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Liberal vs. Limited Rations For Draft Colts In Michigan  
Michigan State University Agricultural Experiment Station  
Special Bulletin  
R.S. Hudson, Animal Husbandry  
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# LIBERAL vs. LIMITED RATIONS for Draft Colts in Michigan

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R. S. HUDSON

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Lot II—Fed conservative ration as yearlings. Note thrifty appearance and good condition.

AGRICULTURAL EXPERIMENT STATION

MICHIGAN STATE COLLEGE  
Of Agriculture and Applied Science

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SECTION OF ANIMAL HUSBANDRY

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East Lansing, Michigan

## RECOMMENDATIONS

Colts should not be pastured continuously on the same land because frequent studies during the course of this test, showed that infestations of parasites are more apt to occur on permanent pastures than when colts are changed from one pasture to another.

Regardless of their condition, it seems wise to treat colts for internal parasites in late November or December, using a six dram capsule of carbon disulphide\* for mature horses and three drams for weanling colts. Parasites sap the energy of horses and lower the efficiency of feeds used.

Colts can be halter broken most readily early in life and they then can be handled more easily when treated for worms or when their feet are trimmed.

The feet should be trimmed every two months or oftener to keep them in good condition; and this work trains the colt so it will permit its feet to be handled when it becomes mature. Keeping the colt's feet level tends to develop sound feet and legs.

Well developed colts at two years of age may be worked in harness, thereby reducing cost of growing them. They learn more readily than when more mature and when they are working they do not destroy fences or injure themselves. Two-year-olds should not be worked at the heaviest farm work for too long a continuous period.

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\*Carbon disulphide is inflammable and should be handled with care. United States Department of Agriculture Circular No. 148, Washington, D. C., and University of Illinois Circular No. 378, Urbana, Illinois, discuss common parasites of horses and prescribe treatments.

# LIBERAL vs. LIMITED RATIONS

for

## Draft Colts in Michigan

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R. S. HUDSON

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A continued decrease in the horse and mule population during the last decade along with the economic readjustment in farming methods has created a strong demand for horses of all ages. In addition to this, the birth rate has not kept pace with mortality, thus creating a shortage of young stock for replacements. According to the census estimates horses two years old or over decreased 220,000 in numbers from 1920 to 1934 in Michigan alone. In spite of the fact that more colts are being raised and many horses are being purchased and brought in from other states, Michigan had 6,000 less horses of work age January 1, 1934 than on the same date a year earlier.

Because of these conditions, coupled with an effort to get along with present equipment and limited expenditures, many farmers, some for the first time, are raising young horses, and are seeking information on economic feeding and management methods.

Feed and labor constitute a large part of the cost of raising horses to workable age. The amounts of feed and the labor required, therefore, largely determine the cost, and the amount of each of these items used in raising horses under various conditions is a factor of major importance to Michigan producers.

The advisability of feeding limited rations to young growing horses is questioned by many, and very little data for Michigan\* conditions are available to guide the feeder.

### Object of Trials

The object of the trial which is described in this bulletin was to compare, by actual weights and measurements, the effect on the development and to find the influence on the value of colts of liberal, conservative, and limited rations.

### Methods Used

Twenty-four weanling colts were divided into three lots of eight, each of which was made as similar as possible in age, size, sex, breeding, health and condition of animals. These lots were placed on three

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\*The author wishes to acknowledge the work done by the Missouri Station on this subject and reported in their Bulletin No. 316 of July, 1932.

Author's acknowledgments: During the progress of this work the author was ably assisted in keeping records by W. D. Gordon, student Michigan State College '34 and by Leonard H. Blakeslee, assistant in Animal Husbandry Department, Michigan State College, in the compilation.

different rations January 1, 1932. On February 28, 1934, after approximately a two-year experimental period, and after a 56-day finishing period, they were sold as coming-three-year-olds at public auction.

### Colts Used in Trials

These 24 individuals were of Belgian and Percheron breeding. They were typical Michigan colts and were purchased from Michigan farmers at an average cost of \$60.00 per head. The horse foals were castrated December 11, 1931, and all were treated for bots with three dram carbon disulphide capsules on December 22, 1931. A second treatment of six drams was given in January, 1934. All colts were identified by hoof number.

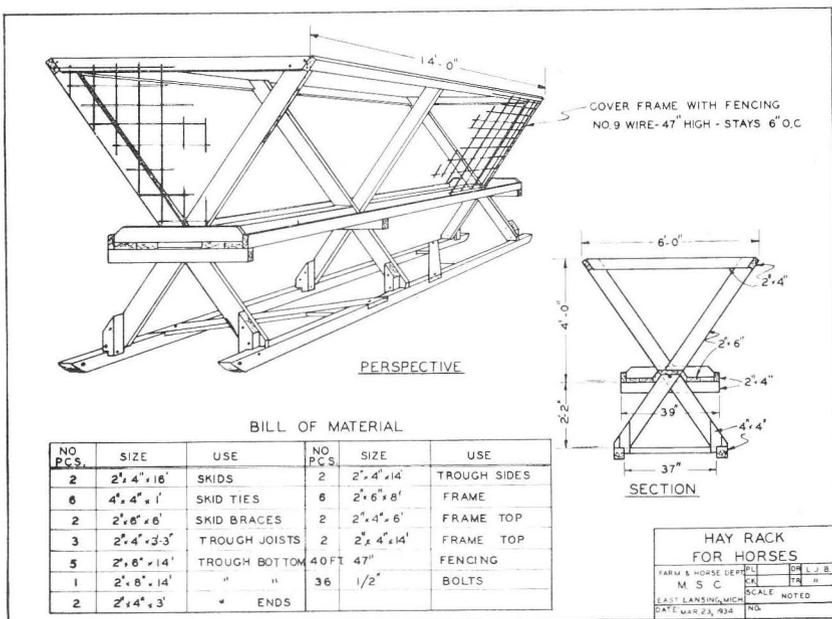


Fig. 1. Hay rack for horses.

### Management of Colts

All colts were fed out-of-doors in groups, which is advisable in producing sound and healthy colts and is a good practice to reduce feeding costs. At the start of the experiment, the colts were halter broke for convenience in leading to the scales for frequent weighing. The foot brand number was renewed every four months and all hoofs were properly trimmed every six to eight weeks to insure sound feet and legs and to improve the action.

### Equipment and Feeds Used

Each lot was provided with a 16 x 30 open shelter constructed of cheap shiplap siding and a straw roof (pictured on cover page). These shelters were located in three adjacent paddocks of 4.4 acres each.

Water was provided in each lot. Hay and grain racks (illustrated in Figures 1 and 2) made possible group feeding.

Alfalfa hay, ear corn, and oats used in the test were either produced on the College Farm or were purchased locally. Oat straw and salt were kept before each lot at all times. Alfalfa pasture for each lot was provided in a field adjoining the exercise paddocks.

