a daily intake of 80 to 130 milligrams of carotene was sufficient to enable production of normal calves, but that weak calves were the rule when the daily intake of carotene was 50 to 60 milligrams. These values are higher than those suggested by Kuhlman and Gallup (34), and Moore (43), in which cases 40 to 50 micrograms per pound of body weight were given as the minimum amount of carotene necessary for either reproduction or lactation. Davis and Madsen (13) fed 60 micrograms of carotene per kilogram to heifers and reported the birth of apparently normal calves. These results should not be considered as conflicting, since the breeds of animals used, sources of carotene and other conditions of the experiments were not comparable.

Investigations by Keener et al. (29) and by Kempt (30) indicated that the vitamin A and carotene requirements of dairy calves were only one-half as great during the summer as during the winter.

The development of symptoms of avitaminosis A depends largely upon the previous feed conditions and the

length of time elapsing prior to depletion of the vitamin A reserves. Vitamin A deficiency in cattle under natural conditions was reported by Hart, Mead and Guilbert (26) who found that during the very dry summer of 1932, cows suffered from night blindness, corneal ulceration, diarrhea, and nonrecurrence of estrus after calving. Calves born late in the season died, and the oil from as much as 10 grams of their livers gave no blue color in the Carr-Price test. Survivors recovered when green feed was again available. Fernandes (15) also found that drought and the lack of green fodder resulted in vitamin A deficiency as evidenced by general debility and blindness among cattle. Feeding of green fodder and cod liver oil yielded good results.

Jones and co-workers (28), (50) stated that in seven experiments conducted from 1934 to 1941 with 310 feeder cattle ranging from 3 to 16 months of age at the time of being placed in the feedlot and fed rations low in carotene, the time required for depletion of body reserves of vitamin A, as indicated by night blindness, ranged from 45 to 268 days. Reserves of young animals became depleted in less time than that of older animals. In dry years less time was required for depletion than in years with favorable rainfall. Earlier work by Dickson and Jones (14) indicated that steer calves would suffer from vitamin A deficiency in approximately 100 days, but these steers

would regain good health following the addition of one pound of high quality alfalfa hay to the daily ration. Other investigators have published similar findings. Schmidt (52) working with feedlot cattle in the Red Beds region of Texas, found that cows and calves fed largely on white kafir, cottonseed meal and cottonseed hulls developed sore eyes, nasal discharge, marked weight losses, and convulsions after approximately 120 days of feeding. These conditions were corrected by adding alfalfa, cod liver oil, or crystalline carotene supplements to the ration. Guilbert and Hart (20) reported clinical symptoms of vitamin A deficiency occurring in beef steers after 225 days on a ration of dried molasses beet pulp, rolled barley, cottonseed meal, and calcium carbonate. Reserves of vitamin A had been practically exhausted after 282 days, and the animals were in a critical condition.

Many authors have reported on variations in the carotenoid content of forage plants. In 1932 Converse and Meigs (8) observed that cows receiving overripe timothy hay as the only source of roughage for a 12-month period failed to produce normal calves. Hart and Guilbert (24) reported reproductive failure in range cattle due to vitamin A deficiency appearing near the end of a dry feed season. Hart, Guilbert and Goss (25) analyzed over 400 samples of range forage collected during different seasons over a two year period. Marked changes in nutritive value were evident

during various stages of growth and in different seasons. A very high rate of mortality of newborn calves occurred in a herd of 250 Holstein cows pastured during the winter months in corn stalk fields and then fed in a dry lot on a ration of wheat straw and 12 to 14 bushels of yellow corn per day (51). Flora and co-workers (16) fed growing calves poor quality, bleached, and aged timothy hays with a grain mixture. The resulting avitaminosis A was corrected quite effectively by feeding carrots, dehydrated alfalfa hay, or by a commercial carotene concentrate.

Following a study of seasonal changes of the blood carotenoid and vitamin A levels, and the normal ratio of these levels in cattle, Braun (3) concluded that seasonal changes of carotenoid intake were unaffected by pathological disturbances, but varied with statistical significance according to the age and breed of the animals. Seasonal changes in the vitamin A level were dependent on carotene and vitamin A intake, but were modified by parturition, abortion, and acute infections. The vitamin A-carotene ratio was below normal during parturition, abortion and acute infections, but was slightly above normal if vitamin A supplement was fed. Data collected by Sutton and Soldner (53) indicated wide fluctuations in blood plasma carotene within the different breeds responding similarly to changes in carotene intake. Blood plasma vitamin A was found to vary between narrower limits than

did blood plasma carotene. Changes in blood plasma vitamin A tended to lag behind the blood plasma carotene changes. In another publication, Braun (4) stated that, "The utilization of stored vitamin first forces available carotenoid stores to be converted to vitamin A, thus decreasing the carotenoid level without decreasing the vitamin A level." A tendency towards a direct relationship between vitamin A stores and the vitamin A level of the blood was found to exist only when the former fell below normal levels.

Findings of Nelson and associates (47) revealed that the carotene and vitamin A content of blood plasma was higher in beef calves than in dairy calves. Moore and Berry (44) found the plasma vitamin A of Holstein, Ayrshire, and Guernsey calves from birth to four months of age varied from 7.2 to 14 micrograms per cent. The feeding of a vitamin A supplement was recommended where difficulty is encountered in raising calves. Moore (42) showed that within a breed heifers had definitely lower plasma carotene values than producing cows, under both winter and summer pasture conditions. He described the rise of plasma carotene from 0.10 to 0.33 micrograms per cc. at 15 hours and to 8.49 micrograms per cc. at 168 hours following the feeding of freshly cut alfalfa to a cow with a very low initial plasma carotene value.

Many symptoms have been attributed to carotene and vitamin A deficiencies. Moore (41) found that calves

receiving low carotene rations developed nyctalopia, papillary edema, and a permanent type of blindness due to a constriction of the optic nerve. Symptoms of vitamin A deficiency were associated with generalized edema or anasarca in cattle by Madsen and associates (37). Crowther (11) reported the occurrence of irregular estrus, probable prolonged gestation, and difficult parturition. The placenta was often abnormal and fetal death and resorption or abortion frequently resulted in cases of vitamin A deficiency.

Bulls subjected to a period of vitamin A depletion showed a marked loss of fertility (11). Sexual activity and ability decreased rapidly during the period of depletion, and semen samples from vitamin A deficient bulls showed marked increases of cellular debris and abnormal spermatozoa with a decline in motility (38).

Chapter III

METHODS AND MATERIALS

Forty Hereford heifer calves were allotted with respect to weight, type, condition, and color, and were fed the experimental rations shown in Table 1.

Table 1.--ALLOTTING AND FEEDING PLAN

Lot No.	I	II	III	IV
Winter Rations	Chopped cane Soybean meal Mineral mix Salt	Chopped cane Soybean meal Mineral mix Salt Vit. A oil	Chopped cane Soybean meal Mineral mix Salt Alfalfa hay	Soybean meal Mineral mix Salt Native pasture
Summer Rations	During the summer of 1947, 1 to 4 heifers in each lot were periodically interchanged between crested wheatgrass and native pasture near Sterling, Colorado. All other heifers were pastured on native pasture. Moorman's mineral mixture was fed. During the summer of 1948, all heifers were pastured on native pasture near Idalia, Colorado, and bonemeal was used as the mineral supplement.			

During the wintering periods, all lots received concentrates once and roughages twice daily. All feeds

and refuse were weighed each day. Feed samples taken every 28 days throughout the two years of the experiment were reduced to an air-dry basis in a large drier, then ground in a Wiley mill and preserved for chemical analysis in air-tight glass jars.

The vitamin A oil was mixed with the protein supplement daily and fed in a manner to insure equal distribution to all animals in the lot. Alfalfa hay was fed to Lot III at a level to provide carotene equivalent in vitamin A value to that received as oil concentrate by the animals of Lot II. Vitamin A equivalent intake was calculated by dividing the carotene intake by the factor 3.5.

Dry matter consumption by heifers on winter range was calculated according to Morrison's recommendations (46). Dry matter consumption on summer range was computed from values obtained for steers on pasture by Garrigus and Rusk (18).

Two day weights of each heifer were obtained at the beginning and end of each phase, and individual single day weights were taken each 28 days. All animals were graded for type at the beginning of each phase, and for condition at the beginning of the experiment and the end of the second wintering period. In grading the heifers for both type and condition, individuals were given the regular market grades from common minus to choice plus then the grades were assigned a numerical value of 0 to 10 in

order to determine the average of the lot. All heifers were number branded during the spring of 1947, and were then clipped at frequent intervals to facilitate identification and the keeping of individual records.

Blood samples were taken from the jugular vein of each animal at intervals not exceeding 56 days. The samples were refrigerated until analyses could be made, and care was taken to analyze as quickly as possible. Serum carotene and vitamin A were determined colorimetrically by the Kimble method (31) using an Aminco type F photoelectric colorimeter. A factor was applied in the computation of vitamin A to correct for the blue color developed by carotene (2). Serum calcium was determined by the Tisdall method as modified by Clark and Collip (7), and serum phosphorus was measured by a modification of the Bell-Doisy phosphate method as described by Briggs (5).

The vitamin A content of the oil fed to Lot II was determined colorimetrically by the Carr-Price method as modified by Dann and Evelyn (12). Feed samples were analyzed for dry matter, total carotenoids and total nitrogen. Carotenoids were determined by the method described by Peterson (49), and nitrogen analysis was carried out by the Kjeldahl method. All analyses were conducted in the nutrition laboratories of the Animal Investigations Section at Colorado A & M College.

Chapter IV

ANALYSIS OF DATA

General observations

Data relative to weight, condition scores, and blood analysis generally reflected the influence of feed and environmental conditions. The health of all lots was excellent and only very slight differences, if any, could be attributed to diseased, parasitic, or injured animals. Death loss was limited to one heifer from the pasture lot, caused by poisoning while on summer range. Slight infestations of lice were encountered at times, but were corrected by spraying or dusting before the condition became serious. Considerable shrink resulted from shipping the heifers to and from summer pasture. Change of feed usually enabled the animals to regain quickly the weight lost long before the next weigh day.

Classical symptoms of vitamin A deficiency were not observed during the course of the experiment. Appearance of such symptoms were no doubt prevented by the excellent condition of the pastures and the high quality of the cane and alfalfa, resulting from above average annual rainfall. The heifers which received a small amount of alfalfa showed more bloom, scored higher in type and con-

dition, showed more vigor, and had better appetites than the other groups. Animals receiving continuous pasture appeared rough and thin after the winter months. These animals made, however, the largest gains while on summer pasture resulting in an appearance equal to the other lots by the end of the summer.

Eye disorders

Some cases of eye disorder diagnosed as "pink eye" were encountered soon after the animals were placed on summer pasture in 1947. Six heifers were affected, one each from the control lot, oil supplemented lot, and pasture lot, and three from the alfalfa supplemented lot. Heifers from the control, oil supplemented and pasture lots were not affected to the point of blindness and recovered in from four to six days. In the alfalfa supplemented lot, animal number 15 was blind in one eye for three weeks, and animals number 27 and 31 were blind in one or both eyes for about six weeks. During this period the carotene ranged from 500 to 600 micrograms and the vitamin A varied from 527 to 1120 I.U. per 100 ml. of serum.

Serum carotene

Lot averages of blood serum carotene ranged from a low of 36 micrograms per 100 milliliters in the fish liver oil lot for May of 1948 to a high of 875 micrograms

in the pasture lot for July 1948. The alfalfa supplemented lot maintained higher serum carotene values than did either the control or fish liver oil supplemented lots. Changes in carotene consumption were reflected by parallel changes in serum carotene as shown in Figures 1 and 2. The fish liver oil lot showed lower serum carotene levels than the control lot which received the same carotene intake. Some animals were found repeatedly to have higher individual carotene values than others under the same conditions receiving the same feed.

Serum vitamin A

Serum vitamin A reached a low of 101 I.U. per 100 milliliters in April 1947, in the control lot. The highest averages occurred in May of 1948 when the pasture lot reached a peak of 579 I.U. per 100 milliliters of serum. Serum vitamin A values were not as variable as the carotene values. Changes in serum vitamin A tended to lag behind changes in serum carotene. A noticeable decline in serum vitamin A occurred in all lots during the summer months although serum carotene remained high. Figures 1 and 2 show for all lots the vitamin A values compared with the vitamin A equivalent intake.

