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CENSUS OF AGRICULTURE

THE FARM HORSE

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FIFTEENTH CENSUS OF THE UNITED STATES

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THE FARM HORSE

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THE FARM HORSE

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INTRODUCTION

This is a study of the farm-horse situation in the United States and closely related problems, particularly the causes and effects of the decrease in the number of work animals in recent years, brought out in the analysis of census statistics.

While the decline of 6,313,696 in the number of farm horses and mules occurring in the last decade is in itself a very pressing farm problem, the effects of the decrease are of vastly greater importance. Indeed it is one of the main contributing factors of the present economic situation. At least 18,000,000 acres of crop land, formerly required to produce horse feed, have been put into other crops in the last decade. This added acreage augmented by the release of that part of 3,000,000 acres of plowable pasture formerly devoted to horses, has resulted in surpluses of various crops and livestock; in many crops the surpluses have resulted in decreased prices for these farm products, greatly lowering farm purchasing power; and the reduction in the latter has affected the entire country.

It is not within the scope of this monograph to go deeply into the theory of surpluses or their relation to prices and purchasing power. Its main purpose is to trace the origin of the surpluses of crops and livestock, in so far as they are connected with decreases in the number of farm horses and mules, and to offer a few illustrations of the effect of such decrease on prices and farm purchasing power. A correct idea of the importance of the whole subject, however, can best be obtained from concrete illustrations. The minimum figure of 18,000,000 acres released by the decrease in horses and mules between 1920 and 1930 is sufficient to produce yearly 6,000,000 bales of cotton, half the usual crop, or 250,000,000 bushels of wheat, about one-third of the wheat crop, or 487,000,000 bushels of corn, an amount sufficient to feed over 12,500,000 hogs a year. These illustrations emphasize the magnitude of possible surpluses and invite consideration of what the effects on industry and prices would be if a large proportion of this surplus acreage went into any one crop in any one year. Naturally the released acreage has been spread among many crops as will be shown in a later chapter.

It must be pointed out here, however, that the surpluses of crop production resulting from a surplus acreage, are cumulative in character, and tend to continue until readjustments of acreage occur. Thus, if only one-tenth of the minimum acreage released went into cotton each year, a surplus of 600,000 bales yearly would be produced amounting in 10 years to 6,000,000 bales, other conditions remaining unchanged.

By 1930 the acreage released had reached the minimum figure previously mentioned but in the three years that have passed since the census the surpluses have increased in magnitude and the adverse effects have become much more serious.

An unusual combination of circumstances has occurred which renders an analysis of the horse situation more timely than ever before. In the first place a heavy movement of population back to the farm occurred in the census year 1929. The Department of Agriculture estimates an increase in farm population of over 1,500,000 since that time, which on the usual basis would mean the equivalent of over 400,000 families. These people will require between 400,000 and 600,000 additional work stock if they have about the same average number of work animals per family as is shown for the remainder of the agricultural population. Or

if it is contended that the increase is principally made up of unattached work hands the number of work animals required would be much greater.

From the study of farm power which will be covered in a later chapter, a slight surplus of power appears to have been available for the land under cultivation in 1929, but this was sufficient to take care of only a few per cent additional acreage. As there is a natural tendency toward expansion of acreage of crops amounting to about 1 or 2 per cent a year, and as relatively few tractors and trucks were sold to farmers in the past three years, the excess of farm power available appears to have been exhausted. Even under adverse conditions, additional work animals would be required to take care of normal growth.