The colts were kept in the paddocks or pastures from the start of the experiment until sold, except when weighing and measuring. During the fitting period of 56 days, all colts were stabled in the College Work Horse Barn. They were also handled, harnessed, and hitched in preparation for sale.

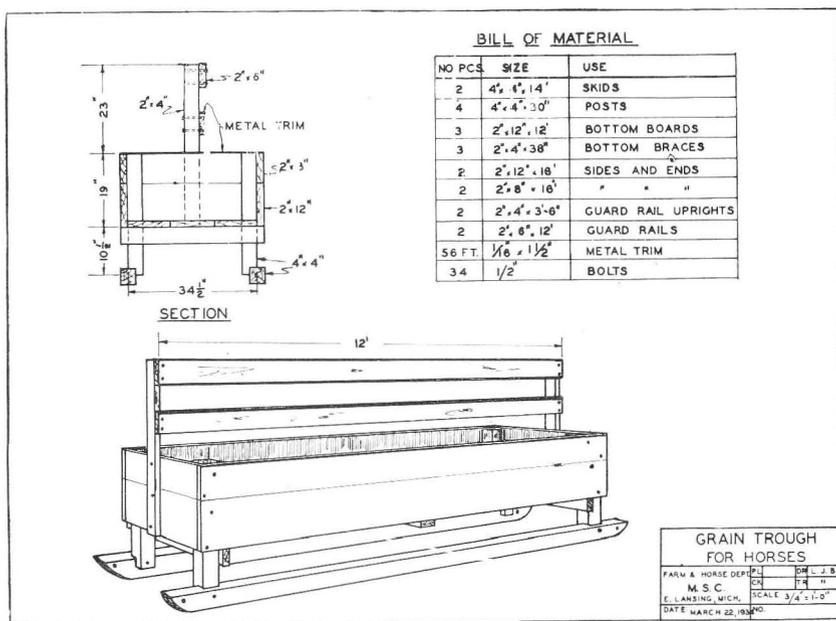


Fig. 2. Grain trough for horses.

### Method of Feeding

During the winter period grain, consisting of equal parts by weight of whole oats and ear corn was fed twice daily, and alfalfa hay was fed once daily, usually at night.

During the summer when pasture was short, hay usually was fed once daily. Grain, when supplied, ordinarily was fed once daily. Lot I, however, was fed twice daily in order to induce them to consume all the feed they possibly could.

### Description of Pasture

The pasture used for the colts was a three-year-old seeding of alfalfa. June grass had crept in and gradually thickened during the experiment. When turned to pasture the first season, each lot was given four acres in addition to their 4.4 acre paddock. The middle of

June an additional four acres of alfalfa, from which one cutting had been removed, was provided for each lot. On August 25, a 28-acre pasture, from which one cutting of alfalfa had been removed, was provided. This area was rotated between the three lots, each lot pasturing it every third day. The total amount of pasture for the first pasture season, therefore, was 52 acres plus 13 acres in the paddocks, an average of 2.7 acres per colt. One cutting was removed from 40 of the 52 acres, thus each colt did not have a full season's use of the 2.7 acres.

During the second pasture season, the entire 52 acres was fenced into three pastures of equal size, providing approximately 17.3 acres per lot of eight colts. No hay was removed from the lots during the second season.

During each pasture period, the colts in Lots II and III kept their pasture cropped much closer than those in Lot I. This fact accounts for the increased gains during the pasture period.

### Feeding by Periods

To make possible proper management and detailed records, the entire experiment was divided into periods. Table I sets forth the rations fed during each period. While under observation during the month of preliminary feeding, December 1, 1931, to January 1, 1932, and during the period November 15, 1933, to January 3, 1934, all colts were fed together, receiving approximately the same rations. The experiment really began in the period between January 1, 1932, and April 31, 1932. The colts in Lot I were given all the hay and grain that they would consume, that is, grain was kept before them at all times but

Table I. Average daily ration.\*

	Days Receiving Hay	Hay and Straw (pounds)			Days Receiving Grain	Grain (pounds)		
		Lot I	Lot II	Lot III		Lot I	Lot II	Lot III
Dec. 1, 1931-Jan. 1, 1932..	31	6.72	* 6.72	6.72	31	5.55	5.55	5.55
Jan. 1, 1932-Apr. 30, 1932..	121	10.27	8.23	7.25	121	12.35	6.18	3.08
May 1, 1932-Oct. 31, 1932..	Straw 109	.....	9.27	10.25	Lot 1—158.5 2—119. 3—44.	9.53	5.11	2.64
	40	9.08	11.10	10.88				
	181	18.63	10.97	10.85				
Nov. 1, 1932-Apr. 30, 1933..	181	18.63	10.97	10.85	181	14.86	7.44	3.72
May 1, 1933-Nov. 14, 1933..	Straw 170	.....	11.84	13.18	1— 135.5 2— 13.5 3—	8.18	4.08	3.75
	105	10.39	10.13	10.98				
	48.5	21.61	21.61	21.61				
Nov. 15, 1933-Jan. 3, 1934..	48.5	21.61	21.61	21.61	48.5	9.15	9.15	9.15
†Jan. 3, 1934-Feb. 28, 1934..	56	11.53	13.01	13.06	56	13.58	14.80	14.85

\*Lots II and III received oat straw at liberty but did not consume all of it.

†Grain for this period included six tenths pound of linseed meal and one pound of bran.

All lots were on pasture for 171 days from May 1, to October 31, 1932, and 186 days from May 1, to November 14, 1933.