Fig. 1.--Relationship of vitamin A equivalent intake and blood serum levels

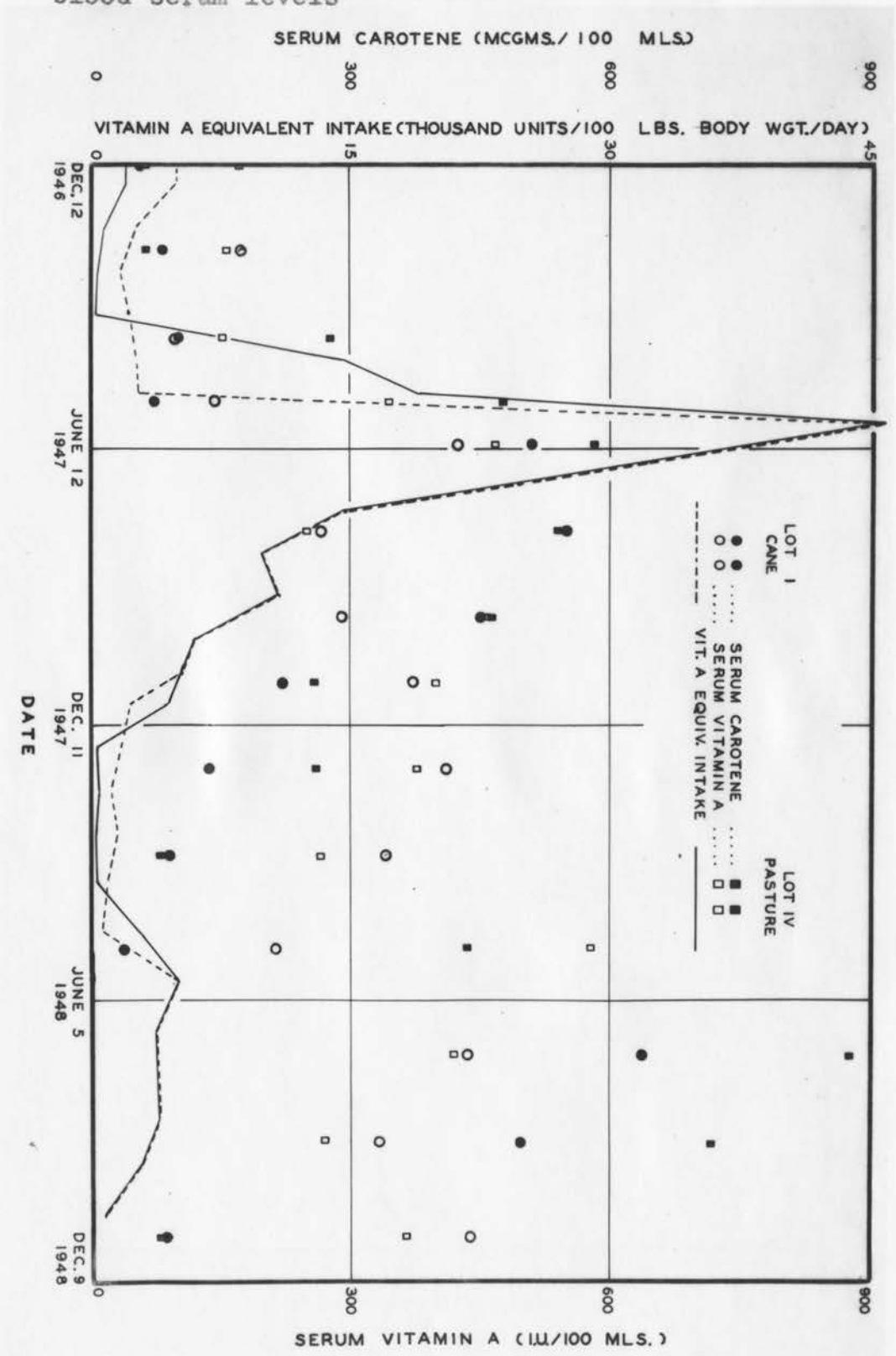
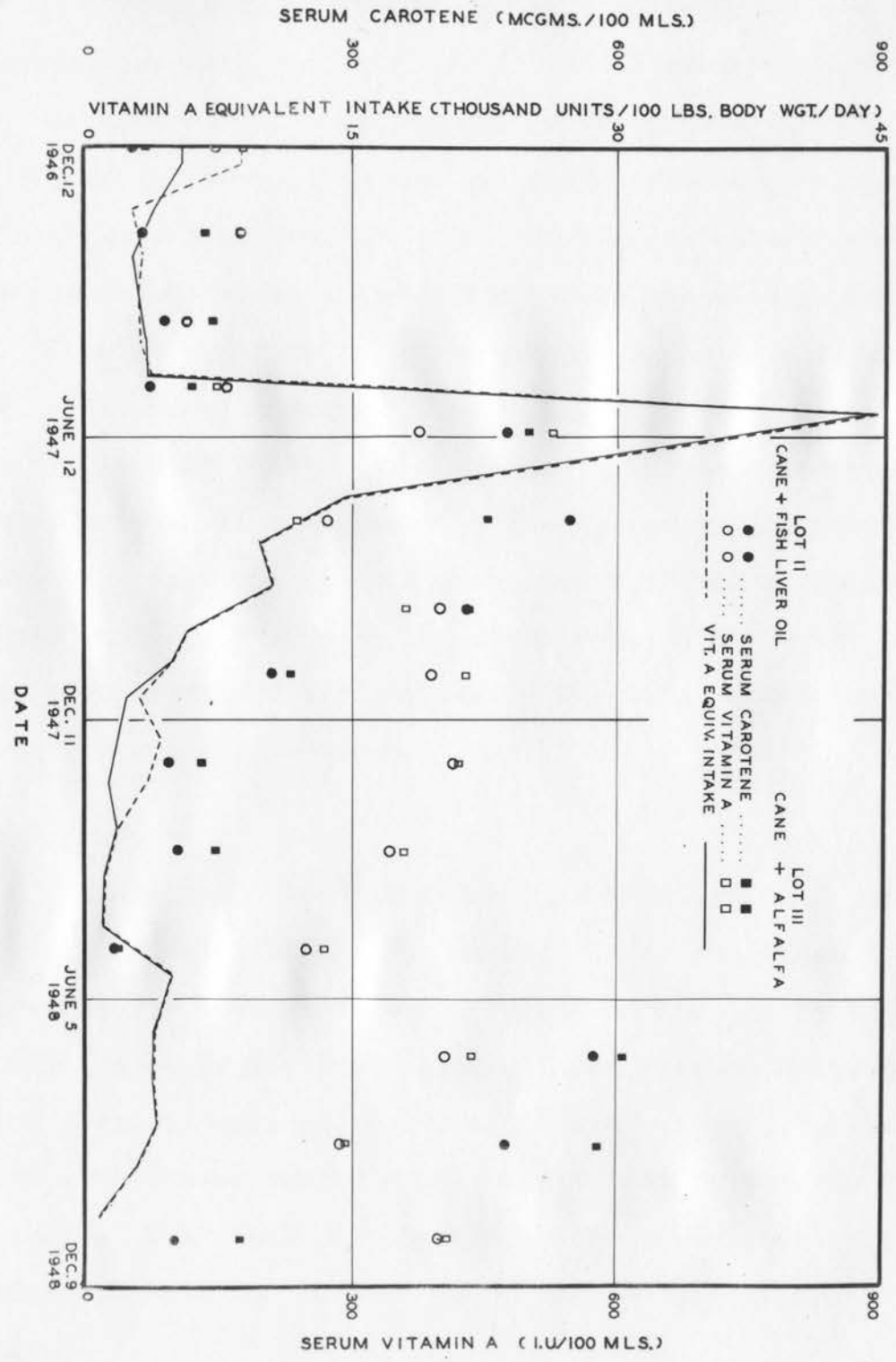


Fig. 2.--Relationship of vitamin A equivalent intake and blood serum levels



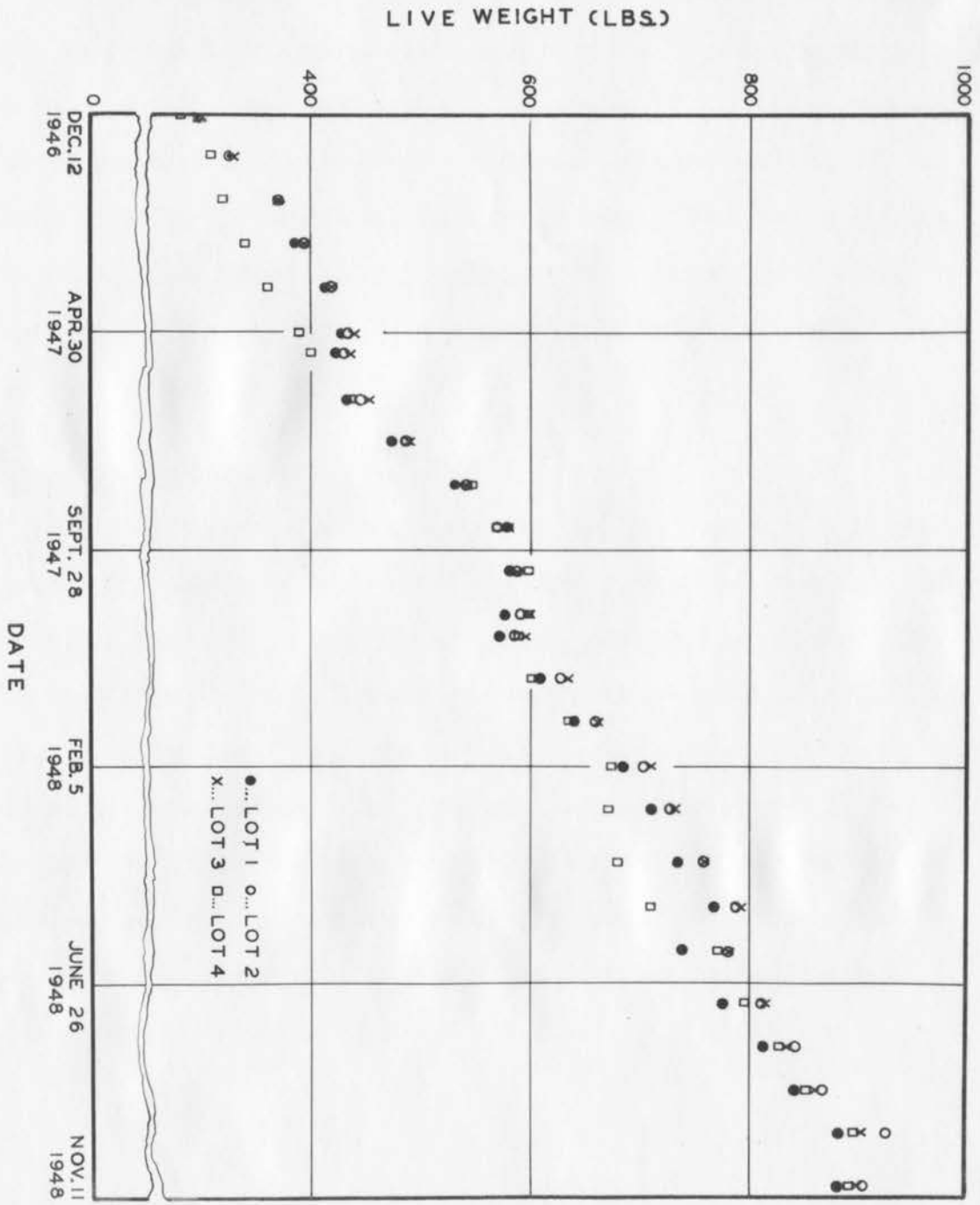
Serum calcium and phosphorus

Values for serum calcium and phosphorus were variable, ranging from 7.06 to 12.84 milligrams of calcium and from 4.48 to 10.38 milligrams of phosphorus per 100 milliliters of serum. No one lot had consistently higher or lower levels than other lots. Phosphorus values declined and calcium values increased with the approach of maturity. In this experiment the concentration of Ca and PO_4 ions in the blood serum were generally in reciprocal relation to each other. An increase in the concentration of one resulted in a decrease in the concentration of the other. Although the mineral consumption by the pasture lot was much lower than by the other lots, there were, however, no appreciable differences in the calcium and phosphorus content of the serum.

Weight gains

Average weights for each lot of animals for each month are shown in Figure 3. As calves and yearlings, slightly heavier weights were attained by the lot receiving alfalfa while the fish liver oil lot weighed heaviest at two years of age. Both vitamin A and carotene supplemented lots showed nearly equal weights and gains superior to those of the check lot throughout the experiment. The pasture lot made the largest gains during the summer periods.

Fig. 3.--Average weights of heifers by lots



Feed consumption

Data in Table 2 show the average daily dry matter, protein, carotene, and vitamin A equivalent intake for each lot and experimental period. Dry matter, protein, and carotene fed were equal for lots I and II. Differences shown on the table are due to feed refused and weighed back, and to differences in live weights between the lots. Calculations for feed consumption on pasture were based on values for dry matter intake as published by Morrison (46) or by Garrigus and Rusk (18).

Type and condition

Figure 4 shows graphically the average type and condition scores given by different judges to the lots at various periods of the experiment. At the beginning of the experiment, all lots were judged as equal in type and practically equal in condition. As time passed, the alfalfa supplemented lot gained the superior rating in both type and condition scores. The fish liver oil supplemented lot was surpassed by the control lot and was approached closely by the pasture lot in both type and condition score.

Table 2.--FEED CONSUMPTION AND WEIGHT GAINS

Lot	Average weight	Average gain	Average dry matter intake 100# live wt./day	Average protein intake pounds 100# live wt./day	Average carotene intake mg/100# live wt./day	Average vitamin A intake *** units/ 100# live wt./day
	Pounds	Pounds	Pounds	Pounds	Mgs.	Units
			Winter 1946-47			
I	379.32	119.75	2.33	0.245	9.961	2,846
II	384.46	127.75	2.22	0.234	9.089	4,038
III	385.10	131.25	2.29	0.269	13.123	3,749
IV	344.76	104.75	2.49*	0.221	20.020	5,720
			Summer 1947			
I	521.50	147.80	2.60**	0.186	59.694	17,055
II	534.04	156.45	2.55**	0.182	58.600	16,743
III	537.40	160.00	2.54**	0.180	58.494	16,713
IV	529.78	190.66	2.57**	0.181	59.268	16,934
			Winter 1947-48			
I	692.66	197.45	2.37	0.175	5.134	1,467
II	712.12	200.80	2.32	0.170	5.011	2,374
III	717.00	200.00	2.28	0.174	5.568	1,591
IV	662.54	124.06	1.99*	0.128	5.252	1,500
			Summer 1948			
I	817.85	114.00	1.83**	0.083	11.556	3,302
II	848.39	117.50	1.79**	0.081	11.307	3,231
III	843.10	103.75	1.80**	0.082	11.345	3,242
IV	823.28	180.83	1.83**	0.083	11.536	3,296

* Dry matter consumption for animals on winter range was calculated by using Morrison's recommendations.

** Dry matter consumption was computed from values obtained for steers on pasture published by Garrigus and Rusk. Illinois Agricultural Experiment Station Bulletin 454.

*** Vitamin A equivalent intake calculated as 3.5 micrograms carotene equivalent to 1 International unit vitamin A.

Table 3.--FEED COST PER 100 POUNDS GAIN

Period	Lot I	Lot II	Lot III	Lot IV
Winter 1946-47	$14.08	$13.38	$12.79	$11.77
Summer 1947	5.07	4.79	4.69	3.93
Winter 1947-48	18.95	18.77	17.68	14.45
Summer 1948	10.53	10.21	11.57	6.64
Overall	12.74	12.33	12.04	8.29

Cost of live weight gains

Table 3 shows the feed cost per 100 pounds gain for each lot during each phase and for the entire experiment. Overall cost of 100 pounds gain was as follows: Lot IV, $8.29; Lot III, $12.04; Lot II, $12.33, and Lot I, $12.74. Cost of 100 pounds gain was more expensive in the second winter and summer than during the first winter and summer.

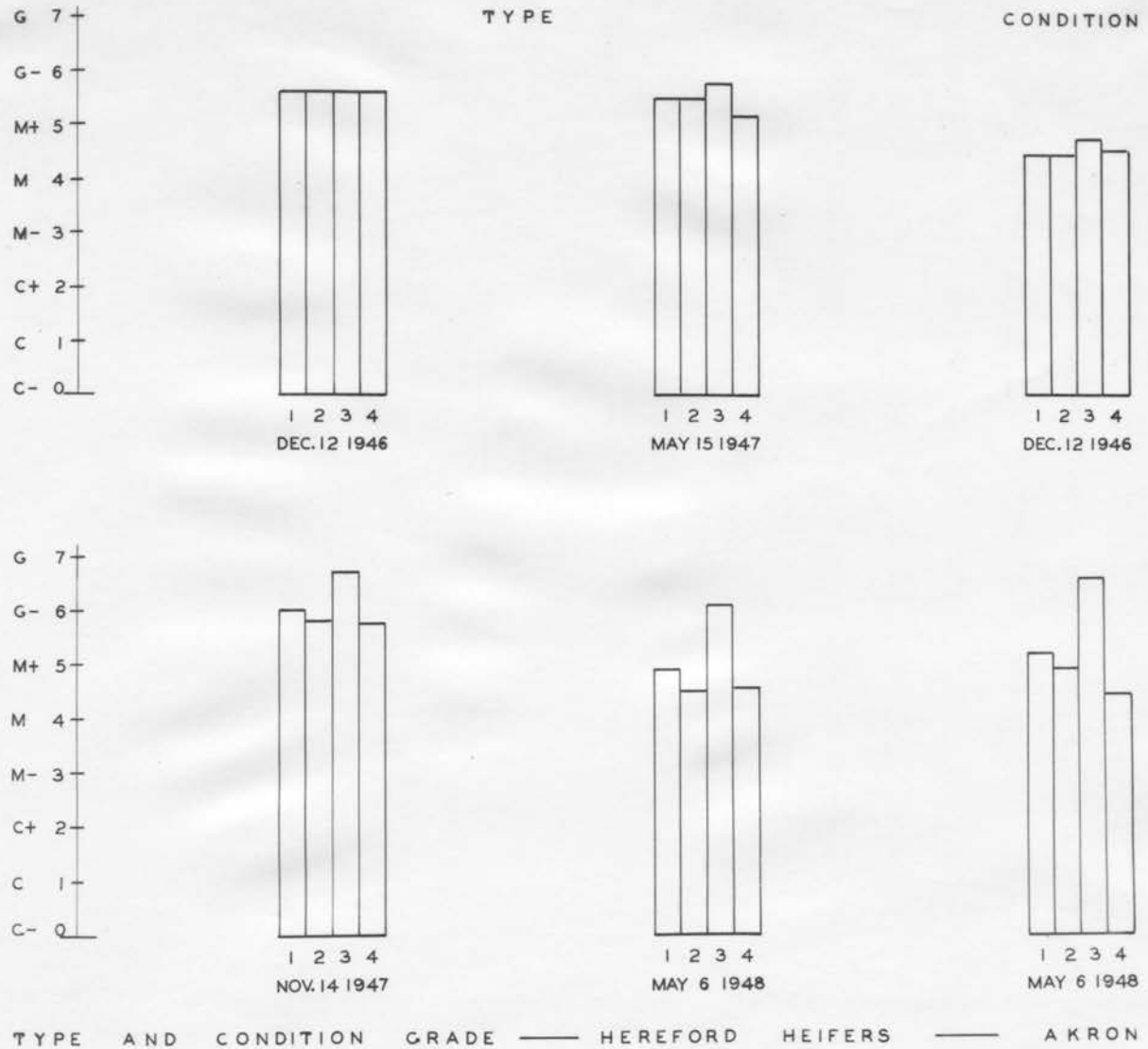


Fig. 4.--Type and condition grade

Calving performance

Information on parturition assembled in Table 4 reveals that all animals conceived. Four calves were born dead, two each in the control and fish liver oil lots. The time required for conception, as judged by calving dates was: Alfalfa lot, 21 days; fish liver oil lot, 35 days; pasture lot, 49 days; and control lot, 56 days. Two heifers each in the control and fish liver oil lots required assistance during parturition. One case of placental retention occurred in each lot.