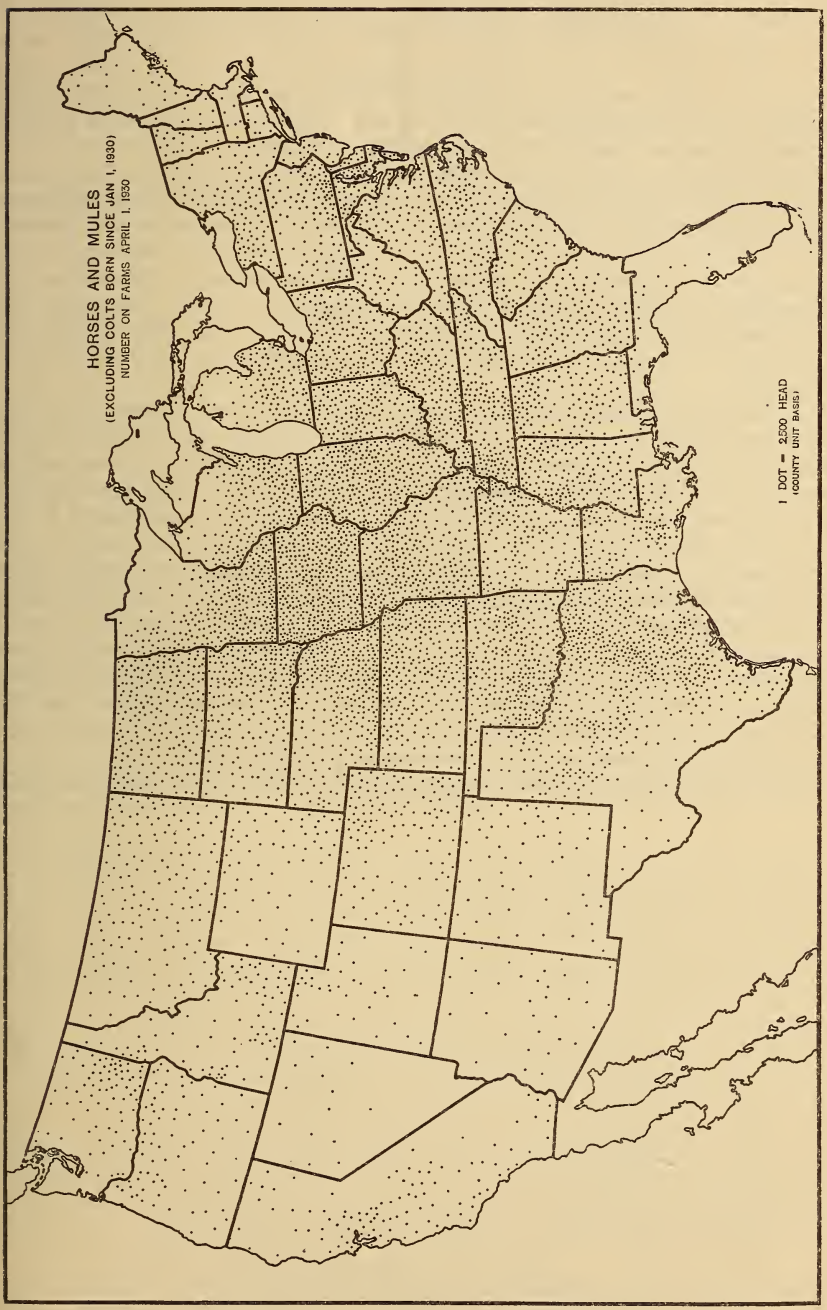
All of this taken in connection with the advanced age of work animals at this time and the increasing mortality rate, which now exceeds the birth rate by about 4 or 5 per cent, seems to indicate a rather acute horse situation in the very near future.

The automobile, tractor, and improved farm machinery have had much the same effect on the farm and farm horse as improved machinery has had upon the factory and factory worker. Their use has enabled a greater production per unit and has thrown out of employment a tremendous number of work animals, between four and five million or about one-fourth of the mature horse and mule population. Also about 2,000,000 city horses and mules raised on the farm have been replaced by machinery between 1920 and 1930, and more than 3,000,000 between 1910 and 1930. As the change has taken place gradually, covering almost two generations of horses when measured by the average life span of the horse, expanding agriculture has taken care of a part of the surplus produced by the introduction of machinery; and the relatively high death rate and easily controlled birth rate have helped to absorb part of the shock of adjustment.

In the final analysis, however, the greatest effect of machinery is being felt by the human population, for not only has machinery released horses and mules, added crop acreage, and built up surpluses resulting in a great fall in prices, but it has also released men, smaller numbers being needed to handle farms and produce the same amount of crops. The men so displaced have helped to swell the numbers of the unemployed when the peak of industrial production, which temporarily utilized their labor in boom times, had passed.

The effects of surpluses built up by release of crop acreage previously devoted to horse feed, and of machinery on horses and men required will be discussed at length in later chapters.