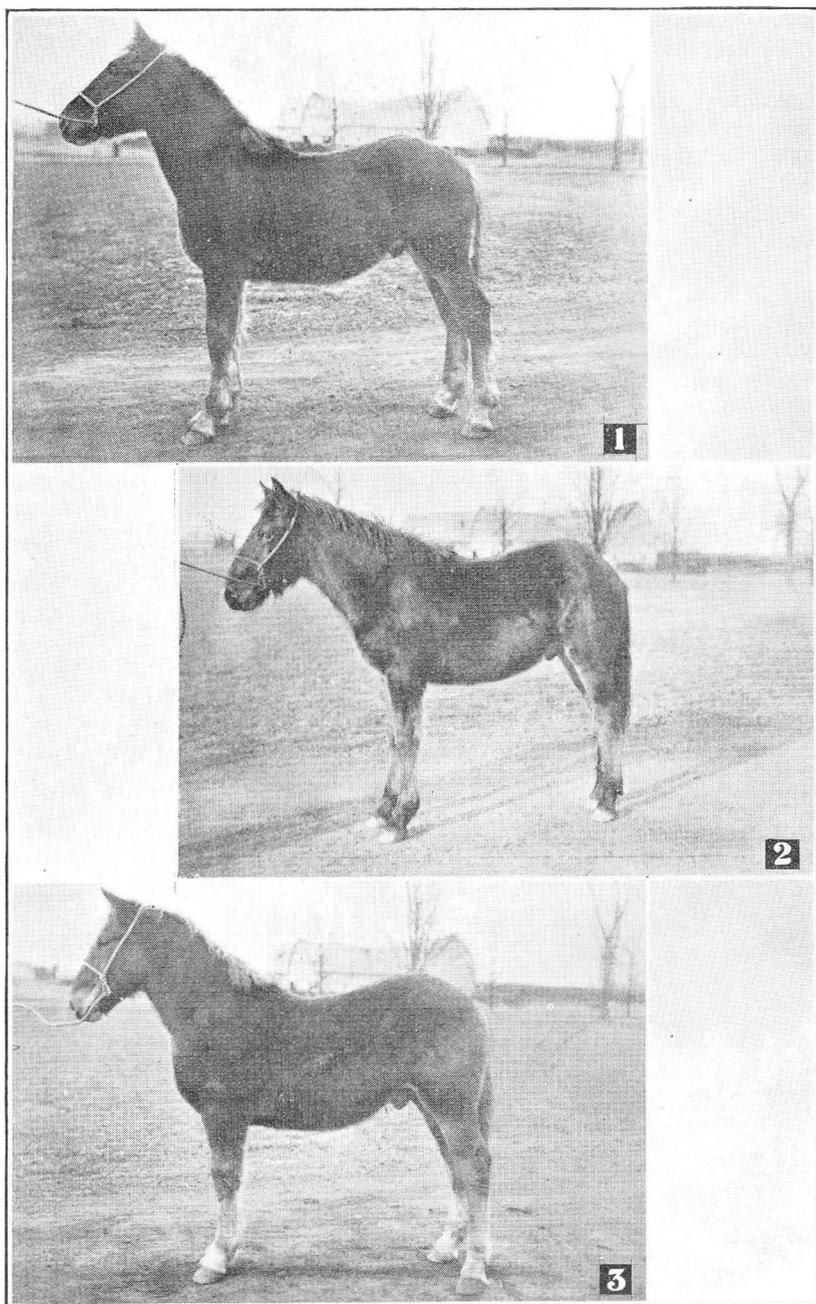


Plate I.

Number 2 geldings of the respective lots as weanlings before receiving the varied rations.

it was not allowed to accumulate and when they refused to eat the full amount the quantity was slightly reduced. Lot II colts always received one-half and Lot III one-fourth the amount of grain fed to those in Lot I. Lot I was fed unlimited amounts of hay, Lot II was limited to 1.05 lbs. per day per 100 lbs. live weight and Lot III to slightly less. Lot I would not consume more than about 1.28 lbs. of hay per 100 lbs. live weight. Straw was kept before the three lots but, since Lot I did not consume any, it was discontinued after the first month.

The second period, extending from May 1, 1932, to November 1, 1932, includes 184 days. The colts were on pasture 171 days of this period. When they were turned to pasture on May 14, all dry feed and grain was discontinued except grain in Lot I. This was decreased to about one-fourth the amount given in Table I, due to indications of foundering. On May 25, after all evidence of foundering were cleared up, the Lot I grain ration was again increased to all they would clean up. This was fed twice daily. On July 18, pasture was drying up and grain was provided Lot II once daily, the ration being one-half that of Lot I. Hay was provided all three lots from August 23 to September 19 in amounts indicated in Table I due to short pasture. Lot III was fed grain once daily throughout October, the ration one-fourth the amount received by Lot I.

The third feeding period, from November 1, 1932, to May 1, 1933, is the second winter period and the colts were dry fed the entire 181 days. The method employed for determining the ration of each lot during the first winter was used during this period. It was impossible, however, to get Lot I to consume as much grain in proportion to body weight during this period as they did the first winter.

The 198 days from May 1, 1933, to November 15, 1933, is the fourth period, or second pasture period. All lots were turned on pasture on May 14 and remained there 186 days. When on pasture, all dry feed was discontinued until July 15 when Lot I was given 30 lbs. of grain once daily and Lot II was fed 15 lbs. From August 15 to the end of

**Table II. Feed consumed during experiment by periods.\***

	Hay (tons)			Whole Oats (bu.)			Ear Corn (bu.)		
	Lot I	Lot II	Lot III	Lot I	Lot II	Lot III	Lot I	Lot II	Lot III
Dec. 1, 1931-Jan. 1, 1932	.83	.83	.83	25.84	25.84	25.84	7.86	7.86	7.86
Jan. 1, 1932-Apr. 30, 1932	4.97	3.98	3.51	186.88	93.44	46.62	85.43	42.71	21.31
May 1, 1932-Oct. 31, 1932	1.44	1.76	1.72	188.47	75.72	14.44	86.16	34.61	6.60
Nov. 1, 1932-Apr. 30, 1933	13.49	7.95	7.86	336.41	168.59	84.31	153.78	77.07	38.54
May 1, 1933-Nov. 14, 1933	4.36	4.25	4.61	138.75	69.38	6.31	63.43	31.71	2.88
Nov. 15, 1933-Jan. 3, 1934	4.19	4.19	4.19	55.47	55.47	55.47	25.36	25.36	25.36
Jan. 3, 1934-Feb. 28, 1934	2.56	2.89	2.90	78.88	86.91	86.88	39.41	43.51	43.88
Totals.....	31.84	25.85	25.62	1010.70	575.35	319.87	461.42	262.83	146.03

\*Bran, linseed meal, salt, straw, and pasture consumed can be obtained from Table VI.