Table 4.--SUMMARY OF CALVING DATA

	Lot I	Lot II	Lot III	Lot IV
Number of cows	10	10	10	9
Number of calves	10	10	10	9
Birth date of first calf	3/10/49	2/9/49*	3/13/49	3/13/49
Birth date of last calf	5/5/49	4/20/49	4/3/49	5/1/49
Days required for 70% of calves in lot to be dropped	25	(10)	9	17
Days required for complete calving	56	(35)	21	49
Average birth weight (pounds)	72.6	72.1	71.9	68.6
Death loss of cows during calving	1	0	0	0
Death loss of calves	2	2	0	0
Cows requiring assistance at calving	2	2	0	0
Retained placentas	1	1	1	1

* Calf was not carried the full gestation period and was dead at birth. First live calf was born March 16, 1949.

Chapter V
DISCUSSION

General observations

Due to above average rainfall during both summers, superior quality of the summer range and winter forage apparently inhibited the development of gross vitamin A deficiency symptoms. Although such circumstances are the exception rather than the rule in the high plains area, certainly during the time of this experiment the common dryland rations of eastern Colorado satisfied the vitamin A requirements for growth and conception of beef heifers. Nevertheless, the animals receiving a small amount of alfalfa hay exhibited better appetites, more vigor and more bloom to their hair coats than did the others. By the end of the summer periods, differences in the general appearance between lots were not distinguishable.

Eye disorders

"Pink eye" is rather frequently observed on the northern plains range soon after young animals are placed on spring pasture. In this experiment, those heifers which received higher levels of carotene from alfalfa

during the previous winter were the most severely affected. Most of the animals in the alfalfa lot presented a yellowish lachrymal discharge, although only three developed severe inflammation and blindness. One is inclined to incriminate hypercarotenemia as a cause for this trouble. Certainly, the observed serum carotene and vitamin A levels cannot logically indicate deficiency. A carotene-vitamin A-thyroid interrelationship is suggested as a possible contributing factor in "pink eye". It is known that excess carotene depresses the activity of the thyroid gland, and that thyroidectomy is frequently followed closely by "pink eye".

Serum carotene and vitamin A

Blood serum carotene of animals receiving alfalfa hay was considerably higher than that of the other lots during the wintering periods. Although extreme variation was observed in the pasture lot, the serum carotene promptly increased rather rapidly from the lowest observed values with the consumption of new grass early in the spring, and attained the highest level during the summer periods. Kniese (32) pointed out the possibility of low levels acting as a stimulus to the rate of conversion by stating, ".....indicates an increased ability to convert carotene from plant sources to serum carotene."

The serum carotene of the fish liver oil lot was usually lower than that of the control lot which received

the same carotene intake. This indicates that fish liver oil depresses serum carotene in some manner not explained by the data obtained in this work.

At the same vitamin A equivalent consumption, alfalfa supplementation resulted in higher serum vitamin A values than obtained from fish liver oil supplement. Only in a few instances, when the fish oil lot received temporarily higher vitamin A equivalent intake, did the serum vitamin A values approach those recorded for the alfalfa supplemented animals. Higher serum vitamin A levels were obtained during the second winter although the vitamin A equivalent intake per 100 pounds of body weight was lower than during the previous winter. The available data does not permit an explanation as to whether this was due to greater storage of vitamin A during the previous summer, lower requirements with increased age, or because of gestation. An appreciable decline in serum vitamin A occurred in all lots during the summer months, while at the same time the serum carotene remained high. It would appear logical to explain this phenomena as being due to the depressing effect of hot weather upon the thyroid gland (6) and the fact that carotene cannot be converted into vitamin A during hypothyroidism (39) or in the absence of the thyroid gland (6).

Serum calcium and phosphorus

Mineral mixture was self-fed to all lots and

variation with respect to consumption in the different lots might partly explain the considerable variation in the serum calcium and phosphorus values. No logical explanation can be given for a low mineral consumption by the pasture lot during the winter months, or for the maintenance of normal serum values throughout this period of diminished mineral intake. In general, the concentration of Ca and PO_4 ions in the blood serum were in reciprocal relationship to each other. An increase in the concentration of the one resulted in a decrease in the concentration of the other. The serum calcium values tended to increase and the serum phosphorus levels decrease with the approach of maturity.

Weight gains

Throughout the greater part of the experiment the alfalfa supplemented lot was the heaviest, although the fish oil lot weighed the most near the end of the second summer. Difference in weight of the two lots was so slight at all times, however, that it is impossible from weight data alone to critically evaluate either supplement. Although no classical symptoms of vitamin A deficiency were in evidence, there were temporary periods during which it was impossible, due to the quality of the feed, to supply carotene intakes considered as minimum for growth by some authors. According to other recommendations however, the carotene consumption at these times was ade-

quate. During these periods the vitamin A equivalent intake was greater in the fish liver oil and alfalfa supplemented lots. This might account for the superior gains of the vitamin A supplemented lots. The small gains made by the pasture lot during the winters were followed by superior gains during the summer, resulting in total body weights equal to the vitamin A supplemented lots toward the end of the summer periods.

Feed consumption

The heifers receiving alfalfa exhibited the best appetites as shown by the small amount of feed refused and weighed back. Stimulated appetites may be due either to some factor in the alfalfa hay, or merely to increased palatability brought about by the variety introduced into the ration. Dry matter consumption for the groups in drylot was about 2.3 pounds daily per 100 pounds of body weight throughout both winters. Poor quality of the feed during the winter of 1947-48 resulted in lower consumption of protein and carotene than the previous winter. Calculated intakes of dry matter, protein, and carotene were considerably higher in the summer of 1947, than in the summer of 1948.

Cost of live weight gains

Animals which received pasture made the least expensive live weight gain of all lots throughout the

entire experiment. The alfalfa lot showed the least expensive gain of the three drylot fed groups. Gain of the control lot was the most expensive. Total feed cost was highest for the fish liver oil lot, but relatively greater gain reduced the cost per 100 pounds gain. Cost of gain is based largely on economic considerations and obviously does not critically evaluate biologic performance, which in this case concerned vitamin A nutrition. A lower cost of gain as shown by the heifers on continuous pasture does not mean therefore a more adequate vitamin A metabolism. Data pertinent to the gestation and lactation periods of these animals and also the performance of their offspring must first be obtained before final recommendations can be made.

Type and condition

All lots were scored as equal with regard to type and approximately equal in condition at the start of the experiment. Although the heifers were graded several times by different judges, the alfalfa lot was rated repeatedly as superior in type. This lot was followed in the order given by the control lot, fish liver oil lot, and the pasture lot. Condition scores varied according to the feed conditions prior to judging. The alfalfa lot was given the highest score for condition, the pasture lot was lowest and the other lots were rated approximately equal. In view of the fact that the alfalfa lot was con-

sistently rated superior in both type and condition, it is logical to assume that the alfalfa supplement was responsible for the attractive appearance of this lot when viewed by the judges.

Calving performance

Observations limited to behavior of cows and calves at parturition indicate that the period of conception, as judged by calving dates, was shortest in the alfalfa supplemented lot. This lot was followed by the fish liver oil lot, which required 14 days longer time for calving. The time required to drop 70 per cent of the calves in each lot was as follows: Alfalfa supplemented lot, 9 days; fish liver oil supplemented lot, 10 days; pasture lot, 17 days; and control lot, 25 days. Animals receiving the unsupplemented, common dryland rations required considerably longer time for conception after pasture mating with the bull. Heifers receiving continuous pasture dropped calves weighing the least at birth. This might be due to the lower dry matter, protein, or carotene consumption by the dams. Calf birth weight averages in the other lots were practically equal. The loss of one cow from the control lot during parturition was due to an abnormal position of the calf and probably cannot be attributed to nutritional factors.

Chapter VI

SUMMARY

The vitamin A nutrition of prepartum Hereford heifers was studied under practical dry land conditions, supplementing commonly fed rations with alfalfa hay and fish liver oil. Forty animals were allotted to four groups which received the following rations: (a) cane, (b) cane and fish liver oil, (c) cane and alfalfa, and (d) continuous pasture. All lots received in addition soybean oil meal, salt, and mineral mixture. The alfalfa hay and fish liver oil were supplemented on a vitamin A equivalent basis. All groups grazed together on summer range.

Individual two day average weights were taken at the beginning and end of each phase, and single day weights were obtained every 28 days. Blood samples were collected at approximately 56 day intervals, and the serum was analyzed for carotene, vitamin A, calcium, and phosphorus. Samples of all feeds were analyzed every 28 days for dry matter, nitrogen, and carotenoids.

In the absence of classical vitamin A deficiency symptoms, together with evidence of growth and parturition performance currently considered as normal in practical

beef herd maintenance, it may be concluded that common dry land rations, of the quality observed during this experiment, support adequate vitamin A nutrition. Within the limitations of this study, one may also conclude that alfalfa hay is equal to, and in some cases superior to, fish liver oil as a vitamin A supplement in the maintenance of serum carotene and vitamin A levels, weight gains, type and condition grades, vigor, and general appearance.

Limited observations indicate that an advantage was derived from the feeding of alfalfa hay supplement in that calving time for the lot was appreciably shorter than that of the other lots, being completed in the interval of one estrus cycle of 21 days. Seventy per cent of the calves of this lot were dropped in nine days. Furthermore, the calves dropped by the alfalfa supplemented lot were by far the most vigorous of all.

A P P E N D I X

LIST OF APPENDIX TABLES

LIST OF APPENDIX TABLES.--Continued

Table 1a.--TOTAL FEED CONSUMPTION - WINTER 1946-47

Lot No.	Dates	Chopped cane lbs.	Alfalfa hay lbs.	Bleached cane lbs.	Protein supplement lbs.	Vitamin A oil ml.	Mineral mixture lbs.	Salt lbs.
I	12/12-1/8	2,970.00	----	----	187.50	----	10.00	10.00
	1/8-2/5	3,360.00	----	----	210.00	----	10.00	10.00
	2/5-3/5	2,780.00	----	----	210.00	----	20.00	10.00
	3/5-4/2	2,800.00	----	----	210.00	----	20.00	20.00
	4/2-4/30	2,780.00	----	----	210.00	----	20.00	20.00
	4/30-5/15	1,525.00	----	----	108.75	----	10.00	10.00
	Total	16,215.00	----	----	1,136.25	----	90.00	80.00
	Av/Hd/Day	10.46	----	----	0.73	----	0.06	0.05

Table 1b.--TOTAL FEED CONSUMPTION - WINTER 1946-47

Lot No.	Dates	Chopped cane lbs.	Alfalfa hay lbs.	Bleached cane lbs.	Protein supplement lbs.	Vitamin A oil ml.	Mineral mixture lbs.	Salt lbs.
II	12/12-1/8	2,970.00	----	------	187.50	120.00	10.00	10.00
	1/8-2/5	3,360.00	----	------	210.00	------	10.00	10.00
	2/5-3/5	1,950.00	----	900.00	210.00	64.00	10.00	30.00
	3/5-4/2	1,850.00	----	930.00	210.00	48.00	30.00	20.00
	4/2-4/30	1,850.00	----	950.00	210.00	48.00	20.00	20.00
	4/30-5/15	1,525.00	----	------	108.75	24.00	10.00	10.00
	Total	13,505.00	----	2,780.00	1,136.25	304.00	90.00	100.00
	Av/Hd/Day	8.71	----	1.79	0.73	0.20	0.06	0.06

Table 1c.--TOTAL FEED CONSUMPTION - WINTER 1946-47

Lot No.	Dates	Chopped cane lbs.	Alfalfa hay lbs.	Bleached cane lbs.	Protein supplement lbs.	Vitamin A oil ml.	Mineral mixture lbs.	Salt lbs.
III	12/12-1/8	2,430.00	540.00	----	129.00	----	10.00	10.00
	1/8-2/5	2,800.00	560.00	----	140.00	----	10.00	10.00
	2/5-3/5	2,240.00	560.00	----	135.00	----	20.00	40.00
	3/5-4/2	2,240.00	560.00	----	140.00	----	40.00	40.00
	4/2-4/30	2,240.00	560.00	----	140.00	----	20.00	20.00
	4/30-5/15	1,230.00	295.00	----	72.50	----	10.00	10.00
	Total	13,180.00	3,075.00	----	756.50	----	110.00	130.00
	Av/Hd/Day	8.50	1.98	----	0.49	----	0.07	0.08

Table 1d.--TOTAL FEED CONSUMPTION - WINTER 1946-47

Lot No.	Dates	Chopped cane lbs.	Alfalfa hay lbs.	Bleached cane lbs.	Protein supplement lbs.	Vitamin A oil ml.	Mineral mixture lbs.	Salt lbs.
IV	12/12-1/8	480.00	----	----	187.50	----	----	----
	1/8-2/5	------	----	----	210.00	----	----	----
	2/5-3/5	------	----	----	202.50	----	10.00	20.00
	3/5-4/2	------	----	----	210.00	----	----	----
	4/2-4/30	------	----	----	210.00	----	----	----
	4/30-5/15	------	----	----	108.75	----	----	----
	Total	480.00	----	----	1,128.75	----	10.00	20.00
	Av/Hd/Day	0.31	----	----	0.73	----	0.006	0.013

Table 1e.--TOTAL FEED CONSUMPTION - WINTER 1947-48

Lot No.	Dates	Chopped cane lbs.	Alfalfa hay lbs.	Protein supplement lbs.	Vitamin A oil ml.	Mineral mixture lbs.	Salt lbs.
I	11/14-12/11	5,840.00	----	270.00	----	20.00	30.00
	12/11-1/8	6,150.00	----	280.00	----	10.00	20.00
	1/8-2/5	6,160.00	----	280.00	----	10.00	10.00
	2/5-3/4	6,160.00	----	280.00	----	10.00	20.00
	3/4-4/8	7,630.00	----	350.00	----	20.00	30.00
	4/8-5/6	5,366.00	----	280.00	----	-----	10.00
	Total	37,306.00	----	1,740.00	----	70.00	120.00
	Av/Hd/Day	21.32	----	0.99	----	0.04	0.07

Table 1f.--TOTAL FEED CONSUMPTION - WINTER 1947-48

Lot No.	Dates	Chopped cane lbs.	Alfalfa hay lbs.	Protein supplement lbs.	Vitamin A oil ml.	Mineral mixture lbs.	Salt lbs.
II	11/14-12/11	5,840.00	----	270.00	40.00	20.00	30.00
	12/11-1/8	6,150.00	----	280.00	140.00	10.00	30.00
	1/8-2/5	6,160.00	----	280.00	140.00	10.00	10.00
	2/5-3/4	6,160.00	----	280.00	20.00	10.00	20.00
	3/4-4/8	7,667.00	----	350.00	25.00	20.00	30.00
	4/8-5/6	5,518.00	----	280.00	20.00	10.00	30.00
	Total	37,495.00	----	1,740.00	385.00	80.00	150.00
	Av/Hd/Day	21.43	----	0.99	0.22	0.05	0.09