While the main subject of this study as indicated by the title, is the farm horse, it is necessary to discuss all horses and mules, including range horses, wild horses, and city horses. Range horses are included in census statistics with farm horses because the definition of farms includes ranches. The dividing line between the range horse and wild horse not owned is somewhat difficult to draw. In some cases the difference is merely between the branded and the unbranded animal. Of course the wild horses which are not considered owned property are not enumerated by the census. As a potential source of supply wild horses may be of some importance. They also offer some statistical complications because they are now being slaughtered at some plants. Statistics for city horses and mules are not included in the official figures of the 1930 census. It is necessary to consider the number of city horses and mules for the following reasons: there has never been much horse breeding in the city. City horses were formerly almost exclusively bred on farms but because of their practical disappearance such breeding is no longer necessary. They have declined in numbers from 3,500,000 in 1910 to a few hundred thousand in 1930. Any computations made to determine mortality, birth rate, or the net disappearance, require adjustments to meet the situation.


HORSES AND MULES
(EXCLUDING COLTS BORN SINCE JAN 1, 1930)
NUMBER ON FARMS APRIL 1, 1930
1 DOT = 2,500 HEAD
(COUNTY UNIT BASIS)

The study must also cover mules, particularly as the trend in mules is different from that in horses, and as breeding operations, birth and mortality statistics are all affected by complications introduced by mules, and by the fact that this hybrid, resulting from breeding mares with jacks, does not reproduce. The reverse cross, the hinny, is very rare and such animals are reported with mules. Asses and burros were occasionally included with mules in the census but such cases are rare. The animals are relatively so few in number as to need little mention except as they are required in the breeding of mules.

Any discussion of feed or feed crops necessarily requires the inclusion of other farm animals because feed requirements of all animal units are primary considerations on most farms. The various feed and pasture requirements are different for the different animals but surpluses of animals or animal products are as serious as the surplus of crops, although much harder to trace. Changes in crop acreages and livestock form such an intricate pattern and are so interwoven with other factors that it is sometimes necessary to consider and explain those factors although at first glance they might appear to be entirely unrelated to the horse situation.

Few technical terms are used in this monograph and these are explained in an appropriate place in the text. To make the distinction between farm and city horses a definition of a farm is perhaps necessary. For census purposes a farm was a tract of land which was 3 acres or more in area or which produced agricultural commodities to the value of $250 or more in 1929, farmed directly by the operator by his own labor or with the assistance of his family or hired help. The definition of a farm, therefore, includes ranges and range horses. City horses and mules are those in towns and villages in inclosures which do not come within the definition of a farm. "Work animals" is a term used for convenience, which covers not only horses and mules actually in harness but all horses and mules 2 years old and over irrespective of use. The statistics do not include asses, burros, nor oxen, which are sometimes covered by this designation. For the convenience of the reader and to avoid confusion regarding the exact meaning of the tables, all decreases or deficiencies are printed in italics.

This review covers the farm horse situation as it appears in February, 1933.

CHAPTER I.—THE HORSE SITUATION

GENERAL REVIEW

Farm horses and mules in the United States increased steadily from 1850 to about 1920. Calculations based upon birth rate, mortality, exports, and net disappearances appear to indicate that the high point in *farm* horses was reached in 1918 or 1919. This is also borne out by the number of colts 1 year old and under 2 compared with the colts under 1 year, and also by the yearly estimates of the Department of Agriculture.

The increase in the number of farm horses roughly paralleled the growth and development of farms. Although the increase continued almost to 1920, a decrease in the ratio of work animals to acres in farms was noted shortly after 1910. By 1920 the average number of work animals per thousand acres had decreased from 27 to 26, and by 1930 had fallen to 19. This index brings out very strikingly the difference in the trend of horses and mules. Between 1910 and 1930 the number of horses per thousand acres in farms fell from 23 to 14, while the number of mules was 5 per thousand acres in farms in both 1910 and 1930. The difference is also revealed by the absolute figures. The downward trend was clearly perceptible in the number of horses in 1920, while mules were still increasing in numbers. To get a really correct idea of the situation, however, city horses and mules must be included because of the very material proportion which city work animals represented of the total number of work animals, and of the total farm breeding operations. With the city animals included, the high point of the horse and mule population of the country appears to have been reached in 1913 or 1914. At that point it was checked by very heavy exportation of animals for war purposes. Otherwise the total would probably have reached the peak slightly before that of farm animals, because city horses were decreasing at a rate more than offsetting the rather heavy farm breeding at that time. An interesting feature is the way that mules tended in a small measure to supplant, first, city work animals and then farm horses, and this preference appears true of the exports.