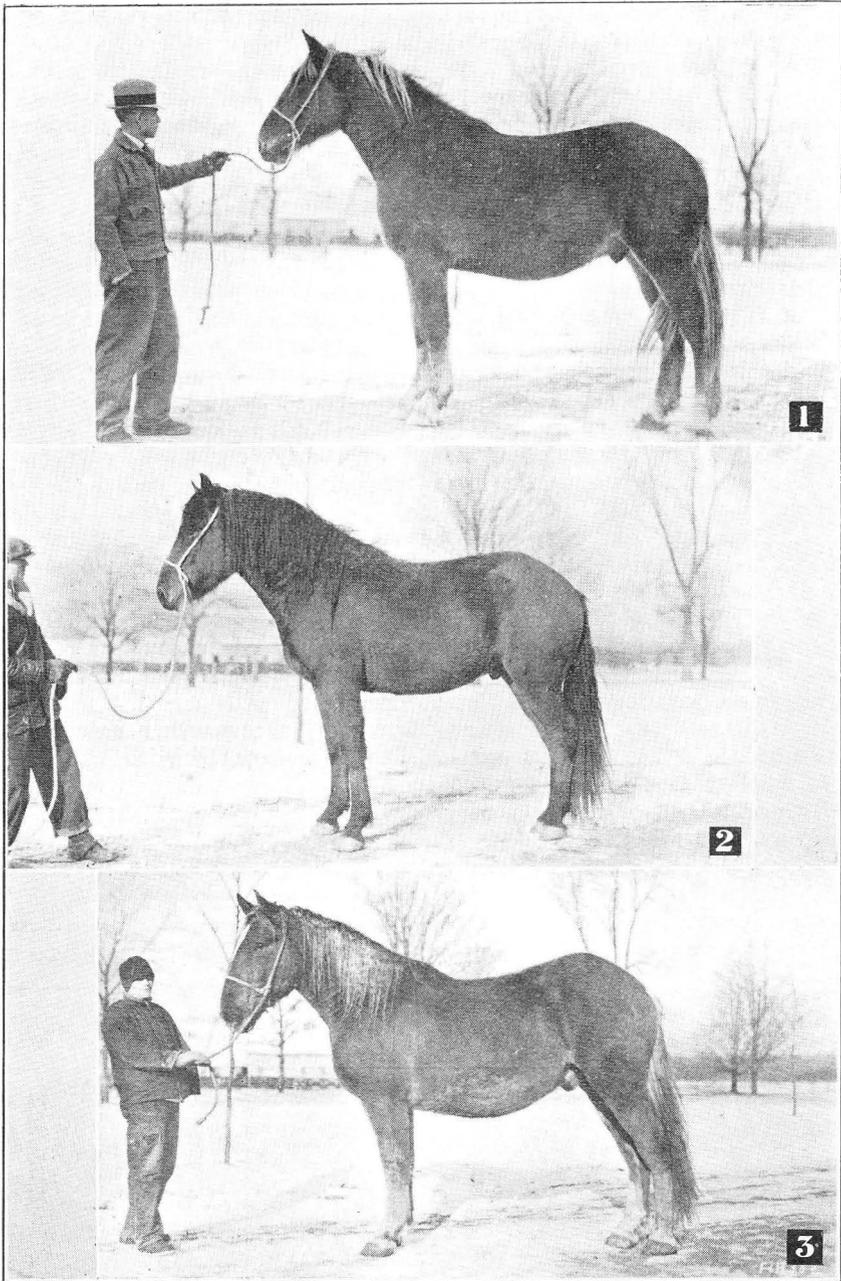


Plate II.  
Number 2 geldings as rising three-year-olds when the three  
different rations were discontinued.

the period, all lots were fed approximately the same amount of hay once daily as pasture was very limited.

The fifth and final period extends from November 15, 1933, to February 28, 1934. Until January 3 of this period, all colts were fed hay, straw, ear corn, and whole oats together in the paddocks. On January 3, the colts were placed in the College Work Horse Barn where they were all fed individually. At this time, bran and linseed meal was added to their ration. All colts received approximately the same ration. Lot I individuals were in extremely high condition and too fat for sale or for work. Thus the ration was intended to reduce the weight and harden Lot I, maintain the weight of Lot II, and increase the weight of Lot III which was in thin condition. Lot II was in good condition for sale or work.

The total feed consumed by periods for each lot is shown in Table II. These figures represent the amount of hay, whole oats, and ear corn actually weighed out and fed to each lot of colts.

Calculated on the basis of total average weight of colts per lot for the first experimental winter period, Lot I received 1.28 lbs. of hay per day per 100 lbs. live weight, Lot II 1.05 lbs, and Lot III .99 lb. By reducing ear corn to a shelled corn basis and combining the weight of oats and shelled corn, Lot I received 1.39 lbs., Lot II .71 lb., and Lot III .38 lb. of grain per day per 100 lbs. of live weight. It is very important to note that Lot I consumed a comparatively larger ration of grain during the first winter of feeding. During the second winter or third experimental period, Lot I consumed only .99 lb. of grain per day per 100 lbs. as compared with 1.39 lbs. during the first winter. Hay consumption, however, increased because Lot I consumed 1.38 lbs. per day per 100 lbs., as compared with 1.28 lbs. the first winter. Lot II was limited to .90 lb. of hay and .55 lb. of grain daily per 100 lbs. Lot III received .97 lb. of hay and .3 lb. of grain daily per 100 lbs. live weight.

**Table III. Total feed per colt (weaning to sale date).\***

	Lot I	Lot II	Lot III
	Liberal Ration	Conservative Ration	Limited Ration
Ear corn (bu.).....	57.68	32.85	18.25
Whole oats (bu.).....	126.34	71.92	39.98
Wheat bran (lbs.).....	53.62	52.75	55.
Linseed meal (lbs.).....	33.38	32.75	34.
Salt (lbs.).....	39.38	51.88	39.38
Straw (tons).....	.12	1.70	1.86
Hay (tons).....	3.98	3.23	3.20
Days on pasture (2 seasons).....	357	357	357
†Acres pastured (each season).....	2.7	2.7	2.7

\*Lots II and III received straw at liberty, but did not consume all.

†Under "Description of pasture" will be found details concerning pasture management.

During the finishing period, the hay fed was 1.02 lbs., 1.17 lbs., and 1.29 lbs. per hundredweight daily for Lots I, II, and III respectively. The grain consumed during this period was .6 lb., .7 lb., and .76 lb. daily per 100 lbs. live weight, respectively.

As indicated in the footnotes of Table I, each colt received an additional .6 lb. of linseed meal and 1 lb. of bran daily which would slightly increase the amount of grain per 100 lbs. live weight.

Table III shows the amounts of feed required to raise a colt from a weanling until ready for work as a rising-three-year-old, when fed three different rations. Using the 10-year average yields\* of hay and grain in Michigan, it would take 8.3 acres to produce the hay, oats, and corn utilized by each colt in Lot I. This 8.3 acres consisted of 1.95 acres of corn, 3.92 acres of oats, and 2.43 acres of alfalfa.

Each Lot II colt required 1.1 acres for corn, 2.23 acres for oats, and 1.97 acres for alfalfa, making a total of 5.3 acres necessary to produce the feed.

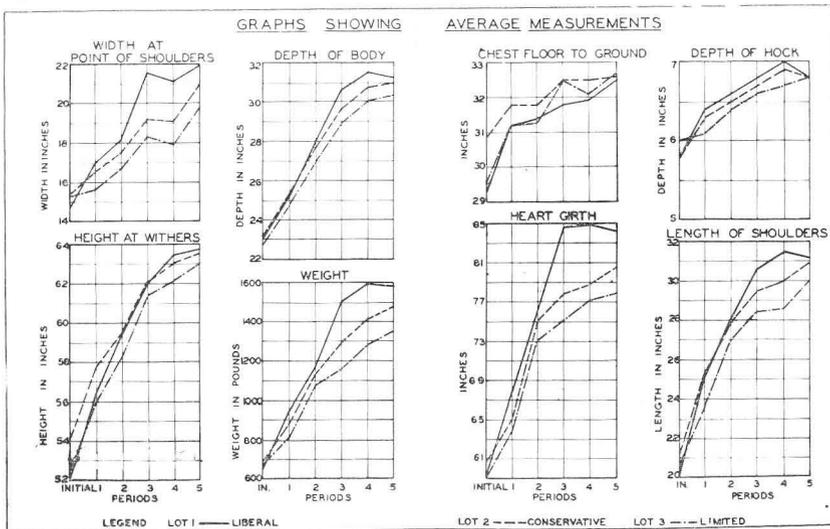


Fig. 3. Graph.