Table 1g.--TOTAL FEED CONSUMPTION - WINTER 1947-48

Lot No.	Dates	Chopped cane lbs.	Alfalfa hay lbs.	Protein supplement lbs.	Vitamin A oil ml.	Mineral mixture lbs.	Salt lbs.
III	11/14-12/11	5,560.00	270.00	202.50	----	20.00	30.00
	12/11-1/8	5,871.50	280.00	210.00	----	10.00	30.00
	1/8-2/5	5,880.00	280.00	210.00	----	10.00	10.00
	2/5-3/4	5,600.00	560.00	140.00	----	10.00	20.00
	3/4-4/8	6,974.00	680.00	175.00	----	20.00	40.00
	4/8-5/6	4,980.00	560.00	140.00	----	-----	30.00
	Total	34,865.50	2,630.00	1,077.50	----	70.00	160.00
	Av/Hd/Day	19.92	1.50	0.62	----	0.04	0.09

Table 1h.--TOTAL FEED CONSUMPTION - WINTER 1947-48

Lot No.	Dates	Chopped cane lbs.	Alfalfa hay lbs.	Protein supplement lbs.	Vitamin A oil ml.	Mineral mixture lbs.	Salt lbs.
IV	11/14-12/11	------	----	243.00	----	10.00	10.00
	12/11-1/8	------	----	243.00	----	-----	-----
	1/8-2/5	720.00	----	252.00	----	-----	10.00
	2/5-3/4	360.00	----	252.00	----	20.00	20.00
	3/4-4/8	360.00	----	315.00	----	-----	20.00
	4/8-5/6	------	----	252.00	----	-----	10.00
	Total	1,440.00	----	1,557.00	----	30.00	70.00
	Av/Hd/Day	0.91	----	0.99	----	0.02	0.04

Table 2.--FEED ANALYSIS 1946-48

Type of feed	Date of sample	Master number	Percent dry matter	Lbs. protein per lb. D.M.	Mcgms. carotene per lb. D.M.
Chopped cane	12/12/46	1,361	58.24	.0783	9,128
	12/23/46	1,364	49.95	.0740	11,222
	1/8/47	1,379	65.78	.0797	4,968
	2/5/47	1,396	79.58	.0765	2,170
	3/5/47	1,457 B	80.46	.0716	3,330
	4/2/47	1,500	88.66	.0828	4,788
	4/30/47	1,532	94.68	.0562	586
	5/14/47	1,558	93.52	.0759	4,077
	11/14/47	1,767	57.15	.0607	3,884
	12/11/47	1,779	65.72	.0576	4,026
	1/8/48	1,792	75.99	.0741	1,217
	2/5/48	1,812	75.45	.0595	2,525
	3/4/48	1,844	57.54	.0559	2,944
	3/4/48	1,845	74.39	.0261	1,177
	4/8/48	1,860	92.66	.0291	1,372
	5/6/48	1,874	90.42	.0337	1,200
Bleached cane	1/8/47	1,378	73.77	.0676	1,946
	2/5/47	1,395	59.72	.0666	1,915
	3/5/47	1,457 B	80.46	.0716	3,330
Alfalfa hay	12/12/46	1,362	88.68	.1388	12,414
	12/23/46	1,365	89.93	.1799	13,357
	1/8/47	1,380	80.12	.1862	11,608
	2/5/47	1,397	88.54	.1842	12,346
	3/5/47	1,456	90.08	.1840	9,173
	4/2/47	1,501	91.74	.1888	9,972
	4/30/47	1,533	88.22	.2044	12,178
	5/14/47	1,559	87.62	.1908	11,604
	12/11/47	1,778	89.87	.1771	3,877
	1/8/48	1,791	86.94	.1765	5,108
	2/5/48	1,811	86.65	.1803	7,902
	3/4/48	1,843	85.39	.1946	4,273
	4/8/48	1,859	91.06	.1888	5,121
	5/6/48	1,873	92.95	.2039	2,486
Pasture grass	12/12/46	1,360	89.78	.0403	2,296
	1/8/47	1,377	91.24	.0349	1,886
	2/5/47	1,394	91.30	.0456	1,004
	3/5/47	1,458	96.31	.0364	561

Table 2.--FEED ANALYSIS 1946-48--Continued

Type of feed	Date of sample	Master number	Percent dry matter	Lbs. protein per lb. D.M.	Mcgms. carotene per lb. D.M.
Pasture grass cont.	4/2/47	1,499	93.01	.0449	790
	4/30/47	1,534	44.11	.1318	37,450
	5/14/47	1,560	56.58	.0782	24,915
	6/12/47	1,655	37.57	.1026	58,959
	7/10/47	1,661	54.51	.0715	24,939
	8/7/47	1,675	71.04	.0521	13,500
	9/4/47	1,689	75.69	.0525	9,999
	10/2/47	1,704	73.11	.0459	7,326
	11/14/47	1,766	85.18	.0339	1,862
	11/14/47	1,768	52.80	.0475	15,835
	12/11/47	1,786	84.80	.0384	938
	1/8/48	1,793	79.57	.0294	567
	2/5/48	1,814	78.91	.0167	884
	3/4/48	1,846	62.41	.0169	000
	4/8/48	1,861	90.70	.0494	1,427
	5/6/48	1,875	82.11	.0628	10,727
	5/6/48	1,876	96.70	.0673	11,719
	6/5/48	1,877	95.28	.0518	6,590
	7/8/48	1,878	95.86	.0496	7,559
	8/5/48	1,881	67.14	.0440	7,093
	9/2/48	1,886	75.61	.0407	8,410
	9/30/48	1,887	88.36	.0311	3,505
	11/6/48	1,903	96.08	.0448	25
Crested wheat-grass	6/12/47	1,654	27.91	.0919	27,814
	7/10/47	1,660	48.50	.0737	16,746
	8/7/47	1,674	66.02	.0972	25,068
	9/4/47	1,688	77.03	.0502	6,391
	10/2/47	1,703	53.74	.1300	34,342
	11/14/47	1,765	51.26	.1133	31,280
Soybean oil meal	12/12/46	1,357	90.56	.4330	193
	1/8/47	1,374	89.84	.4521	000
	2/5/47	1,391	89.37	.4754	000
	3/5/47	1,478	91.19	.4526	000
	4/2/47	1,496	88.77	.4407	000
	4/30/47	1,529	89.64	.4352	000
	11/14/47	1,764	90.46	.4457	315
	12/11/47	1,777	90.66	.4475	52

Table 2.--FEED ANALYSIS 1946-48--Continued

Type of feed	Date of sample	Master number	Percent dry matter	Lbs. protein per lb. D.M.	Mcgms. carotene per lb. D.M.
Soybean oil meal cont.	1/8/48	1,790	89.72	.4678	137
	2/5/48	1,810	90.78	.4519	000
	3/4/48	1,842	90.74	.4765	000
	4/8/48	1,858	92.41	.4432	54
	5/6/48	1,872	92.11	.4677	29
Fish liver oil	8/15/46	Vitamin A - 26,000 I. U. per gram			
	8/18/47	Vitamin A - 31,000 I. U. per gram			
	2/3/48	Vitamin A - 33,683 I. U. per gram			
	6/14/48	Vitamin A - 33,500 I. U. per gram			

Table 3a.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (WINTER 1946-47)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per da.	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per da.	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per da.	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per da.
I	12/12 to 1/8	1,832	2.09	202.19	0.229	15,208	17.23	4,345,114	4,922
	1/8 to 2/5	2,630	2.69	277.91	0.285	9,375	9.60	2,678,525	2,743
	2/5 to 3/5	2,415	2.27	253.70	0.239	6,720	6.33	1,919,857	1,809
	3/5 to 4/2	2,557	2.28	267.22	0.238	9,612	8.56	2,746,203	2,446
	4/2 to 4/30	2,735	2.32	284.22	0.241	11,293	9.56	3,226,496	2,732
	4/30 to 5/15	1,532	2.40	156.15	0.244	6,360	9.95	1,817,120	2,816
	Average		2.34		0.246		10.20		2,846
	Total	13,701		1,441.39		58,568		16,733,315	

* Vitamin A equivalent intake calculated as 3.5 micrograms carotene equivalent to 1 International Unit vitamin A.

Table 3b.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (WINTER 1946-47)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per da.	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per da.	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per da.	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per da.
II	12/12 to 1/8	1,832	2.06	202.19	0.228	15,208	17.13	7,735,280	8,712
	1/8 to 2/5	2,630	2.68	277.91	0.283	9,375	9.54	2,678,480	2,725
	2/5 to 3/5	2,325	2.17	245.56	0.229	6,411	5.98	3,640,280	3,397
	3/5 to 4/2	2,374	2.09	246.82	0.217	7,547	6.63	3,512,880	3,086
	4/2 to 4/30	2,549	2.12	262.59	0.219	9,263	7.71	4,003,160	3,331
	4/30 to 5/15	1,532	2.34	156.15	0.239	6,360	9.74	2,495,400	3,790
	Average		2.24		0.236		9.46		4,038
	Total	13,242		1,391.22		54,156		24,065,480	

Table 3c.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (WINTER 1946-47)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
III	12/12 to 1/8	1,947	2.18	236.05	0.265	18,405	20.66	5,258,705	5,904
	1/8 to 2/5	2,632	2.67	304.32	0.309	13,466	13.68	3,847,423	3,915
	2/5 to 3/5	2,414	2.26	281.98	0.264	10,792	10.09	3,083,383	2,883
	3/5 to 4/2	2,529	2.22	297.37	0.261	12,560	11.04	3,588,687	3,155
	4/2 to 4/30	2,682	2.23	316.85	0.263	14,825	12.31	4,235,813	3,518
	4/30 to 5/15	1,481	2.25	171.34	0.261	8,282	12.61	2,366,265	3,543
	Average		2.30		0.270		13.40		3,749
	Total	13,685		1,607.91		78,330		22,380,276	

Table 3d.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (WINTER 1946-47)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
IV	12/12 to 1/8	2,240	2.65	147.82	0.175	6,242	7.37	1,783,340	2,106
	1/8 to 2/5	2,296	2.60	185.36	0.210	3,046	3.45	870,303	984
	2/5 to 3/5	2,352	2.55	176.13	0.191	1,696	1.84	484,617	525
	3/5 to 4/2	2,436	2.48	180.55	0.184	1,519	1.55	433,992	443
	4/2 to 4/30	2,548	2.42	370.15	0.292	53,536	50.88	15,295,907	14,512
	4/30 to 5/15	1,410	2.38	185.71	0.314	40,942	69.23	11,697,705	18,597
	Average		2.51		0.228		22.39		5,720
	Total	13,282		1,182.72		106,981		30,565,864	

Table 4a.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (SUMMER 1947)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
I	5/15 to 6/12	3,612	3.00	362.86	0.302	190,473	158.12	54,420,919	45,177
	6/12 to 7/10	3,682	2.88	317.24	0.248	139,980	109.57	39,994,238	31,307
	7/10 to 8/7	3,780	2.67	251.44	0.178	73,927	52.29	21,121,992	14,941
	8/7 to 9/4	3,850	2.49	250.79	0.163	54,431	35.16	15,551,800	10,046
	9/4 to 10/2	3,892	2.41	286.98	0.179	61,041	37.82	17,440,384	10,806
	10/2 to 10/30	3,892	2.40	203.00	0.124	34,359	21.17	9,816,736	6,220
	10/30 to 11/14	2,085	2.42	87.28	0.108	15,476	17.96	4,421,669	5,131
	Average		2.61		0.186		61.72		17,661
	Total	24,793		1,759.59		569,687		162,767,738	

* Vitamin A equivalent intake calculated as 3.5 micrograms carotene equivalent to 1 International Unit vitamin A.

Table 4b.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (SUMMER 1947)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
II	5/15 to 6/12	3,640	2.96	365.67	0.298	191,937	156.15	54,839,200	44,604
	6/12 to 7/10	3,699	2.84	318.70	0.245	140,614	107.98	40,175,512	30,850
	7/10 to 8/7	3,794	2.62	252.38	0.174	74,201	51.32	21,200,318	14,664
	8/7 to 9/4	3,867	2.45	251.89	0.160	54,671	34.70	15,620,243	9,913
	9/4 to 10/2	3,903	2.38	287.81	0.176	61,219	37.35	17,491,015	10,672
	10/2 to 10/30	3,912	2.34	204.05	0.122	34,535	20.66	9,867,173	5,902
	10/30 to 11/14	2,094	2.34	87.58	0.106	15,517	17.38	4,433,483	4,964
	Average		2.56		0.183		60.79		17,367
	Total	24,909		1,768.08		572,694		163,626,944	

Table 4c.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (SUMMER 1947)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
III	5/15 to 6/12	3,654	2.93	367.18	0.294	192,669	154.54	55,048,340	44,155
	6/12 to 7/10	3,716	2.81	320.17	0.241	141,268	106.79	40,362,405	30,511
	7/10 to 8/7	3,797	2.62	252.57	0.174	74,259	51.19	21,216,792	14,627
	8/7 to 9/4	3,867	2.45	251.89	0.160	54,671	34.70	15,620,243	9,914
	9/4 to 10/2	3,906	2.38	288.04	0.176	61,268	37.32	17,505,128	10,663
	10/2 to 10/30	3,914	2.34	204.13	0.122	34,544	20.60	9,869,799	5,885
	10/30 to 11/14	2,100	2.33	87.86	0.105	15,573	17.31	4,449,420	4,945
	Average		2.55		0.182		60.35		17,242
	Total	24,954		1,771.84		574,252		164,072,127	

Table 4d.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (SUMMER 1947)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
IV	5/15 to 6/12	3,584	3.05	306.04	0.308	188,978	160.94	53,993,374	45,984
	6/12 to 7/10	3,696	2.85	318.45	0.246	140,508	180.44	40,145,175	30,983
	7/10 to 8/7	3,794	2.62	252.38	0.174	74,201	51.23	21,200,318	14,638
	8/7 to 9/4	3,875	2.45	252.41	0.160	54,785	34.69	15,652,786	9,912
	9/4 to 10/2	3,906	2.37	288.04	0.175	61,268	37.17	17,505,128	10,620
	10/2 to 10/30	3,920	2.33	204.45	0.122	34,600	20.61	9,885,736	5,945
	10/30 to 11/14	1,884	2.35	80.46	0.096	14,552	18.15	4,157,843	5,186
	Average		2.57		0.183		71.89		17,609
	Total	24,659		1,756.23		568,892		162,540,360	

Table 5a.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (WINTER 1947-48)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
I	11/14 to 12/11	3,833	2.32	321.83	0.194	14,236	8.60	4,067,320	2,457
	12/11 to 1/8	4,610	2.63	402.46	0.230	11,448	6.54	3,270,810	1,867
	1/8 to 2/5	4,917	2.65	427.89	0.231	8,744	4.71	2,498,229	1,347
	2/5 to 3/4	4,350	2.22	354.25	0.182	11,203	5.72	3,200,731	1,635
	3/4 to 4/8	5,842	2.30	342.32	0.135	9,558	3.76	2,730,886	1,076
	4/8 to 5/6	5,170	2.45	271.73	0.129	6,328	3.00	1,807,905	857
	Average		2.43		0.184		5.39		1,540
	Total	28,722		2,120.48		61,517		17,575,881	

*Vitamin A equivalent intake calculated as 3.5 micrograms carotene equivalent to 1 International Unit vitamin A.