The explanation of the decreases in horses and mules is of course, the invasion of the machine, automobile, tractor, truck, and improved heavy farm machinery; and in point of time the decreases in horses closely follow the general introduction of such machinery. This phase of the subject will be more fully discussed in a later chapter which will show the relationship of each and apportion, so far as possible, the displacement caused by each. The relative changes in numbers of horses as compared with mules is probably largely due to the automobile, which has replaced practically all the buggy horses and a large part of the general-purpose farm horses and combination delivery and driving city horses. Naturally this would occur first in the cities where the automobiles first became common, and replacement of the city horses would tend to favor the mules. The further explanation of the mule increase is due to the expansion of the cotton acreage made necessary by the boll weevil, and the fact that mules are generally considered to be better adapted to practices and conditions in the Cotton Belt than horses. While a small number of mules have always been used for driving and saddle purposes, they are primarily draft animals.

An analysis of the purposes for which horses are kept found in succeeding pages will throw light on the changes which have occurred.

NUMBER OF HORSES, 1930, 1925, AND 1920—(Excluding spring colts, 1930.)

DECREASE IN FARM HORSES AND MULES, 1920–30

The decrease of 6,313,696 in the number of farm horses and mules between 1920 and 1930 took place at a fairly constant rate. By 1925, as indicated by the census of that year, the important difference in the trend of horses and mules was clearly defined. That census showed a material increase in the number of all mules, which at that time had reached the highest point recorded by any census. After 1925 the trend of horses and mules was similar. But owing to differences in average age and mortality rate and other factors, the percentage of decreases in mules as shown by the 1930 census was very much less than that in horses. Certain factors affect all work animals in the same way, but it is apparent that there is a closer relationship between horses and automobiles than between mules and automobiles.

TABLE 1.—HORSES AND MULES ON FARMS, 1930 AND 1920, WITH PER CENT OF DECREASE, BY DIVISIONS AND STATES

[Decreases in italics]