Lot III required only .62 acre for corn, 1.24 acres for oats, and 1.95 acres for hay, a total of 3.8 acres. Summarizing, it required 8.3, 5.3 and 3.8 hay and grain acres to develop each colt in Lots I, II, and III, respectively, based on the 10-year average yield of Michigan corn, oats, and alfalfa hay. Assuming each colt utilized only 1.5 acres the first year since one cutting was taken from part of the pasture, and 2.7 acres the second pasture season, the total acres required to develop each colt in the respective lots would be 12.5, 9.5, and 8.

### Method of Taking Weights and Measurements

Initial, final, and all intervening colt weights are the average of three consecutive individual daily weights taken on a tested 10-ton

\*Ten-year average yields, 1921-1932: alfalfa hay 1.64 tons per acre, oats 32.2 bushels per acre, corn 29.6 bushels per acre.

wagon scale. Body measurements were taken with the horse standing on a board floor in normal position. A regulation horse measuring standard was used in obtaining the height. Calipers were used for taking depth of body, depth of hock, depth of cannon, and width of shoulder points. Other measurements were taken with a steel tape.

**Table IV. Showing weights and gains per colt by periods.**

	Lot I		Lot II		Lot III	
	Average Weight (lbs.)	Average Gain (lbs.)	Average Weight (lbs.)	Average Gain (lbs.)	Average Weight (lbs.)	Average Gain (lbs.)
Initial Weight.....	653	.....	686.7	.....	668.1	.....
Jan. 1, 1932						
End of 1st Period.....	944.5	291.2	880.8	194.1	820.5	143.8
May 1, 1932						
End of 2nd Period.....	1197.1	252.5	1137.5	256.7	1081.2	270.9
Nov. 1, 1932						
End of 3rd Period.....	1507.5	310.4	1297.5	160.	1162.4	81.2
May 1, 1933						
End of 4th Period.....	1587.9	80.4	1418.3	120.8	1287.8	125.4
Nov. 14, 1933						
Final Weight.....	1573.8	-14.2	1478.5	60.2	1346.7	58.8
Feb. 28, 1934						
Total Gain.....	.....	920.4	.....	791.9	.....	680.1

### Experimental Weights and Body Measurements

The accompanying graphs compare the weights and the essential body measurements as they were taken each period. All weights and body measurements represent the average for each lot. Though every precaution was taken to obtain accurate measurements, there is a possibility of a slight variation in each case. These variations may be due to colts not standing in the same position each time or to change in condition. In spite of the possibilities of variations, the author believes a very representative figure was obtained by using the average measurements for each lot.

All measurements except those of chest-floor to ground and of width at point of shoulders show a steady increase to the end of the fourth period. It is a noteworthy fact that all three lots made the most pronounced development before the start of the second period or previous to one and one-half years of age. All three lots continued to develop at about the same rate in height at withers, depth of body, length of shoulders, and depth of hock as rising-two-year-olds. During the fourth and fifth period, practically all measurements seemed to level off, indicating a slowing up of skeletal growth as two-year-olds.

The increase in body depth and in condition of Lot III during the second pasture period made an apparent decrease in the measurement of chest-floor to ground, or length of leg. It is quite apparent that the gain in height of weanlings is due largely to increase in body depth, as Lots II and III gained approximately 2.4 inches in the chest-floor to ground measurement while gaining 7.7 inches in depth of body.

The slight decrease in width at point of shoulders seems to indicate

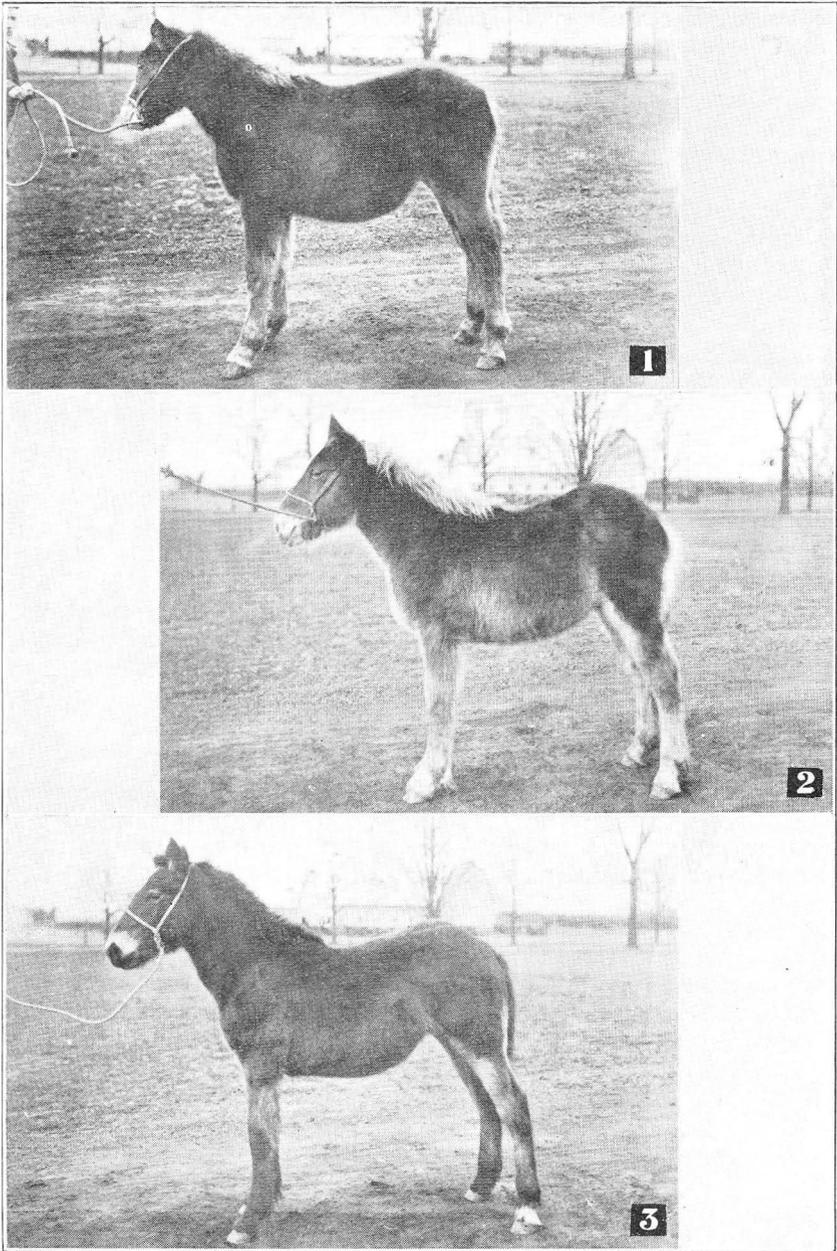


Plate III

Number 7 mares of the respective lots as weanlings before receiving the varied rations.