Table 5b.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (WINTER 1947-48)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
II	11/14 to 12/11	3,833	2.25	321.83	0.190	14,236	8.36	5,273,520	3,097
	12/11 to 1/8	4,610	2.55	402.46	0.224	11,448	6.35	7,491,680	4,153
	1/8 to 2/5	4,917	2.57	427.89	0.224	8,744	4.57	6,791,160	3,510
	2/5 to 3/4	4,350	2.16	354.25	0.177	11,203	5.57	3,803,800	1,891
	3/4 to 4/8	5,873	2.26	343.17	0.132	9,598	3.69	3,496,150	1,343
	4/8 to 5/6	5,309	2.45	276.09	0.128	6,506	3.00	2,462,040	1,137
	Average		2.37		0.179		5.26		2,522
	Total	28,892		2,125.69		61,735		29,246,350	

Table 5c.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (WINTER 1947-48)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
III	11/14 to 12/11	3,838	2.23	326.29	0.190	14,618	8.45	4,176,508	2,425
	12/11 to 1/8	4,597	2.52	404.07	0.221	12,040	6.61	3,439,871	1,889
	1/8 to 2/5	4,885	2.53	428.10	0.222	9,924	5.14	2,835,291	1,468
	2/5 to 3/4	4,333	2.14	364.15	0.180	13,120	6.47	3,748,445	1,849
	3/4 to 4/8	5,812	2.23	366.91	0.141	11,545	4.42	3,298,512	1,263
	4/8 to 5/6	5,203	2.39	303.05	0.139	7,827	3.60	2,236,386	1,029
	Average		2.34		0.182		5.78		1,654
	Total	28,668		2,192.57		69,074		19,735,013	

Table 5d.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (WINTER 1947-48)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100 # per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
IV	11/14 to 12/11	3,100	2.07	222.09	0.148	24,195	16.14	6,912,869	4,612
	12/11 to 1/8	3,175	2.04	200.42	0.129	2,246	1.44	641,844	412
	1/8 to 2/5	3,326	2.01	199.52	0.121	2,890	1.50	825,589	500
	2/5 to 3/4	3,402	2.00	169.38	0.099	1,950	1.15	557,284	328
	3/4 to 4/8	4,252	2.00	265.88	0.124	3,157	1.48	902,089	424
	4/8 to 5/6	3,478	1.99	287.75	0.164	19,736	10.14	5,638,767	2,897
	Average		2.02		0.131		5.31		1,529
	Total	20,733		1,345.04		54,174		15,478,442	

Table 6a.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (SUMMER 1948)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
I	5/6 to 6/5	4,365	1.93	260.15	0.115	39,957	17.65	11,416,500	5,044
	6/5 to 7/8	4,811	1.91	243.94	0.097	34,036	13.50	9,724,440	3,856
	7/8 to 8/5	4,144	1.85	193.94	0.086	30,359	13.53	8,674,120	3,865
	8/5 to 9/2	4,200	1.81	178.08	0.077	32,558	14.01	9,302,400	4,004
	9/2 to 9/30	4,284	1.77	153.80	0.064	25,524	10.54	7,292,592	3,010
	9/30 to 11/5	5,425	1.75	206.15	0.067	9,575	3.09	2,735,750	884
	Average		1.84		0.084		12.05		3,444
	Total	27,229		1,236,06		172,009		49,145,802	

* Vitamin A equivalent intake calculated as 3.5 micrograms carotene equivalent to 1 International Unit vitamin A.

Table 6b.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (SUMMER 1948)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
II	5/6 to 6/5	4,410	1.87	262.84	0.112	40,369	17.14	11,534,100	4,897
	6/5 to 7/8	4,868	1.85	246.78	0.094	34,433	13.09	9,837,960	3,739
	7/8 to 8/5	4,200	1.81	196.56	0.084	30,769	13.24	8,791,160	3,782
	8/5 to 9/2	4,262	1.77	180.69	0.076	33,036	13.74	9,438,835	3,925
	9/2 to 9/30	4,390	1.74	157.62	0.062	26,158	10.38	7,473,715	2,965
	9/30 to 11/5	5,565	1.73	211.47	0.065	9,822	3.06	2,806,350	873
	Average		1.80		0.082		11.78		3,364
	Total	27,695		1,255.96		174,587		49,882,120	

Table 6c.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (SUMMER 1948)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
III	5/6 to 6/5	4,419	1.86	263.37	0.111	40,452	17.05	11,557,578	4,872
	6/5 to 7/8	4,884	1.85	247.62	0.094	34,549	13.06	9,871,290	3,732
	7/8 to 8/5	4,183	1.81	195.77	0.085	30,646	13.24	8,755,880	3,784
	8/5 to 9/2	4,242	1.78	179.86	0.075	32,884	13.82	9,395,424	3,948
	9/2 to 9/30	4,340	1.75	155.81	0.063	25,858	10.45	7,387,920	2,965
	9/30 to 11/5	5,495	1.74	208.81	0.067	9,699	3.07	2,771,050	878
	Average		1.80		0.082		11.78		3,363
	Total	27,563		1,251.24		174,088		49,739,142	

Table 6d.--TOTAL DRY MATTER, PROTEIN, CAROTENE AND VITAMIN A EQUIVALENT CONSUMPTION (SUMMER 1948)

Lot No.	Dates	Dry matter (lbs.) Total	Dry matter (lbs.) Av.per 100# per day	Protein (lbs.) Total	Protein (lbs.) Av.per 100# per day	Carotene (Mgms.) Total	Carotene (Mgms.) Av.per 100# per day	Vitamin A equivalent (units)* Total	Vitamin A equivalent (units)* Av.per 100# per day
IV	5/6 to 6/5	3,915	1.95	233.33	0.116	35,838	17.86	10,239,420	5,103
	6/5 to 7/8	4,366	1.87	221.35	0.096	30,884	13.26	8,824,167	3,788
	7/8 to 8/5	3,747	1.83	175.37	0.086	27,452	13.38	7,843,500	3,824
	8/5 to 9/2	3,805	1.79	161.34	0.076	29,498	13.86	8,427,974	3,960
	9/2 to 9/30	3,893	1.76	139.77	0.063	23,197	10.48	6,627,679	2,995
	9/30 to 11/5	4,930	1.75	187.33	0.066	8,701	3.08	2,486,003	880
	Average		1.82		0.084		11.99		3,425
	Total	24,656		1,118.49		155,570		44,448,743	

Table 7a.--BLOOD SERUM CAROTENE (Mcgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12-46	2-5-47	4-2-47	5-14-47	6-12-47	8-7-47	10-2-47	11-13-47
I	2	90.90	87.00	131.40	90.00	588.00	513.00	462.00	168.00
	3	104.40	-----	132.00	96.00	522.00	597.00	606.00	294.00
	7	30.00	111.00	108.00	82.50	591.60	597.00	588.00	183.00
	9	36.00	-----	105.00	57.00	534.00	366.00	234.00	129.00
	10	50.40	87.00	87.00	67.50	500.40	644.50	372.30	174.00
	14	153.00	87.00	97.20	69.00	504.00	618.00	492.00	285.00
	17	50.10	-----	123.00	83.10	420.60	498.00	575.40	210.00
	23	47.40	63.00	114.00	90.00	498.00	561.00	324.00	246.00
	30	57.00	-----	66.00	60.00	431.40	552.00	315.00	150.00
	43	57.00	-----	112.50	87.00	522.00	561.00	552.00	399.00
Average		67.62	87.00	107.61	78.21	511.20	550.75	452.07	223.80

Table 7b.--BLOOD SERUM CAROTENE (Mcgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12-46	2-5-47	4-2-47	5-14-47	6-12-47	8-7-47	10-2-47	11-13-47
II	5	50.70	105.00	114.00	57.00	393.00	543.00	618.00	447.00
	6	50.70	57.00	87.00	69.00	393.00	579.00	492.00	159.00
	18	24.00	45.00	129.00	102.00	431.40	477.00	294.00	189.00
	21	26.40	75.00	84.00	48.00	381.00	429.00	348.00	129.00
	24	93.00	89.40	114.00	92.40	584.40	597.00	411.00	225.00
	25	85.20	31.80	78.00	87.00	498.00	494.40	522.00	150.00
	33	37.50	63.00	69.00	67.50	524.40	561.00	300.00	135.00
	42	63.00	69.00	75.00	84.00	462.00	570.00	300.00	276.00
	39	63.00	55.20	81.00	67.50	518.40	504.00	267.00	171.00
	40	71.40	69.00	96.00	91.50	600.60	720.00	747.00	261.00
Average		56.49	65.94	92.70	76.59	478.62	547.44	429.90	214.20

Table 7c.--BLOOD SERUM CAROTENE (Mcgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12-46	2-5-47	4-2-47	5-14-47	6-12-47	8-7-47	10-2-47	11-13-47
III	1	88.20	135.00	175.80	132.00	534.00	522.00	330.00	222.00
	11	59.40	------	111.00	114.00	348.00	276.00	331.20	219.00
	12	45.00	108.00	135.00	102.00	348.00	462.00	330.00	183.00
	13	72.60	177.00	156.00	108.00	524.40	351.00	513.00	201.00
	15	60.00	192.00	184.20	162.00	618.00	688.50	315.00	234.00
	27	56.40	133.20	126.00	102.00	507.60	513.00	294.00	156.00
	29	67.80	103.80	132.00	136.20	469.50	469.50	597.00	210.00
	31	73.20	103.80	162.00	135.00	543.00	387.00	462.00	225.00
	36	88.20	156.00	123.00	105.00	552.00	552.00	606.00	522.00
	37	69.60	120.30	144.00	109.80	552.00	405.00	528.00	153.00
Average		68.04	136.57	144.90	120.60	499.65	462.60	430.62	232.50

Table 7d.--BLOOD SERUM CAROTENE (Mcgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12-46	2-5-47	4-2-47	5-14-47	6-12-47	8-7-47	10-2-47	11-13-47
IV	4	48.00	54.00	252.00	451.50	618.00	469.50	534.00	504.00
	8	65.40	67.20	277.50	484.50	579.00	582.60	345.00	243.00
	16	111.00	-----	316.20	513.00	588.00	552.00	561.00	246.00
	19	57.00	41.10	316.20	423.00	575.40	504.00	351.00	238.50
	20	51.00	70.80	228.00	405.00	466.50	351.00	447.00	------
	22	48.90	81.00	339.00	570.00	702.00	717.00	675.00	267.00
	26	48.90	-----	268.50	399.00	462.00	454.50	306.00	144.00
	28	154.80	124.80	318.00	570.00	762.00	747.00	606.00	333.00
	32	52.20	66.00	246.00	450.00	435.00	447.00	264.00	174.00
	34	49.80	66.00	264.00	528.00	610.80	570.00	579.00	174.00
Average		68.70	71.36	282.54	479.40	579.87	539.46	466.80	258.16

Table 8a.--BLOOD SERUM CAROTENE (Mcgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13-47	1-8-48	3-4-48	5-6-48	7-8-48	9-2-48	11-5-48
I	2	168.00	129.00	117.00	40.50	496.50	441.00	63.00
	3	294.00	198.00	135.00	47.40	876.00	571.50	220.50
	7	183.00	160.20	72.00	43.50	585.00	475.50	63.00
	9	129.00	138.00	66.00	49.50	369.00	294.00	51.00
	10	174.00	138.00	76.50	38.40	597.00	391.50	66.00
	14	285.00	96.00	81.00	43.50	609.00	648.00	97.50
	17	210.00	191.70	102.00	38.40	648.00	609.00	61.50
	23	246.00	121.20	96.00	36.90	723.00	496.50	76.50
	30	150.00	57.00	82.50	30.60	747.00	369.00	57.00
	43	399.00	159.00	102.00	28.50	723.00	648.00	150.00
Average		223.80	138.81	93.00	39.72	637.35	494.40	90.60

Table 8b.--BLOOD SERUM CAROTENE (Mcgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13-47	1-8-48	3-4-48	5-6-48	7-8-48	9-2-48	11-5-48
II	5	447.00	82.50	90.00	31.80	507.00	519.00	159.00
	6	159.00	67.50	91.50	28.80	648.00	432.00	76.50
	18	189.00	93.00	156.00	34.20	465.00	330.00	60.00
	21	129.00	109.80	96.00	28.50	414.00	324.00	94.50
	24	225.00	145.20	96.00	36.90	723.00	681.00	138.00
	25	150.00	82.50	112.50	33.00	475.50	399.00	61.50
	33	135.00	76.50	82.50	29.40	519.00	406.50	117.00
	42	276.00	123.00	111.00	66.00	571.50	486.00	78.00
	39	171.00	92.40	112.50	31.80	507.00	441.00	117.00
	40	261.00	84.00	90.00	38.40	939.00	747.00	90.00
Average		214.20	95.64	103.80	35.88	576.90	476.55	99.15

Table 8c.--BLOOD SERUM CAROTENE (Mcgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13-47	1-8-48	3-4-48	5-6-48	7-8-48	9-2-48	11-5-48
III	1	222.00	141.00	171.00	49.50	558.00	399.00	60.00
	11	219.00	102.00	144.00	31.80	349.50	300.00	45.00
	12	183.00	117.00	144.00	42.00	519.00	609.00	58.50
	13	201.00	120.00	150.00	38.40	609.00	450.00	57.00
	15	234.00	117.00	150.00	35.40	771.00	1080.00	1125.00
	27	156.00	108.00	147.00	43.50	747.00	771.00	76.50
	29	210.00	174.00	135.00	43.50	648.00	531.00	60.00
	31	225.00	138.00	123.00	36.90	609.00	585.00	58.50
	36	522.00	165.00	120.00	46.50	648.00	539.10	148.50
	37	153.00	150.00	144.00	46.50	648.00	539.10	72.00
Average		232.50	133.20	142.80	41.40	610.65	580.32	176.10

Table 8d.--BLOOD SERUM CAROTENE (Mcgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13-47	1-8-48	3-4-48	5-6-48	7-8-48	9-2-48	11-5-48
IV	4	504.00	168.00	46.20	492.90	939.00	747.00	66.00
	8	243.00	255.00	76.50	369.00	967.50	681.00	55.50
	16	246.00	207.00	67.50	492.90	822.00	571.50	115.20
	19	238.50	261.00	93.00	321.90	681.00	519.00	60.00
	22	267.00	417.00	135.00	458.70	1110.00	1110.00	159.00
	26	144.00	135.00	51.00	426.00	597.00	496.50	84.00
	28	333.00	405.00	147.00	495.00	996.00	1023.00	70.50
	32	174.00	225.00	66.00	369.00	681.00	747.00	61.50
	34	174.00	280.50	93.00	513.60	1080.00	558.00	75.00
Average		258.16	261.50	86.13	437.66	874.83	717.00	82.97

Table 9a.--BLOOD SERUM VITAMIN A (I. U./100 Ml.) 1946-47

Lot No.	Animal No.	12-12-46	2-5-47	4-2-47	5-14-47	6-12-47	8-7-47	10-2-47	11-13-47
I	2	------	185.40	114.00	171.00	323.40	255.00	291.60	368.40
	3	------	------	100.80	147.30	530.10	328.20	285.30	443.70
	7	------	153.00	119.70	159.60	438.90	289.20	311.40	322.50
	9	------	------	------	118.20	454.20	156.30	286.20	354.60
	10	------	173.10	100.80	160.20	539.70	300.90	276.60	353.70
	14	------	168.90	93.30	148.80	520.20	299.40	249.60	342.60
	17	------	------	123.00	160.80	230.70	275.40	317.10	318.00
	23	------	200.10	89.40	168.00	429.30	260.40	311.70	465.30
	30	------	------	116.70	127.50	393.90	288.60	263.40	418.50
	43	------	------	134.10	169.20	395.10	218.40	288.60	357.30
Average		------	176.10	100.87	153.06	425.55	267.18	288.15	374.46

Table 9b.--BLOOD SERUM VITAMIN A (I. U./100 Ml.) 1946-47

Lot No.	Animal No.	12-12-46	2-5-47	4-2-47	5-14-47	6-12-47	8-7-47	10-2-47	11-13-47
II	5	-----	115.50	105.30	139.20	322.50	241.50	378.90	387.00
	6	-----	214.80	131.40	169.80	280.50	218.10	435.60	495.30
	18	-----	222.00	101.70	222.60	330.90	316.20	404.70	491.10
	21	-----	147.30	-----	179.40	471.90	535.80	380.40	474.00
	24	128.40	143.70	131.70	138.30	336.90	230.70	372.90	423.90
	25	108.90	165.30	120.00	162.00	424.80	221.40	341.10	364.50
	33	141.60	191.40	93.90	113.70	468.90	191.40	351.00	260.10
	42	193.50	151.50	141.00	134.70	305.10	229.50	336.00	333.30
	39	186.30	201.90	74.70	142.20	366.60	217.20	537.00	401.40
	40	126.60	224.10	142.20	174.90	458.70	276.00	479.70	242.70
Average		147.55	177.75	115.77	157.68	376.68	272.28	401.73	387.33