DIVISION OR STATE	HORSES ON FARMS APR. 1, 1930					HORSES ON FARMS JAN. 1, 1920			
	All horses	Colts born between Jan. 1 and Apr. 1, 1930	Colts born in 1929	Colts born in 1928	Horses born before 1928	All horses	Horse colts under 1 year of age	Horse colts 1 year old and under 2 years of age	Horses 2 years old and over
United States	13,510,839	127,265	494,762	462,512	12,426,300	19,767,161	1,198,236	1,333,480	17,220,900
GEOGRAPHIC DIVISIONS:									
New England	182,069	578	1,158	1,433	178,900	305,045	6,670	5,739	292,636
Middle Atlantic	671,468	2,537	8,090	8,625	652,216	1,114,758	27,779	29,734	1,057,245
East North Central	2,687,804	16,890	73,278	69,537	2,528,099	4,113,650	173,546	223,892	3,716,212
West North Central	5,152,267	42,239	206,231	193,405	4,710,392	6,942,499	476,314	565,879	5,900,306
South Atlantic	603,726	5,201	14,487	12,438	571,600	1,039,043	34,319	41,892	962,832
East South Central	590,847	7,296	15,066	12,734	555,751	1,045,677	53,775	46,624	945,278
West South Central	1,523,849	23,058	49,515	43,520	1,407,756	2,160,487	133,044	136,312	1,891,131
Mountain	1,511,466	22,559	104,770	99,046	1,285,091	2,075,655	231,542	217,144	1,612,424
Pacific	587,343	6,907	22,167	21,774	536,495	970,347	61,247	66,264	842,836
NEW ENGLAND:									
Maine	60,958	131	263	369	60,195	94,350	1,732	1,894	90,724
New Hampshire	20,101	62	109	124	19,806	38,194	851	649	36,694
Vermont	52,279	126	596	666	50,891	77,231	2,250	2,272	72,709
Massachusetts	24,797	139	115	173	24,370	50,605	1,111	529	48,965
Rhode Island	3,199	35	21	36	3,107	6,540	129	63	6,348
Connecticut	20,735	85	54	65	20,531	38,125	597	332	37,196
MIDDLE ATLANTIC:									
New York	320,460	1,029	3,615	3,948	311,868	536,171	12,952	12,890	510,329
New Jersey	39,269	169	214	315	38,571	72,621	954	791	70,876
Pennsylvania	311,739	1,339	4,261	4,362	301,777	505,966	13,873	16,053	476,040
E. NORTH CENTRAL:									
Ohio	494,947	3,217	13,169	11,929	466,632	810,692	29,265	39,415	742,012
Indiana	443,411	3,753	12,965	12,664	414,029	717,233	31,915	39,090	646,228
Illinois	820,850	6,978	27,137	25,484	761,251	1,296,852	71,008	89,926	1,135,918
Michigan	382,660	1,303	7,584	6,824	366,949	605,509	17,526	24,170	563,813
Wisconsin	545,936	1,639	12,423	12,636	519,238	683,364	23,832	31,291	628,241
W. NORTH CENTRAL:									
Minnesota	805,093	3,449	25,991	25,094	750,559	932,794	46,587	60,272	825,935
Iowa	1,047,527	7,048	42,618	40,521	957,340	1,386,522	79,547	108,176	1,198,799
Missouri	597,090	5,525	20,972	17,943	552,650	906,220	55,805	62,824	787,591
North Dakota	612,058	3,616	23,646	23,935	560,861	855,682	69,250	73,422	713,010
South Dakota	621,343	7,413	36,214	34,165	543,551	817,058	73,100	82,158	661,800
Nebraska	754,296	6,982	27,606	25,635	694,073	961,396	70,075	82,149	809,172
Kansas	714,860	8,206	29,184	26,112	651,358	1,082,827	81,950	96,878	903,999
SOUTH ATLANTIC:									
Delaware	17,833	167	325	316	17,025	27,752	660	931	26,161
Maryland	94,099	1,083	2,700	2,490	87,826	141,341	5,094	6,898	129,349
District of Columbia	144	----	----	2	142	311	1	----	310
Virginia	203,174	2,278	6,596	5,385	188,915	312,465	12,962	16,417	283,086
West Virginia	112,638	694	3,177	2,667	106,100	169,148	6,331	8,579	154,238
North Carolina	86,716	339	698	625	85,054	171,436	3,487	3,139	164,810
South Carolina	30,497	128	218	211	29,940	77,517	1,876	1,941	73,700
Georgia	37,325	237	242	288	36,558	100,503	2,311	2,514	95,678
Florida	21,300	275	531	454	20,040	38,570	1,597	1,473	35,500
E. SOUTH CENTRAL:									
Kentucky	247,955	3,635	7,961	5,927	230,432	382,442	18,526	17,018	346,898
Tennessee	175,375	1,975	4,124	3,742	165,534	317,921	16,365	14,328	287,228
Alabama	64,840	594	1,093	1,044	62,109	130,462	6,370	5,161	118,931
Mississippi	102,677	1,092	1,888	2,021	97,676	214,852	12,514	10,117	192,221
W. SOUTH CENTRAL:									
Arkansas	137,747	1,112	2,449	2,200	131,986	251,926	12,808	12,246	226,872
Louisiana	118,440	2,007	3,398	3,003	110,032	178,756	10,308	9,017	159,431
Oklahoma	505,620	6,600	18,179	15,896	464,945	738,443	57,482	64,167	616,794
Texas	762,042	13,339	25,489	22,421	700,793	991,362	52,446	50,882	888,034
MOUNTAIN:									
Montana	450,264	5,738	37,760	34,063	372,703	668,723	85,513	75,731	504,141
Idaho	206,086	2,495	10,399	10,478	182,714	293,123	28,015	27,774	237,334
Wyoming	173,173	2,402	14,945	15,309	140,517	198,295	27,547	26,341	144,407
Colorado	329,344	4,307	18,245	16,538	290,254	420,704	41,429	44,146	335,129
New Mexico	141,123	3,016	8,877	8,182	121,048	182,686	15,083	16,157	151,446
Arizona	79,699	2,411	5,648	5,537	66,103	136,167	15,319	8,318	101,323
Utah	91,218	1,335	5,202	5,328	79,353	125,471	12,989	12,573	99,909
Nevada	40,559	855	3,694	3,611	32,399	50,486	5,647	6,104	38,735
PACIFIC:									
Washington	182,503	1,266	5,997	6,132	169,108	296,381	19,524	21,529	255,328
Oregon	178,875	2,650	9,654	9,678	156,893	271,559	23,464	24,393	223,702
California	225,965	2,991	6,516	5,964	210,494	402,407	18,259	20,342	363,806