maximum growth when two-year-olds. The increase which followed is caused by spread of shoulder due to collar pressure. The decrease of Lot I in weight and several of the measurements during the last period was due to the smaller ration. All graphs show a marked tendency for Lots II and III to continue development as three-year-olds. Cannon measurements, included in Table B of the Appendix, showed practically no gain after 18 months of age. The length of back measurement showed a decrease during the fourth period. This was due to the method of measuring, since condition and position of colt is an important factor in this measurement. All increases in skeletal growth were slower in Lots II and III, but no indications of stunted growth were evident. Weights and measurements lead us to conclude that:

1. Greatest development of skeleton takes place before a colt is one and one-half years of age.
2. The development in body depth is much greater than that in length of leg, chest-floor to ground.
3. There is a distinct growth in length of leg.
4. There is a distinct widening across the breast, between shoulder points, after colts begin to wear a collar.
5. Heavy feeding induces early development in width, depth, and length of body also in bone.
6. There is a marked tendency for conservatively fed colts to overcome their early handicap as rising-three-year-olds if fed properly.
7. The depth of hock seems to decrease slightly when colts are put in harness.

### Experimental Variations

Slight variations will be noted in average weights, measurements, and gains at the end of the first and of the second experimental periods. These variations are due to the accidental death of number five in Lot III on March 31, 1932, and the death of number six in Lot III on May 30 due to a severe case of pneumonia. In each case, other colts were substituted. Weights and measurements for these two periods in Lot III, however, are the average of only seven colts, the irregular one being eliminated in each period when deaths occurred.

Lot I made the best gains during the entire experiment, as shown in Table V, although it did not make the best gains on pasture during the second and third period.

Table V. Average daily gain by periods.

	Daily Gain per Colt					
	1st Period (lbs.)	2nd Period (lbs.)	3rd Period (lbs.)	4th Period (lbs.)	5th Period (lbs.)	Entire Experiment
Lot I.....	2.40	1.37	1.71	.41	-.14	1.15
Lot II.....	1.60	1.39	.88	.61	.58	1.00
Lot III.....	1.18	1.50	.45	.63	.57	.83

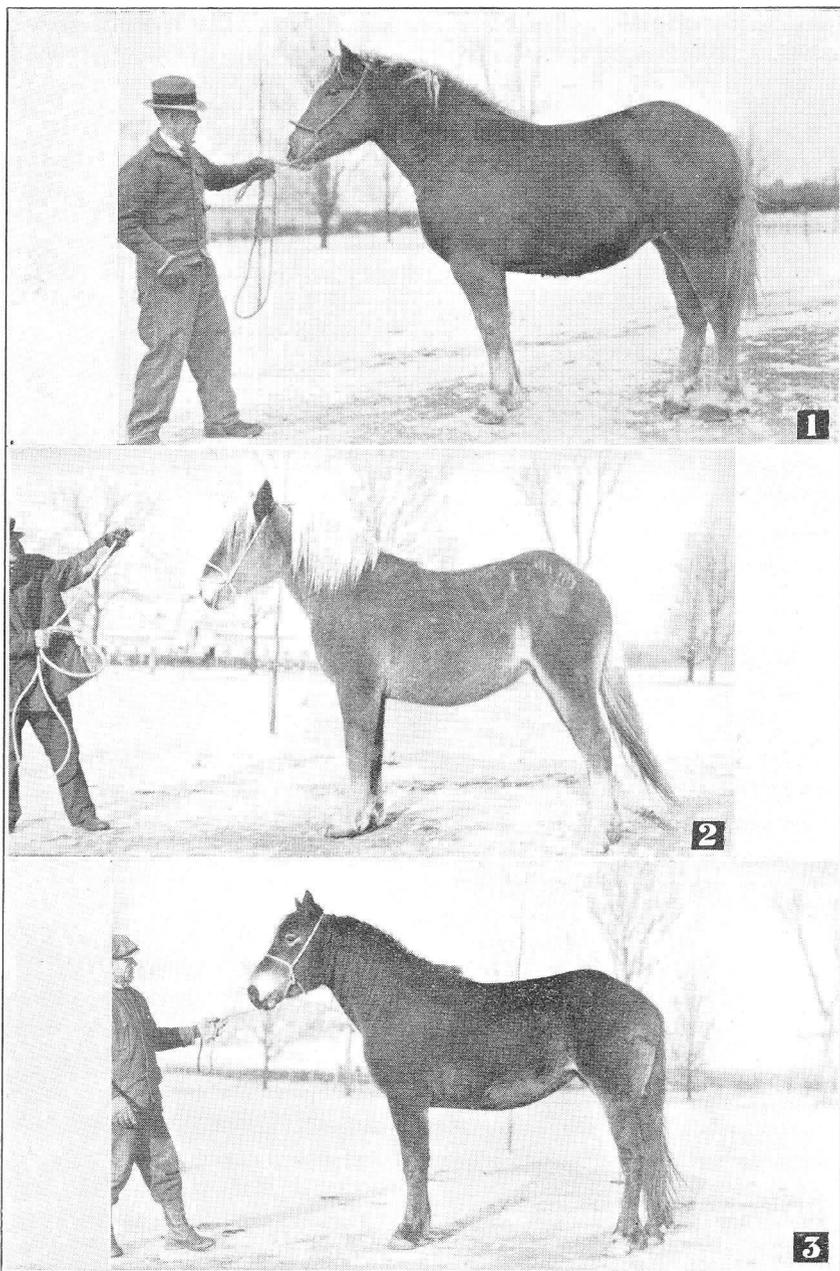


Plate IV.

Number 7 mares as rising-three-year-olds when the three different rations were discontinued.

Considering pounds of feed per 100 lbs. of gain, Lot I consumed 772 lbs., Lot II 503 lbs., and Lot III 342 lbs. of grain. The hay consumed was 843 lbs., 790 lbs., and 990 lbs. for the respective lots.

With Lots I and II in shape for work as two-year-olds, Lot II was still the most efficient in gains since these colts consumed 560 lbs. of hay and 398 lbs. of grain while Lot I consumed 582 lbs. of hay and 600 lbs. of grain per 100 lbs. of gain.

It is apparent that Lot I used 269 lbs. more of grain per 100 lbs. gain than Lot II. This extra grain was used by Lot I for excess fat, making the gains more costly, and the colts were no more useful as work animals than those in Lot II.