Table 9c.--BLOOD SERUM VITAMIN A (I. U./100 Ml.) 1946-47

Lot No.	Animal No.	12-12-46	2-5-47	4-2-47	5-14-47	6-12-47	8-7-47	10-2-47	11-13-47
III	1	-----	150.00	152.70	189.60	464.70	222.60	307.50	437.10
	11	-----	-----	105.90	103.20	254.40	295.80	321.90	426.30
	12	176.10	161.10	94.20	134.10	527.40	212.10	426.00	322.50
	13	238.50	158.70	121.50	167.40	633.90	142.20	426.00	552.90
	15	165.00	198.30	77.70	117.60	648.30	333.60	416.10	524.70
	27	119.40	162.00	86.40	126.60	386.70	174.00	443.70	415.80
	29	163.20	162.00	145.50	129.30	445.80	201.30	268.20	274.50
	31	234.00	207.90	186.00	207.90	919.80	217.50	350.10	435.60
	36	225.90	198.30	106.80	153.60	422.10	271.80	303.30	482.10
	37	133.80	182.70	111.00	166.50	567.60	365.10	392.40	417.00
Average		181.99	175.67	118.77	149.58	527.07	243.60	365.52	428.85

Table 9d.--BLOOD SERUM VITAMIN A (I. U./100 Ml.) 1946-47

Lot No.	Animal No.	12-12-46	2-5-47	4-2-47	5-14-47	6-12-47	8-7-47	10-2-47	11-13-47
IV	4	-----	149.40	154.20	354.90	468.90	208.80	416.70	457.20
	8	-----	141.90	174.90	369.90	461.40	181.80	536.70	390.00
	16	-----	-----	126.00	357.00	365.40	195.60	431.40	402.30
	19	233.40	191.40	132.00	295.80	317.10	230.70	499.20	417.60
	20	171.60	126.60	104.40	288.60	289.50	320.40	483.00	Died
	22	182.40	131.40	166.80	373.50	486.60	292.20	566.10	324.00
	26	175.20	-----	183.60	291.60	557.10	229.80	492.30	340.20
	28	202.80	188.60	185.70	448.50	891.90	321.00	342.30	438.00
	32	81.60	127.80	155.70	310.50	392.40	204.00	418.20	434.70
	34	174.90	212.70	184.80	350.40	442.20	343.50	444.60	392.70
Average		174.55	158.70	156.81	344.07	467.25	252.78	463.05	399.63

Table 10a.--BLOOD SERUM VITAMIN A (I. U./100 Ml.) 1947-48

Lot No.	Animal No.	11-13-47	1-8-48	3-4-48	5-6-48	7-8-48	9-2-48	11-5-48
I	2	368.40	454.80	295.20	242.70	433.50	485.40	519.30
	3	443.70	435.90	200.10	194.70	505.80	372.90	458.70
	7	322.50	414.00	236.10	189.00	380.10	299.10	457.80
	9	354.60	442.80	402.30	226.80	370.80	245.70	490.20
	10	353.70	462.90	444.00	209.10	533.70	381.90	483.30
	14	342.60	372.30	449.40	229.50	454.80	392.40	388.20
	17	318.00	413.10	345.60	219.60	392.40	292.80	443.40
	23	465.30	416.40	514.80	259.50	490.50	364.50	385.50
	30	418.50	310.20	283.80	186.00	480.00	202.80	386.70
	43	357.30	414.30	290.10	188.10	304.50	275.40	376.50
Average		374.46	413.67	346.14	214.50	434.61	331.29	438.96

Table 10b.--BLOOD SERUM VITAMIN A (I. U./100 Ml.) 1947-48

Lot No.	Animal No.	11-13-47	1-8-48	3-4-48	5-6-48	7-8-48	9-2-48	11-5-48
II	5	387.00	420.30	507.00	321.60	477.00	396.60	399.60
	6	495.30	361.20	287.40	224.10	425.40	318.60	325.50
	18	491.10	444.00	373.80	260.70	447.60	330.00	309.00
	21	474.00	475.50	361.80	224.10	389.70	259.20	389.40
	24	423.90	452.40	292.80	232.50	439.50	218.40	450.90
	25	364.50	354.30	327.30	234.00	416.10	333.60	471.90
	33	260.10	378.00	250.80	213.30	513.60	229.50	391.20
	42	333.30	423.00	249.90	306.30	372.90	280.80	384.90
	39	401.40	436.80	507.30	201.60	243.00	213.90	418.20
	40	242.70	440.70	307.50	270.60	324.60	321.00	445.50
Average		387.33	418.62	346.56	248.88	404.94	290.16	398.61

Table 10c.--BLOOD SERUM VITAMIN A (I. U./100 Ml.) 1947-48

Lot No.	Animal No.	11-13-47	1-8-48	3-4-48	5-6-48	7-8-48	9-2-48	11-5-48
III	1	437.10	449.40	291.90	313.80	537.90	320.10	301.50
	11	426.30	425.10	413.70	246.60	321.30	270.00	357.60
	12	322.50	446.70	379.20	341.10	450.60	273.30	417.60
	13	552.90	417.00	432.00	282.60	454.80	276.00	379.20
	15	524.70	425.70	445.50	221.10	508.20	330.00	440.10
	27	415.80	329.40	338.70	217.50	294.00	241.20	325.50
	29	274.50	421.20	249.60	229.50	392.40	319.20	510.00
	31	435.60	395.40	265.50	298.20	541.80	152.10	405.60
	36	482.10	450.60	282.00	279.00	455.40	414.30	446.10
	37	417.00	469.50	493.20	279.00	402.90	333.30	525.60
Average		428.85	423.00	359.13	270.84	435.93	292.95	410.88

Table 10d.--BLOOD SERUM VITAMIN A (I. U./100 Ml.) 1947-48

Lot No.	Animal No.	11-13-47	1-8-48	3-4-48	5-6-48	7-8-48	9-2-48	11-5-48
IV	4	457.20	471.90	205.80	663.30	494.10	163.50	427.80
	8	390.00	432.60	241.50	477.30	293.70	179.40	512.10
	16	402.30	385.20	269.70	678.30	419.10	330.90	353.10
	19	417.60	395.40	268.50	455.10	387.90	354.60	309.00
	22	324.00	325.20	371.10	521.40	460.50	400.50	386.10
	26	340.20	267.60	252.90	451.80	425.70	324.00	322.20
	28	438.00	317.10	339.00	755.10	559.80	210.30	337.20
	32	434.70	398.10	207.30	421.80	387.90	189.00	282.90
	34	392.70	421.20	234.00	789.00	354.00	261.90	371.10
Average		399.63	379.37	265.53	579.23	420.30	268.23	366.83

Table 11a.--BLOOD SERUM PHOSPHORUS (Mgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12	2-5	4-2	5-14	6-12	8-7	10-2	11-13
I	2	7.94	8.75	9.80	11.90	7.34	6.96	12.30	10.90
	3	5.30	5.81	6.60	9.95	8.31	5.60	6.38	8.06
	7	6.68	6.40	8.32	11.60	8.00	7.70	7.25	8.80
	9	5.40	5.15	8.40	10.25	8.44	9.35	7.60	8.25
	10	5.10	7.40	5.80	8.44	6.60	7.30	5.63	6.75
	14	7.70	6.56	6.60	8.86	5.30	8.25	7.38	9.05
	17	5.30	4.50	6.60	9.65	8.35	10.25	8.04	8.70
	23	5.10	6.50	6.80	10.25	7.85	9.11	7.68	10.25
	30	8.54	5.55	9.20	9.05	6.75	9.50	9.32	8.35
	43	5.96	8.40	8.50	10.10	7.55	10.75	8.60	8.00
Average		6.30	6.50	7.66	10.00	7.45	8.48	8.02	8.71

Table 11b.--BLOOD SERUM PHOSPHORUS (Mgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12	2-5	4-2	5-14	6-12	8-7	10-2	11-13
II	5	6.40	7.59	10.00	9.65	5.70	10.75	4.13	7.40
	6	6.40	7.65	10.40	10.40	6.75	8.80	5.38	9.65
	18	5.40	8.19	9.92	10.25	6.90	9.35	8.45	9.65
	21	7.10	7.05	7.00	10.10	8.35	7.64	6.10	7.00
	24	6.90	5.95	8.40	10.60	6.60	7.10	7.38	8.50
	25	5.10	3.81	8.70	10.19	8.90	8.90	8.60	8.35
	33	5.40	5.45	8.50	10.25	7.40	8.00	5.80	8.90
	42	6.52	7.98	9.00	10.75	7.30	8.35	7.15	7.30
	39	6.48	5.45	10.20	10.34	9.35	8.90	6.95	7.14
	40	8.20	7.30	9.38	11.25	8.15	9.59	6.68	8.15
Average		6.39	6.64	9.15	10.38	7.54	8.74	6.66	8.20

Table 11c.--BLOOD SERUM PHOSPHORUS (Mgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12	2-5	4-2	5-14	6-12	8-7	10-2	11-13
III	1	6.60	6.40	8.70	8.25	7.70	7.55	8.00	9.35
	11	8.20	6.93	7.20	9.65	7.20	7.49	8.00	8.25
	12	8.40	6.05	8.40	9.35	6.45	10.40	8.00	8.70
	13	6.66	3.75	8.70	8.80	7.00	10.60	4.53	6.45
	15	7.10	2.95	8.00	9.83	7.30	7.85	7.25	6.75
	27	5.90	5.48	9.20	10.34	6.75	9.65	7.80	7.85
	29	8.32	9.00	9.20	10.34	9.35	8.50	6.85	8.35
	31	6.70	7.65	9.20	10.60	7.10	11.40	8.60	9.35
	36	6.82	6.85	7.80	9.35	6.75	11.10	8.45	6.75
	37	6.70	8.00	7.80	10.10	8.70	8.90	6.68	8.00
Average		7.14	6.31	8.42	9.66	7.43	9.34	7.42	7.98

Table 11d.--BLOOD SERUM PHOSPHORUS (Mgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12	2-5	4-2	5-14	6-12	8-7	10-2	11-13
IV	4	7.54	6.15	7.20	8.50	5.80	8.90	7.68	8.00
	8	6.20	3.65	7.60	9.05	9.80	8.80	7.25	7.55
	16	5.30	5.25	6.60	9.95	9.20	7.24	5.95	7.40
	19	6.60	4.40	8.40	9.95	10.10	8.70	7.08	7.30
	20	6.70	7.05	8.70	9.05	8.25	8.70	9.10	----
	22	5.52	5.29	6.30	9.65	10.75	9.61	7.25	8.25
	26	6.66	5.35	6.50	8.50	7.70	9.20	7.90	7.20
	28	6.66	7.30	8.50	10.40	8.80	7.20	8.60	9.53
	32	7.10	7.30	7.80	8.70	6.75	8.25	6.85	7.10
	34	8.20	4.60	7.40	8.70	7.30	6.45	5.63	7.00
Average		6.65	5.63	7.50	9.24	8.44	8.30	7.33	7.70

Table 12a.--BLOOD SERUM PHOSPHORUS (Mgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13	1-8	3-4	5-6	7-8	9-2	11-5
I	2	10.90	11.25	8.25	4.70	7.05	7.35	4.50
	3	8.06	14.85	6.35	5.25	7.15	6.90	4.50
	7	8.80	8.35	7.00	6.50	7.90	7.35	4.90
	9	8.25	9.35	8.25	6.80	6.65	7.25	3.20
	10	6.75	7.06	6.35	5.90	6.80	6.90	2.75
	14	9.05	9.35	6.25	6.80	7.60	6.65	6.25
	17	8.70	8.90	7.40	6.96	8.60	8.00	5.25
	23	10.25	8.21	6.75	6.11	7.60	7.05	4.15
	30	8.35	10.90	7.85	6.11	5.80	7.45	5.70
	43	8.00	10.10	7.55	6.65	7.60	8.00	4.80
Average		8.71	9.83	7.20	6.18	7.28	7.29	4.60

Table 12b.--BLOOD SERUM PHOSPHORUS (Mgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13	1-8	3-4	5-6	7-8	9-2	11-5
II	5	7.40	9.35	6.60	6.96	5.25	6.59	4.80
	6	9.65	7.16	6.75	7.05	7.25	5.90	4.35
	18	9.65	8.76	8.25	6.99	7.90	6.90	5.00
	21	7.00	8.74	6.60	7.11	6.96	7.05	3.45
	24	8.50	8.25	6.60	4.05	10.85	7.60	4.15
	25	8.35	8.80	7.10	4.80	6.05	7.35	4.15
	33	8.90	9.35	6.05	7.15	7.90	7.90	3.65
	42	7.30	10.40	5.70	7.35	9.05	6.65	5.25
	39	7.14	8.80	6.25	6.65	6.90	6.80	4.80
	40	8.15	12.05	8.00	7.39	7.15	8.00	5.15
Average		8.20	9.17	6.79	6.55	7.53	7.07	4.48

Table 12c.--BLOOD SERUM PHOSPHORUS (Mgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13	1-8	3-4	5-6	7-8	9-2	11-5
III	1	9.35	9.65	5.99	7.05	4.80	6.05	5.00
	11	8.25	7.70	8.00	7.45	7.75	7.35	7.05
	12	8.70	7.06	7.20	6.80	6.90	6.90	5.15
	13	6.45	8.00	6.35	6.05	7.25	6.05	3.95
	15	6.75	6.60	5.00	6.65	6.05	7.25	3.10
	27	7.85	6.07	5.30	6.80	7.25	7.25	4.90
	29	8.35	9.80	7.40	7.60	7.15	7.60	6.15
	31	9.35	9.80	6.66	7.31	6.90	6.65	5.00
	36	6.75	5.80	7.40	7.31	6.05	5.60	3.75
	37	8.00	9.80	7.40	7.31	8.15	6.90	5.70
Average		7.98	8.03	6.67	7.03	6.83	6.76	4.98

Table 12d.--BLOOD SERUM PHOSPHORUS (Mgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13	1-8	3-4	5-6	7-8	9-2	11-5
IV	4	8.00	8.00	7.10	7.90	6.90	8.00	5.00
	8	7.55	8.00	7.10	7.90	6.90	5.90	4.60
	16	7.40	8.80	7.10	8.03	6.15	7.25	5.80
	19	7.30	8.80	6.45	7.75	4.80	7.15	4.86
	22	8.25	9.80	7.85	8.15	6.59	7.25	3.95
	26	7.20	11.66	8.00	8.15	7.25	8.25	5.25
	28	9.53	8.25	8.44	8.40	6.40	6.40	5.00
	32	7.10	7.70	5.30	7.75	5.50	5.60	3.85
	34	7.00	8.00	5.30	7.31	4.80	6.05	3.65
Average		7.70	8.78	6.26	7.93	6.14	6.87	4.66

Table 13a.--BLOOD SERUM CALCIUM (Mgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12	2-5	4-2	5-14	6-12	8-7	10-2	11-13
I	2	7.65	7.55	7.60	7.05	7.35	6.20	8.55	9.35
	3	----	7.40	7.85	8.40	10.05	7.45	11.80	9.20
	7	7.20	----	7.90	6.25	9.35	7.20	7.70	8.15
	9	8.30	7.20	12.40	7.75	7.20	6.45	8.10	8.85
	10	8.45	----	7.45	7.45	11.30	7.25	4.20	9.65
	14	8.45	7.25	8.35	8.05	7.40	7.30	9.20	9.70
	17	7.70	7.60	8.10	7.25	11.25	6.65	8.35	10.30
	23	7.40	7.55	9.65	6.90	8.95	7.05	7.15	10.10
	30	7.95	8.00	10.35	6.75	10.55	7.65	13.45	10.55
	43	7.75	7.48	8.15	7.15	10.25	7.35	11.70	7.25
Average		7.87	7.50	8.78	7.30	9.36	7.06	9.02	9.31