TABLE 1.—HORSES AND MULES ON FARMS, 1930 AND 1920, WITH PER CENT OF DECREASE, BY DIVISIONS AND STATES—Continued

DIVISION OR STATE	MULES ON FARMS APR. 1, 1930					MULES ON FARMS JAN. 1, 1920			
	All mules	Mule colts born between Jan. 1 and Apr. 1, 1930	Mule colts born in 1929	Mule colts born in 1928	Mules born before 1928	All mules	Mule colts under 1 year of age	Mule colts 1 year old and under 2 years of age	Mules 2 years old and over
United States	5,375,017	21,067	81,376	86,969	5,185,605	5,432,391	389,279	391,418	4,651,694
GEOGRAPHIC DIVISIONS:									
New England	2,071	30	9	39	1,993	2,569	70	132	2,367
Middle Atlantic	59,997	145	293	520	59,039	68,109	2,170	4,546	61,393
East North Central	260,663	1,669	6,179	7,852	244,963	310,426	47,074	43,566	219,786
West North Central	673,349	6,092	29,772	31,054	606,431	846,948	149,893	137,742	559,313
South Atlantic	1,023,304	648	1,857	2,468	1,018,331	1,079,033	12,013	23,984	1,043,036
East South Central	1,272,295	3,471	11,936	11,840	1,245,048	1,249,721	71,252	70,004	1,108,465
West South Central	1,917,921	7,487	23,978	24,639	1,861,817	1,685,359	88,550	92,154	1,504,655
Mountain	88,880	1,014	5,445	6,138	76,283	89,341	9,862	9,981	69,498
Pacific	76,537	511	1,907	2,419	71,700	100,885	8,395	9,309	83,181
NEW ENGLAND:									
Maine	524	8	2	18	496	444	26	31	387
New Hampshire	166	1	2	1	162	248	3	18	227
Vermont	524	11	4	9	500	601	23	34	544
Massachusetts	272	6	-------	1	265	332	6	16	310
Rhode Island	67	1	-------	3	63	75	-------	5	70
Connecticut	518	3	1	7	507	869	12	28	829
MIDDLE ATLANTIC:									
New York	5,849	40	48	105	5,656	7,323	233	475	6,615
New Jersey	3,484	13	8	24	3,439	5,705	50	263	5,392
Pennsylvania	50,664	92	237	391	49,944	55,081	1,887	3,808	49,386
E. NORTH CENTRAL:									
Ohio	31,356	175	504	752	29,925	31,626	2,791	3,340	25,495
Indiana	81,988	385	1,468	1,853	78,282	100,358	14,509	13,687	72,162
Illinois	133,457	1,018	3,969	4,661	123,809	168,274	29,224	25,779	113,271
Michigan	6,528	38	107	152	6,231	5,884	290	429	5,165
Wisconsin	7,334	53	131	434	6,716	4,284	260	331	3,693
W. NORTH CENTRAL:									
Minnesota	15,218	115	420	656	14,027	10,238	1,055	1,030	8,153
Iowa	84,960	445	2,695	3,787	78,033	81,520	16,819	13,496	51,205
Missouri	295,778	2,389	11,579	10,864	270,946	389,045	68,457	65,133	255,455
North Dakota	7,782	69	316	484	6,913	7,873	808	691	6,374
South Dakota	19,168	226	1,449	1,517	15,976	15,093	1,936	2,076	11,081
Nebraska	98,973	804	4,044	4,419	89,706	99,847	15,782	14,422	69,643
Kansas	151,470	2,044	9,269	9,327	130,830	243,332	45,036	40,894	157,402
SOUTH ATLANTIC:									
Delaware	9,579	18	34	44	9,483	9,439	158	358	8,923
Maryland	29,051	78	225	249	28,499	32,621	912	1,676	30,033
District of Columbia	29	-------	-------	-------	29	32	1	1	30