**Table VI. Amounts and cost of feed**

	Lot I		Lot II		Lot III	
	Liberal Ration		Conservation Ration		Limited Ration	
	Amount	Cost	Amount	Cost	Amount	Cost
*Ear corn (50 cents per bu.)..	461.42 bu.	\$230.71	262.83 bu.	\$131.46	146.03 bu.	\$73.02
Whole oats (36 cents per bu.)	1010.70 bu.	363.85	575.35 bu.	207.14	319.87 bu.	115.14
Wheat bran (\$1.00 cwt.)....	429. lbs.	4.29	422. lbs.	4.22	440. lbs.	4.40
Linseed meal (\$1.75 cwt.)...	267. lbs.	4.67	262. lbs.	4.58	272. lbs.	4.76
Salt (\$1.00 cwt.).....	315. lbs.	3.15	415. lbs.	4.15	315. $\frac{1}{2}$ lbs.	3.15
Hay (\$6.00 per ton).....	31.84 T.	191.04	25.85 T.	115.10	25.62 T.	153.72
†Straw (\$4.00 per ton).....	.97 T.	3.88	13.61 T.	54.44	14.87 T.	59.48
Pasture (35 cents per week).	408 wks.	142.80	408 wks.	142.80	408 wks.	142.80
Total feed cost per Lot.....		944.39		703.89		556.47
Total feed cost per colt.....		118.05		87.99		69.56

\*Bushel of ears—70 pounds.

†All lots refused between 25 and 50 per cent of the oat straw weighed to them.

**Table VII. Feed cost of Lot I and II to May 1, 1933**

	Lot I		Lot II	
	Liberal Ration		Conservative Ration	
	Amount	Cost	Amount	Cost
Ear corn (50 cents per bu.).....	333.23 bu.	\$166.62	162.25 bu.	\$81.12
Whole oats (36 cents per bu.).....	747.60 bu.	265.53	363.59 bu.	130.89
Hay (\$6.00 per ton).....	20.73 T.	124.38	14.52 T.	87.12
Pasture (35 cents per week).....	195 wks.	68.25	195 wks.	68.25
Salt (\$1.00 per cwt.).....	215 lbs.	2.15	315 lbs.	3.15
Straw (\$4.00 per ton).....	355 lbs.	.71	12.21 T.	48.84
Total feed cost.....		\$627.64		\$419.37
Feed cost per colt.....		78.45		52.42

**Total Feed Cost**

Feed costs alone do not represent the total cost of raising colts. Additional costs such as labor, care, service fees, and veterinary fees, however, vary with the conditions which may prevail in different localities. Table VI shows the total feed cost of each lot from weaning until ready for work as rising-three-year-olds. These varying amounts of feed can be readily used with different feed prices and necessary fixed charges added to determine actual cost. Table VI shows that the colts in Lot II cost at least \$18.43 more than those in Lot III, due to greater feed consumption. The Lot I colts actually cost \$30.06 more than Lot II. Manure was not credited in the experiment. However, the fertilizer value of the hay, grain, and straw fed each colt, based on current prices for nitrogen, acid phosphate, and

**Table VIII. Feed cost of raising weanling colts to working age. (With varying feed prices.)\***

	Hay at \$5.00			Hay at \$7.50		
	Lot I	Lot II	Lot III	Lot I	Lot II	Lot III
†Grain at:						
\$10.00 per ton.....	\$56.30	\$36.85	\$27.50	\$66.25	\$44.93	\$35.50
15.00.....	74.50	47.20	33.25	84.45	55.28	41.25
20.00.....	92.70	57.55	39.00	102.65	65.63	47.00
25.00.....	110.90	67.90	44.75	120.85	75.98	52.75
30.00.....	129.10	78.25	50.50	139.05	86.33	58.50
35.00.....	147.30	88.60	56.25	157.25	96.68	64.25
40.00.....	165.50	98.95	62.00	175.45	107.03	70.00
	Hay at \$10.00			Hay at \$12.50		
	Lot I	Lot II	Lot III	Lot I	Lot II	Lot III
†Grain at:						
\$10.00 per ton.....	\$76.20	\$53.00	\$43.50	\$86.15	\$61.08	\$51.50
15.00.....	94.40	63.35	49.25	104.35	71.43	57.25
20.00.....	112.60	73.70	55.00	122.55	81.78	63.00
25.00.....	130.80	84.05	60.75	140.75	92.13	68.75
30.00.....	149.00	94.40	66.50	158.95	102.48	74.50
35.00.....	167.20	104.75	72.25	177.15	112.83	80.25
40.00.....	185.40	115.10	78.00	195.35	123.18	86.00
	Hay at \$15.00			Hay at \$17.50		
	Lot I	Lot II	Lot III	Lot I	Lot II	Lot III
Grain at:						
\$10.00 per ton.....	\$96.10	\$69.15	\$59.50	\$106.05	\$77.23	\$67.50
15.00.....	114.30	79.50	65.25	124.25	87.58	73.25
20.00.....	132.50	89.85	71.00	142.45	97.93	79.00
25.00.....	150.70	100.20	76.75	160.65	108.28	84.75
30.00.....	168.90	110.55	82.50	178.85	118.63	90.50
35.00.....	187.10	120.90	88.25	197.05	128.98	96.25
40.00.....	205.30	131.25	94.00	215.25	139.33	102.00

\*This table represents cost of hay and grain only. No charge was made for straw due to the usual farm practice of straw at liberty.

†Amounts of grain used to compute tables represent whole oats and ear corn reduced to a shelled corn basis.

potash would be \$49.04, \$40.12, and \$35.23 for the respective lots. Calculating that only 75 per cent of the acid phosphate and potash and 50 per cent of the nitrogen is available, when considering leaching and other losses in the manure, the fertilizer value would be \$29.14, \$24.19, and \$21.45 for each colt in Lots I, II, and III respectively.

The colts in Lot I and II were sufficiently developed and in suitable condition for work May 1, 1933, as two-year-olds. If put to work at that time they would have paid for their feed, thereby reducing the cost for Lot I \$39.60 and for Lot II \$35.57. Table VII shows detailed feed charges to May 1, 1933.

This table is constructed for the purpose of assisting Michigan colt producers in calculating the cost of raising colts to workable age. In each case the cost of pasture, service fee, veterinary services, and time lost by mare when foaling should be added to obtain the total cost.

A study of sale prices will show that color, breed, and sex as well as condition, influenced sale prices. It was the original plan to use sale averages in measuring the economy of the three varied rations. However, the substitutions in Lot III along with the differences in value of fillies and geldings made such a plan inadvisable.

All colts sold for an average of \$185.41. Total feed cost per colt amounted to \$91.86, making the actual cost, including initial cost of colts, \$151.86. The twenty-four colts returned a profit of \$33.55 per colt after paying \$6.00 per ton for alfalfa hay, \$0.50 per bushel for ear corn, \$0.36 per bushel for whole oats, \$4.00 per ton for straw, and \$0.35 per week for pasture used during the experiment. Labor costs and other expenses are not included when computing this profit.

Table IX. Colts used in experiment.