Table 13b.--BLOOD SERUM CALCIUM (Mgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12	2-5	4-2	5-14	6-12	8-7	10-2	11-13
II	5	6.05	7.20	13.15	9.20	10.20	7.75	9.60	9.00
	6	7.25	----	8.30	6.95	9.15	7.30	13.10	8.60
	18	7.05	7.50	8.20	7.05	8.65	7.45	14.00	9.00
	21	7.95	----	10.10	8.80	10.05	7.20	14.40	8.15
	24	6.85	7.85	8.70	6.85	8.50	7.30	15.80	8.45
	25	8.30	7.55	8.75	8.15	8.95	8.10	7.85	9.35
	33	8.30	7.20	8.30	8.40	7.85	7.95	9.65	7.70
	42	7.25	7.20	9.85	7.65	8.80	8.35	8.35	8.90
	39	7.75	7.25	8.35	6.95	11.25	6.55	10.10	10.55
	40	13.10	6.40	9.50	7.25	9.15	7.20	15.05	7.90
Average		7.98	7.27	9.32	7.72	9.26	7.52	11.79	8.76

Table 13c.--BLOOD SERUM CALCIUM (Mgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12	2-5	4-2	5-14	6-12	8-7	10-2	11-13
III	1	6.60	8.00	8.60	8.40	9.15	6.65	13.05	9.55
	11	7.50	7.25	8.60	7.25	11.20	7.95	6.80	8.60
	12	7.60	7.00	8.20	7.65	7.90	6.30	9.65	9.70
	13	8.30	8.10	7.85	8.20	9.65	7.65	11.15	9.35
	15	8.10	----	11.70	8.40	9.25	8.35	7.60	9.70
	27	8.25	7.70	8.00	7.65	11.25	7.95	8.20	9.40
	29	7.75	----	8.05	7.25	8.45	8.35	8.55	8.65
	31	7.75	6.10	8.90	8.05	8.45	6.95	8.10	8.20
	36	6.90	----	9.05	7.20	7.75	7.95	7.60	8.85
	37	7.60	7.25	8.05	8.55	10.40	8.20	7.90	8.40
Average		7.64	7.34	8.70	7.86	9.34	7.63	8.86	9.04

Table 13d.--BLOOD SERUM CALCIUM (Mgms/100 Ml.) 1946-47

Lot No.	Animal No.	12-12	2-5	4-2	5-14	6-12	8-7	10-2	11-13
IV	4	8.30	7.20	7.30	9.25	8.50	8.55	8.25	9.10
	8	8.45	8.60	10.35	8.85	7.85	8.30	9.40	9.05
	16	7.95	8.25	8.75	9.15	10.85	8.10	9.00	9.00
	19	7.40	8.00	7.75	8.25	9.80	7.95	7.15	9.00
	20	8.95	----	8.30	8.70	9.35	8.20	8.15	----
	22	8.25	----	8.20	8.55	9.15	7.95	7.05	9.35
	26	8.85	8.00	8.20	9.00	9.15	8.00	7.40	9.00
	28	7.40	7.00	7.40	8.25	10.25	7.40	7.15	8.30
	32	9.15	----	10.30	8.55	9.75	8.25	6.00	8.90
	34	10.00	7.95	9.50	7.65	8.15	7.95	7.40	8.75
Average		8.47	7.86	8.60	8.62	9.28	8.06	7.70	8.94

Table 14a.--BLOOD SERUM CALCIUM (Mgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13	1-8	3-4	5-6	7-8	9-2	11-5
I	2	9.35	8.30	8.50	8.80	8.85	8.10	12.60
	3	9.20	9.40	8.25	9.60	8.95	10.10	13.10
	7	8.15	8.60	8.70	8.85	7.85	8.40	12.45
	9	8.85	8.35	8.50	9.40	8.90	8.25	13.00
	10	9.65	9.35	8.75	9.20	8.00	9.25	13.00
	14	9.70	8.85	8.65	9.10	8.65	9.60	13.10
	17	10.30	9.20	8.50	9.65	8.50	9.50	13.30
	23	10.10	9.00	8.05	8.70	9.80	7.95	12.45
	30	10.55	8.75	7.75	8.90	8.60	9.65	13.00
	43	7.25	9.20	8.55	8.60	7.85	8.40	12.30
Average		9.31	8.90	8.42	9.08	8.60	8.92	12.83

Table 14b.--BLOOD SERUM CALCIUM (Mgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13	1-8	3-4	5-6	7-8	9-2	11-5
II	5	9.00	9.20	9.70	9.35	8.85	9.40	12.30
	6	8.60	9.20	8.80	8.95	8.90	8.25	11.40
	18	9.00	8.35	8.65	9.00	8.30	8.50	12.15
	21	8.15	10.00	9.05	9.00	7.85	8.15	12.30
	24	8.45	9.00	9.90	9.00	8.25	8.10	12.20
	25	9.35	8.55	9.65	9.05	8.10	9.35	12.15
	33	7.70	9.65	8.65	8.80	8.85	8.35	12.95
	42	8.90	9.30	9.45	10.05	8.70	9.00	13.40
	39	10.55	9.20	10.95	9.00	9.75	10.00	13.30
	40	7.90	8.35	10.00	9.45	8.35	8.60	12.55
Average		8.76	9.08	9.48	9.16	8.59	8.77	12.47

Table 14c.--BLOOD SERUM CALCIUM (Mgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13	1-8	3-4	5-6	7-8	9-2	11-5
III	1	9.55	9.25	9.20	9.05	8.65	9.05	14.35
	11	8.60	8.65	9.70	9.45	7.75	9.40	12.30
	12	9.70	9.00	9.75	11.05	9.60	9.00	12.50
	13	9.35	9.20	9.95	10.05	8.75	9.05	13.60
	15	9.70	9.15	9.20	9.60	9.10	9.10	13.85
	27	9.40	9.20	9.20	9.70	9.20	8.90	12.65
	29	8.65	9.20	8.80	11.40	7.70	10.15	13.05
	31	8.20	9.50	8.65	10.10	9.30	9.95	11.90
	36	8.85	8.55	8.20	10.20	8.65	8.55	12.00
	37	8.40	8.95	8.65	9.90	9.10	9.10	12.25
Average		9.04	9.06	9.13	10.05	8.78	9.22	12.84

Table 14d.--BLOOD SERUM CALCIUM (Mgms/100 Ml.) 1947-48

Lot No.	Animal No.	11-13	1-8	3-4	5-6	7-8	9-2	11-5
IV	4	9.10	9.25	8.60	10.40	8.45	9.50	13.95
	8	9.05	9.00	8.40	11.15	8.90	9.95	12.25
	16	9.00	9.20	9.20	10.20	8.20	9.95	12.45
	19	9.00	9.00	8.50	10.65	8.75	9.25	12.85
	22	9.35	9.10	9.20	11.30	8.50	9.70	12.90
	26	9.00	8.80	9.65	10.60	8.50	9.25	12.35
	28	8.30	9.15	8.90	8.55	8.80	9.65	12.10
	32	8.90	8.50	8.70	10.90	8.45	10.15	12.45
	34	8.75	8.90	9.00	10.95	8.25	9.05	13.90
Average		8.94	8.99	8.91	10.52	8.53	9.61	12.80

Table 15a.--BODY WEIGHTS WINTER 1946-47 (POUNDS)

Lot No.	Animal No.	12-11-12 1946	1-8-47	2-5-47	3-5-47	4-2-47	4-30-47	5-14-15 1947	Total gain
I	2	460.00	490.00	545.00	565.00	600.00	605.00	590.00	130.00
	3	342.50	375.00	425.00	445.00	470.00	505.00	510.00	167.50
	7	267.50	305.00	340.00	345.00	380.00	395.00	397.50	130.00
	9	232.50	250.00	295.00	320.00	355.00	380.00	377.50	145.00
	10	327.50	260.00	295.00	315.00	320.00	335.00	330.00	92.50
	14	285.00	305.00	330.00	315.00	340.00	325.00	317.50	32.50
	17	285.00	290.00	345.00	365.00	390.00	410.00	410.00	125.00
	23	385.00	420.00	470.00	495.00	525.00	545.00	550.00	165.00
	30	290.00	295.00	325.00	335.00	355.00	355.00	325.00	35.00
	43	250.00	280.00	335.00	375.00	410.00	435.00	425.00	175.00
Average		303.50	327.00	370.50	387.50	414.50	429.00	423.25	119.75

Table 15b.--BODY WEIGHTS WINTER 1946-47 (POUNDS)

Lot No.	Animal No.	12-11-12 1946	1-8-47	2-5-47	3-5-47	4-2-47	4-30-47	3-14-15 1947	Total gain
II	5	320.00	340.00	390.00	405.00	450.00	475.00	442.50	122.50
	6	280.00	315.00	360.00	375.00	405.00	420.00	427.50	147.50
	18	355.00	400.00	460.00	475.00	500.00	505.00	522.50	167.50
	21	332.50	365.00	420.00	440.00	475.00	480.00	482.50	150.00
	24	282.50	295.00	330.00	360.00	375.00	395.00	390.00	107.50
	25	395.00	420.00	475.00	495.00	530.00	545.00	537.50	142.50
	33	265.00	290.00	320.00	355.00	370.00	400.00	395.00	130.00
	42	240.00	250.00	290.00	300.00	330.00	335.00	342.50	102.50
	39	367.50	380.00	420.00	440.00	465.00	495.00	482.50	115.00
	40	215.00	235.00	265.00	280.00	305.00	330.00	307.50	92.50
Average		305.25	329.00	373.00	392.50	420.50	438.00	433.00	127.75

Table 15c.--BODY WEIGHTS WINTER 1946-47 (POUNDS)

Lot No.	Animal No.	12-11-12 1946	1-8-47	2-5-47	3-5-47	4-2-47	4-30-47	5-14-15 1947	Total gain
III	1	350.00	385.00	430.00	450.00	470.00	500.00	495.00	145.00
	11	285.00	305.00	345.00	370.00	400.00	410.00	412.50	127.50
	12	235.00	260.00	295.00	315.00	345.00	365.00	360.00	125.00
	13	422.50	470.00	530.00	555.00	580.00	590.00	582.50	160.00
	15	262.50	280.00	315.00	330.00	360.00	395.00	385.00	122.50
	27	245.00	265.00	300.00	330.00	350.00	375.00	362.50	117.50
	29	295.00	325.00	370.00	405.00	440.00	470.00	472.50	177.50
	31	317.50	345.00	385.00	400.00	435.00	445.00	445.00	127.50
	36	347.50	375.00	410.00	425.00	440.00	460.00	447.50	100.00
	37	282.50	310.00	330.00	350.00	375.00	395.00	392.50	110.00
Average		304.25	332.00	371.00	393.00	419.50	440.50	435.50	131.25

Table 15d.--BODY WEIGHTS WINTER 1946-47 (POUNDS)

Lot No.	Animal No.	12-11-12 1946	1-8-47	2-5-47	3-5-47	4-2-47	4-30-47	5-14-15 1947	Total gain
IV	4	315.00	325.00	340.00	355.00	365.00	400.00	400.00	85.00
	8	257.50	280.00	295.00	315.00	335.00	365.00	375.00	117.50
	16	395.00	410.00	425.00	445.00	470.00	510.00	522.50	127.50
	19	247.50	280.00	285.00	310.00	325.00	360.00	365.00	117.50
	20	300.00	305.00	310.00	345.00	350.00	390.00	400.00	100.00
	22	280.00	290.00	295.00	315.00	350.00	385.00	385.00	105.00
	26	230.00	260.00	270.00	285.00	315.00	350.00	355.00	125.00
	28	272.50	280.00	275.00	285.00	300.00	315.00	327.50	55.00
	32	347.50	380.00	375.00	400.00	420.00	445.00	452.50	105.00
	34	282.50	310.00	325.00	345.00	375.00	390.00	392.50	110.00
Average		292.75	312.00	319.50	340.00	360.50	391.00	397.50	104.75

Table 16a.--BODY WEIGHTS SUMMER 1947 (POUNDS)

Lot No.	Animal No.	5-14-15 1947	6-12-47	7-10-47	8-7-47	9-4-47	10-2-47	10-30-47	11-13-14 1947	Total gain
I	2	590.00	638.00	664.00	720.00	786.00	740.00	747.00	734.50	144.50
	3	510.00	520.00	540.00	609.00	654.00	646.00	655.00	655.00	145.00
	7	397.50	416.00	456.00	528.00	582.00	565.00	590.00	565.00	167.50
	9	377.50	410.00	428.00	494.00	540.00	580.00	562.00	570.00	192.50
	10	330.00	346.00	367.00	425.00	454.00	478.00	476.00	442.00	112.00
	14	317.50	314.00	354.00	382.00	394.00	388.00	400.00	388.00	70.50
	17	410.00	424.00	480.00	538.00	564.00	587.00	576.00	568.50	158.50
	23	550.00	544.00	604.00	670.00	714.00	760.00	743.00	731.00	181.00
	30	325.00	320.00	378.00	430.00	444.00	472.00	440.00	442.50	117.50
	43	425.00	440.00	482.00	549.00	580.00	600.00	590.00	614.00	189.00
Average		423.25	437.20	475.30	534.50	571.20	581.60	577.90	571.05	147.80

Table 16b.--BODY WEIGHTS SUMMER 1947 (POUNDS)

Lot No.	Animal No.	5-14-15 1947	6-12-47	7-10-47	8-7-47	9-4-47	10-2-47	10-30-47	11-13-14 1947	Total gain
II	5	442.50	472.00	508.00	581.00	600.00	604.00	585.00	614.00	171.50
	6	427.50	422.00	472.00	524.00	526.00	574.00	582.00	557.50	130.00
	18	522.50	520.00	568.00	636.00	674.00	708.00	704.00	677.00	154.50
	21	482.50	506.00	538.00	612.00	654.00	645.00	688.00	660.00	177.50
	24	390.00	394.00	434.00	503.00	530.00	565.00	577.00	553.00	163.00
	25	537.50	548.00	580.00	644.00	674.00	670.00	684.00	690.00	152.50
	33	395.00	432.00	464.00	512.00	564.00	590.00	588.00	581.50	186.50
	42	342.50	342.00	406.00	460.00	492.00	524.00	507.00	495.00	152.50
	39	482.50	508.00	527.00	595.00	624.00	625.00	658.00	648.00	165.50
	40	307.50	308.00	353.00	410.00	440.00	424.00	440.00	418.50	111.00
Average		433.00	445.20	485.00	547.70	577.80	592.90	601.30	589.45	156.45

Table 16c.--BODY WEIGHTS SUMMER 1947 (POUNDS)

Lot No.	Animal No.	5-14-15 1947	6-12-47	7-10-47	8-7-47	9-4-47	10-2-47	10-30-47	11-13-14 1947	Total gain
III	1	495.00	510.00	556.00	606.00	640.00	702.00	714.00	699.00	204.00
	11	412.50	416.00	447.00	499.00	530.00	540.00	564.00	556.00	143.50
	12	360.00	382.00	440.00	485.00	534.00	534.00	570.00	537.00	177.00
	13	582.50	612.00	628.00	698.00	760.00	706.00	736.00	727.50	145.00
	15	385.00	400.00	427.00	484.00	510.00	542.00	520.00	506.00	121.00
	27	362.50	376.00	400.00	467.00	510.00	540.00	540.00	540.00	177.50
	29	472.50	486.00	508.00	560.00	600.00	594.00	620.00	597.00	124.50
	31	445.00	452.00	495.00	547.00	544.00	576.00	582.00	582.50	137.50
	36	447.50	478.00	534.00	598.00	608.00	622.00	621.00	640.00	192.50
	37	392.50	440.00	462.00	520.00	554.00	580.00	576.00	570.00	177.50
Average		435.50	455.20	489.70	546.40	579.00	593.60	604.30	595.50	160.00

Table 16d.--BODY WEIGHTS SUMMER 1947 (POUNDS)

Lot No.	Animal No.	5-14-15 1947	6-12-47	7-10-47	8-7-47	9-4-47	10-2-47	10-30-47	11-13-14 1947	Total gain
IV	4	400.00	446.00	482.00	547.00	560.00	584.00	591.00	590.00	190.00
	8	375.00	424.00	452.00	510.00	534.00	595.00	586.00	565.00	190.00
	16	522.50	580.00	610.00	710.00	744.00	742.00	780.00	747.50	225.00
	19	365.00	424.00	458.00	522.00	556.00	606.00	584.00	560.00	195.00
	20	400.00	428.00	493.00	554.00	580.00	595.00	596.00	Died	-----
	22	385.00	462.00	498.00	570.00	620.00	612.00	644.00	635.00	250.00
	26	355.00	396.00	440.00	496.00	526.00	560.00	540.00	536.00	181.00
	28	327.50	336.00	386.00	422.00	420.00	424.00	430.00	414.00	86.50
	32	452.50	480.00	544.00	611.00	656.00	690.00	640.00	637.00	184.50
	34	392.50	436.00	480.00	560.00	582.00	588.00	607.00	606.50	214.00
Average		397.50	441.20	484.30	550.20	577.80	599.60	599.80	587.88	190.66

Table 17a.--BODY WEIGHTS WINTER 1947-48(POUNDS)

Lot No.	Animal No.	11-13-14 1947	12-11-47	1-8-48	2-5-48	3-4-48	4-8-48	5-5-6 1948	Total gain
I	2	734.50	765.00	805.00	890.00	940.00	945.00	970.00	235.50
	3	655.00	700.00	715.00	755.00	780.00	815.00	865.00	210.00
	7	565.00	605.00	620.00	660.00	670.00	685.00	730.00	165.00
	9	570.00	610.00	630.00	695.00	725.00	755.00	780.00	210.00
	10	442.00	490.00	525.00	560.00	585.00	610.00	627.50	185.50
	14	388.00	440.00	470.00	500.00	525.00	555.00	575.00	187.00
	17	568.50	600.00	615.00	665.00	700.00	715.00	765.00	196.50
	23	731.00	790.00	845.00	900.00	935.00	960.00	990.00	259.00
	30	442.50	475.00	500.00	505.00	520.00	550.00	550.00	107.50
	43	614.00	640.00	670.00	725.00	750.00	790.00	830.00	216.00
Average		571.05	611.50	639.50	685.50	713.00	738.00	768.50	197.45

Table 17b.--BODY WEIGHTS WINTER 1947-48 (POUNDS)

Lot No.	Animal No.	11-13-14 1947	12-11-47	1-8-48	2-5-48	3-4-48	4-8-48	5-5-6 1948	Total gain
II	5	614.00	665.00	690.00	725.00	745.00	785.00	815.00	201.00
	6	557.50	610.00	645.00	695.00	730.00	755.00	787.50	230.00
	18	677.00	710.00	740.00	815.00	840.00	845.00	900.00	223.00
	21	660.00	700.00	750.00	805.00	850.00	890.00	915.00	255.00
	24	553.00	565.00	610.00	640.00	660.00	680.00	717.50	164.50
	25	690.00	730.00	775.00	800.00	815.00	845.00	885.00	195.00
	33	581.50	565.00	610.00	650.00	680.00	695.00	737.50	156.00
	42	495.00	565.00	580.00	625.00	640.00	680.00	697.50	202.50
	39	648.00	695.00	725.00	775.00	800.00	830.00	855.00	207.00
	40	418.50	465.00	490.00	530.00	550.00	565.00	592.50	174.00
Average		589.45	627.00	661.50	706.00	731.00	757.00	790.25	200.80

Table 17c.--BODY WEIGHTS WINTER 1947-48 (POUNDS)

Lot No.	Animal No.	11-13-14 1947	12-11-47	1-8-48	2-5-48	3-4-48	4-8-48	5-5-6 1948	Total gain
III	1	699.00	730.00	770.00	810.00	845.00	875.00	905.00	206.00
	11	556.00	595.00	635.00	690.00	710.00	725.00	777.50	221.50
	12	537.00	595.00	620.00	670.00	700.00	720.00	757.50	220.50
	13	727.50	760.00	775.00	830.00	840.00	865.00	900.00	172.50
	15	506.00	560.00	585.00	625.00	640.00	660.00	692.50	186.50
	27	540.00	570.00	615.00	650.00	680.00	710.00	757.50	217.50
	29	597.00	655.00	695.00	745.00	770.00	800.00	850.00	253.00
	31	582.50	630.00	660.00	700.00	730.00	745.00	787.50	205.00
	36	640.00	670.00	700.00	745.00	755.00	770.00	815.00	175.00
	37	570.00	580.00	610.00	665.00	680.00	705.00	712.50	142.50
Average		595.50	634.50	666.50	713.00	735.00	757.50	795.50	200.00

Table 17d.--BODY WEIGHTS WINTER 1947-48 (POUNDS)

Lot No.	Animal No.	11-13-14 1947	12-11-47	1-8-48	2-5-48	3-4-48	4-8-48	5-5-6 1948	Total gain
IV	4	590.00	570.00	605.00	665.00	660.00	640.00	690.00	100.00
	8	565.00	570.00	605.00	665.00	660.00	660.00	695.00	130.00
	16	747.50	775.00	805.00	875.00	865.00	865.00	907.50	160.00
	19	560.00	580.00	620.00	650.00	655.00	660.00	695.00	135.00
	22	635.00	635.00	660.00	700.00	680.00	715.00	742.50	107.50
	26	536.00	550.00	580.00	630.00	640.00	630.00	672.50	136.50
	28	414.00	440.00	470.00	490.00	480.00	500.00	535.00	121.00
	32	637.00	675.00	705.00	720.00	725.00	730.00	742.50	105.50
	34	606.50	620.00	655.00	695.00	690.00	705.00	727.50	121.00
Average		587.88	601.67	633.89	676.67	672.78	678.33	711.94	124.06

Table 18a.--BODY WEIGHTS SUMMER 1948 (POUNDS)

Lot No.	Animal No.	5-5-6 1948	6-5-48	7-8-48	8-5-48	9-2-48	9-30-48	11-4-5 1948	Total gain
I	2	970.00	970.00	1000.00	1020.00	1060.00	1095.00	1092.50	122.50
	3	865.00	815.00	870.00	870.00	915.00	960.00	935.00	70.00
	7	730.00	720.00	750.00	800.00	840.00	860.00	862.50	132.50
	9	780.00	750.00	810.00	840.00	880.00	925.00	935.00	155.00
	10	627.50	605.00	670.00	700.00	735.00	805.00	822.50	195.00
	14	575.00	555.00	610.00	640.00	660.00	700.00	717.50	142.50
	17	765.00	770.00	800.00	830.00	850.00	890.00	900.00	135.00
	23	990.00	950.00	980.00	1030.00	1010.00	1080.00	1025.00	35.00
	30	550.00	490.00	550.00	570.00	600.00	625.00	602.50	52.50
	43	830.00	780.00	840.00	850.00	895.00	920.00	932.50	102.50
Average		768.50	740.50	788.00	815.00	865.25	886.00	882.50	114.00

Table 18b.--BODY WEIGHTS SUMMER 1948 (POUNDS)

Lot No.	Animal No.	5-5-6 1948	6-5-48	7-8-48	8-5-48	9-2-48	9-30-48	11-4-5 1948	Total gain
II	5	815.00	820.00	850.00	880.00	890.00	945.00	922.50	107.50
	6	787.50	760.00	800.00	830.00	870.00	960.00	922.50	135.00
	18	900.00	885.00	910.00	920.00	980.00	980.00	955.00	55.00
	21	915.00	850.00	920.00	950.00	1000.00	1075.00	1000.00	85.00
	24	717.50	730.00	750.00	780.00	785.00	850.00	875.00	157.50
	25	885.00	875.00	870.00	910.00	950.00	990.00	1007.50	122.50
	33	737.50	755.00	800.00	840.00	850.00	900.00	870.00	132.50
	42	697.50	705.00	735.00	770.00	770.00	845.00	815.00	117.50
	39	855.00	825.00	850.00	880.00	920.00	965.00	977.50	122.50
	40	592.50	595.00	660.00	700.00	700.00	780.00	832.50	140.00
Average		790.25	780.00	814.50	846.00	871.50	929.00	907.75	117.50

Table 18c.--BODY WEIGHTS SUMMER 1948 (POUNDS)

Lot No.	Animal No.	5-5-6 1948	6-5-48	7-8-48	8-5-48	9-2-48	9-30-48	11-4-5 1948	Total gain
III	1	905.00	885.00	890.00	950.00	930.00	1050.00	1017.50	112.50
	11	777.50	785.00	790.00	800.00	855.00	885.00	895.00	117.50
	12	757.50	765.00	800.00	820.00	890.00	905.00	907.50	150.00
	13	900.00	880.00	900.00	920.00	950.00	980.00	950.00	50.00
	15	692.50	650.00	710.00	720.00	730.00	765.00	820.00	127.50
	27	757.50	740.00	770.00	790.00	830.00	865.00	885.00	127.50
	29	850.00	865.00	860.00	880.00	920.00	930.00	910.00	60.00
	31	787.50	770.00	830.00	850.00	835.00	895.00	887.50	100.00
	36	815.00	815.00	860.00	840.00	890.00	930.00	887.50	72.50
	37	712.50	705.00	760.00	790.00	810.00	835.00	832.50	120.00
Average		795.50	786.00	817.00	836.00	864.00	904.00	899.25	103.75

Table 18d.--BODY WEIGHTS SUMMER 1948 (POUNDS)

Lot No.	Animal No.	5-5-6 1948	6-5-48	7-8-48	8-5-48	9-2-48	9-30-48	11-4-5 1948	Total gain
IV	4	690.00	740.00	750.00	780.00	785.00	860.00	832.50	142.50
	8	695.00	715.00	760.00	800.00	825.00	865.00	857.50	162.50
	16	907.50	995.00	1020.00	1060.00	1080.00	1135.00	1127.50	220.00
	19	695.00	775.00	780.00	830.00	865.00	895.00	900.00	205.00
	22	742.50	805.00	850.00	910.00	915.00	1005.00	990.00	247.50
	26	672.50	725.00	730.00	750.00	775.00	830.00	807.50	135.00
	28	535.00	595.00	610.00	670.00	720.00	745.00	720.00	185.00
	32	742.50	840.00	850.00	870.00	885.00	865.00	917.50	175.00
	34	727.50	780.00	800.00	830.00	850.00	905.00	882.50	155.00
Average		711.94	774.44	794.44	833.33	855.55	900.50	892.77	180.83

Table 19a.--TYPE AND CONDITION GRADES

Date		December 12, 1946		May 15, 1947	Nov. 14, 1947	May 6, 1948	
Lot No.	Animal No.	Type	Condition	Type	Type	Type	Condition
I	2	Good -	Good -	Good	Choice -	Medium	Medium ≠
	3	Medium	Medium ≠	Good	Choice -	Good ≠	Good ≠
	7	Medium ≠	Medium -	Medium	Good	Medium	Medium
	9	Medium -	Medium -	Medium	Medium	Good -	Good -
	10	Medium ≠	Medium -	Medium	Medium	Medium	Medium
	14	Good	Medium	Good	Medium	Medium -	Medium -
	17	Good	Medium	Medium	Medium ≠	Medium ≠	Medium ≠
	23	Good	Good -	Good	Choice -	Good	Good
	30	Good -	Good -	Medium	Medium -	Common ≠	Medium -
	43	Good -	Medium ≠	Good	Good	Good -	Good
II	5	Good -	Medium	Medium	Good -	Medium ≠	Medium ≠
	6	Good -	Medium -	Good	Good -	Medium ≠	Medium ≠
	18	Medium -	Medium ≠	Good	Medium ≠	Medium ≠	Good -
	21	Good ≠	Good -	Good	Good ≠	Good ≠	Choice -
	24	Good -	Medium ≠	Medium	Medium ≠	Medium ≠	Medium
	25	Good	Medium	Good	Good	Good -	Medium ≠
	33	Medium	Medium	Medium	Medium	Medium	Medium ≠
	42	Medium	Medium -	Medium	Medium -	Common ≠	Medium -
	39	Good -	Good	Good	Good	Medium	Medium ≠
	40	Good -	Medium	Medium	Medium -	Common	Common ≠

Table 19b.--TYPE AND CONDITION GRADES

Date		December 12, 1946		May 15, 1947	Nov. 14, 1947	May 6, 1948	
Lot No.	Animal No.	Type	Condition	Type	Type	Type	Condition
III	1	Good ≠	Medium ≠	Good	Choice -	Good	Good ≠
	11	Good -	Medium ≠	Good	Good -	Good	Good ≠
	12	Medium	Medium -	Medium	Medium	Medium	Medium
	13	Good -	Medium	Good	Choice	Good ≠	Choice -
	15	Good -	Medium	Medium	Good -	Good	Good
	27	Medium -	Medium	Medium	Good	Good -	Good
	29	Medium ≠	Medium ≠	Good	Good -	Good -	Good
	31	Medium ≠	Good -	Medium	Good	Medium -	Medium -
	36	Good	Good -	Good	Medium ≠	Good -	Good
	37	Good -	Good -	Good	Good	Good	Good -
IV	4	Good -	Medium	Good	Medium	Medium	Medium
	8	Medium	Medium	Medium	Good -	Medium ≠	Medium ≠
	16	Good ≠	Good -	Good	Good ≠	Good -	Good -
	19	Medium	Medium	Medium	Good -	Common ≠	Medium -
	20	Good -	Medium ≠	Medium	Died November 11, 1947.		
	22	Good -	Medium -	Medium	Good -	Medium	Medium -
	26	Medium	Medium -	Good	Good	Good	Medium ≠
	28	Good	Good -	Medium	Medium	Common ≠	Medium -
	32	Good -	Medium ≠	Good	Good	Medium ≠	Medium ≠
	34	Medium ≠	Good -	Medium	Medium	Good -	Good -

Table 20.--FEED COSTS 1946-48

	Lot I	Lot II	Lot III	Lot IV
Winter 1946-47				
Chopped cane	$101.34	$101.79	$ 82.38	$ 3.00
Soybean oil meal	65.33	65.33	43.50	64.90
Alfalfa hay	----	----	38.44	----
Fish oil	----	0.94	----	----
Mineral mixture	1.85	1.85	2.27	0.21
Salt	0.80	1.00	1.30	0.20
Pasture	----	----	----	55.00
Total	$169.32	$170.91	$167.89	$123.31
Av/head	16.93	17.09	16.79	12.33
Summer 1947				
Pasture	$ 75.00	$ 75.00	$ 75.00	$ 75.00*
Av/head	$ 7.50	$ 7.50	$ 7.50	$ 7.50
Winter 1947-48				
Chopped cane	$279.80	$281.21	$261.49	$ 10.80
Soybean oil meal	91.35	91.35	56.31	81.74
Alfalfa hay	----	----	32.88	----
Fish oil	----	1.17	----	----
Mineral mixture	1.40	1.60	1.40	0.60
Salt	1.20	1.50	1.60	0.70
Pasture	----	----	----	67.50
Total	$373.75	$376.83	$353.68	$161.34
Av/head	37.38	37.68	35.37	17.93
Summer 1948				
Pasture	$120.00	$120.00	$120.00	$108.00
Av/head	$ 12.00	$ 12.00	$ 12.00	$ 12.00
Grand Total	$738.07	$742.74	$716.57	$467.65
Av/head	73.81	74.27	71.66	51.96

* Heifer number 20 died November 11, 1947.

Feed costs used:		Winter 1946-7	Summer 1947	Winter 1947-8	Summer 1948
Chopped cane	Ton	$ 12.50	----	$ 15.00	----
Alfalfa hay	Ton	25.00	----	25.00	----
Soybean oil meal	Ton	115.00	----	105.00	----
Fish liver oil	Lb.	1.62	----	1.62	----
Mineral mixture	Cwt.	41.20	----	40.00	----
Salt	Cwt.	20.00	----	20.00	----
Pasture - Head/month		1.00	$1.25	1.25	$2.00

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