Description of colts	Initial Weight Jan. 1, 1932	Weight Nov. 14, 1933	Final Weight Feb. 28, 1934	Sale Price
Lot I:				
No. 1—Bay gelding . . . . .	530.	1433	1426	\$155.00
No. 2—Sorrel Belgian gelding . . . . .	753.	1596	1585	202.50
No. 3—Bay Belgian gelding . . . . .	736.	1636	1595	267.50
No. 4—Black Percheon filly . . . . .	916.	1990	1973	205.00
No. 5—Black Percheon filly . . . . .	663.	1676	1638	250.00
No. 6—Black Percheon filly . . . . .	466.	1503	1450	170.00
No. 7—Sorrel Belgian filly . . . . .	523.	1533	1578	282.00
No. 8—Brown Percheon-Belgian gelding . . . . .	636.	1333	1343	142.50
Lot II:				
No. 1—Bay gelding . . . . .	530.	1190	1225	137.50
No. 2—Bay Belgian gelding . . . . .	770.	1460	1486	172.50
No. 3—Bay Belgian filly . . . . .	780.	1543	1606	287.50
No. 4—Black Percheron gelding . . . . .	753.	1490	1630	160.00
No. 5—Black Percheron gelding . . . . .	703.	1343	1328	142.00
No. 6—Black Percheron filly . . . . .	763.	1496	1586	250.00
No. 7—Sorrel Belgian filly . . . . .	583.	1353	1436	242.00
No. 8—Brown Percheron-Belgian filly . . . . .	610.	1470	1528	155.00
Lot III:				
No. 1—Cream colored filly . . . . .	650.	1130	1196	100.00
No. 2—Sorrel Belgian gelding . . . . .	893.	1526	1618	165.00
No. 3—Bay Belgian gelding . . . . .	690.	1303	1336	150.00
No. 4—Black Percheron gelding . . . . .	700.	1353	1403	167.50
No. 5—Sorrel Belgian gelding . . . . .	*725.	1137	1176	95.00
No. 6—Black Percheron gelding . . . . .	†806.	1273	1291	150.00
No. 7—Brown Belgian filly . . . . .	676.	1286	1373	207.50
No. 8—Bay Percheron-Belgian filly . . . . .	543.	1283	1376	192.50

\*Weight March 31, 1932 when substituted for black Percheron filly.

†Weight June 1, 1932 when substituted for black Percheron filly.

## APPENDIX

Table A. Average daily cost per colt.

	Lot I	Lot II	Lot III
Dec. 1, 1931-Jan. 1, 1932.....	\$0.07	\$0.07	\$0.07
Jan. 1, 1932-Apr. 30, 1932.....	.15	.10	.07
May 1, 1932-Oct. 31, 1932.....	.13	.08	.06
Nov. 1, 1932-Apr. 30, 1933.....	.19	.12	.09
May 1, 1933-Nov. 14, 1933.....	.12	.09	.07
Nov. 15, 1933-Jan. 3, 1934.....	.16	.16	.16
Jan. 3, 1934-Feb. 28, 1934.....	.16	.18	.18
Average.....	\$0.14	\$0.11	\$0.08

This table gives the average daily cost per colt for each period of feeding. This daily cost includes all feeds weighed to the colts as well as pasture. Feed prices used are the same as in Table VI.

Table B. Average measurements.

Measurement	Lot No.*	Measurements (in inches)					
		Initial Jan. 1, 1932	1st Period Apr. 30, 1932	2nd Period Oct. 31, 1932	3rd Period Apr. 30, 1933	4th Period Nov. 14, 1933	5th Period Feb. 28, 1934
Height.....	1.....	52.2	56.4	59.4	62.	63.5	63.8
	2.....	54.2	57.8	59.6	62.1	63.1	63.6
	3.....	52.4	56.	58.3	61.4	62.2	63.
Depth of body.....	1.....	23.	25.2	28.1	30.6	31.6	31.3
	2.....	23.2	25.4	27.7	29.6	30.7	31.
	3.....	22.7	24.8	27.	28.9	30.	30.3
Heart girth.....	1.....	59.3	67.8	76.2	84.7	84.9	84.2
	2.....	60.7	65.1	75.1	77.8	78.8	80.6
	3.....	59.1	63.8	73.2	75.2	77.2	77.8
Length of shoulder.....	1.....	20.2	25.1	28.1	30.6	31.5	31.2
	2.....	21.2	25.3	27.9	29.5	30.	30.9
	3.....	20.6	23.6	26.9	28.4	28.6	30.
Length of back.....	1.....	29.	32.3	36.	39.5	38.9	39.7
	2.....	30.	33.3	35.2	39.6	38.6	39.1
	3.....	29.7	33.4	36.3	39.1	38.7	39.9
Depth of hock.....	1.....	5.8	6.4	6.6	6.8	7.	6.8
	2.....	5.8	6.3	6.5	6.7	6.9	6.8
	3.....	6.	6.1	6.4	6.6	6.7	6.8
Depth of rear cannon.....	1.....	3.6	4.	4.	4.	4.1	4.
	2.....	3.6	4.	3.8	4.	4.	4.1
	3.....	3.6	3.7	3.7	3.9	3.9	3.9
Depth of front cannon.....	1.....	2.8	3.	3.1	3.2	3.3	3.2
	2.....	2.8	2.9	3.	3.2	3.2	3.2
	3.....	2.8	2.9	3.1	3.2	3.2	3.2
Width at point of shoulders..	1.....	14.7	17.	18.2	21.6	21.2	21.9
	2.....	15.4	16.6	17.5	19.2	19.1	21.
	3.....	15.3	15.7	16.8	18.3	17.9	19.8
Chest-floor to ground.....	1.....	29.3	31.2	31.4	31.8	31.9	32.5
	2.....	30.9	31.8	31.8	32.5	32.5	32.6
	3.....	29.6	31.2	31.3	32.5	32.1	32.7

\*Lot 1—Liberal ration.  
 Lot 2—Conservative ration.  
 Lot 3—Limited ration.

### Discussion

Colts fed on limited winter rations make more rapid gains on good alfalfa and June grass pasture but do not entirely offset those made by colts fed more liberally. Exercise seems necessary in growing good sound draft colts and this may be accomplished by feeding the colts out-of-doors in the winter and by making continuous use of pasture in summer. Where cheap pasture land is available and if hay and grain are high, it seems advisable to limit the feed of colts in the winter time and to take more time for their development. On the contrary, when feeds are cheap and horses high, conservative or even liberal rations are advisable in order to hasten maturity, although extremely liberal feeding produces excess fleshing, which is usually unprofitable and makes the animal overfat for highest efficiency as a work animal.

There is a strong demand for draft colts and Michigan farmers are willing to pay a premium for those with a medium degree of finish and condition.

### Summary

1. A limited ration of grain and alfalfa hay with free access to straw does not stunt draft colts but does retard development.
2. A limited ration seems to have a greater effect on weight and condition than on skeletal development.