Virginia	94,573	271	759	780	92,763	96,830	3,437	5,351	88,042
West Virginia	12,320	59	157	191	11,913	14,981	604	1,091	13,286
North Carolina	294,308	136	362	528	293,282	256,569	3,435	6,922	246,212
South Carolina	188,895	12	56	153	188,674	220,164	1,040	3,412	215,712
Georgia	353,633	57	220	408	352,948	406,351	2,141	4,409	399,801
Florida	40,916	17	44	115	40,740	42,046	285	764	40,997
E. SOUTH CENTRAL:									
Kentucky	252,250	1,221	4,397	3,902	242,730	292,857	23,450	23,690	245,717
Tennessee	318,567	1,410	5,565	5,503	306,089	352,510	33,217	31,354	287,939
Alabama	332,133	228	593	862	330,450	296,138	4,533	5,767	285,838
Mississippi	369,345	612	1,381	1,573	365,779	308,216	10,052	9,193	288,971
W. SOUTH CENTRAL:									
Arkansas	361,508	652	2,445	2,100	356,311	322,677	14,625	15,394	292,658
Louisiana	200,954	202	512	850	199,390	180,115	3,272	4,496	172,347
Oklahoma	315,353	2,704	9,759	9,610	293,280	336,635	35,354	36,148	265,133
Texas	1,040,106	3,929	11,262	12,079	1,012,836	845,932	35,299	36,116	774,517
MOUNTAIN:									
Montana	8,153	76	662	742	6,673	9,462	753	663	8,046
Idaho	7,236	71	336	452	6,377	7,735	1,029	779	5,927
Wyoming	4,050	71	332	468	3,179	3,415	430	457	2,528
Colorado	29,124	384	2,253	2,456	24,031	31,125	4,201	3,801	23,123
New Mexico	22,935	258	1,111	1,019	20,547	20,369	2,002	2,263	16,104
Arizona	11,310	48	224	321	10,717	11,992	515	1,049	10,428
Utah	2,906	48	220	237	2,401	2,793	570	483	1,740
Nevada	3,166	58	307	443	2,358	2,450	362	486	1,602
PACIFIC:									
Washington	22,174	106	546	787	20,735	23,091	1,878	1,664	19,549
Oregon	13,455	146	658	834	11,817	14,375	1,649	1,555	11,171
California	40,908	259	703	798	39,148	63,419	4,868	6,090	52,461

TABLE 1.—HORSES AND MULES ON FARMS, 1930 AND 1920, WITH PER CENT OF DECREASE, BY DIVISIONS AND STATES—Continued

[Decreases in italics]

DIVISION OR STATE	HORSES AND MULES ON FARMS, APR. 1, 1930					HORSES AND MULES ON FARMS, JAN. 1, 1920			
	Total number horses and mules	Horse and mule colts born between Jan. 1 and Apr. 1, 1930	Horse and mule colts born in 1929	Horse and mule colts born in 1928	Horses and mules born before 1928	Total number horses and mules	Horse and mule colts under 1 year of age	Horse and mule colts 1 year old and under 2 years of age	Horses and mules 2 years old and over
United States	18,885,856	148,332	576,138	549,481	17,611,905	25,199,552	1,587,515	1,724,898	21,872,594
GEOGRAPHIC DIVISIONS:									
New England	184,140	608	1,167	1,472	180,893	307,614	6,740	5,871	295,003
Middle Atlantic	731,465	2,682	8,383	9,145	711,255	1,182,867	29,949	34,280	1,118,638
East North Central	2,948,467	18,559	79,457	77,389	2,773,062	4,424,076	220,620	267,458	3,935,998
West North Central	5,825,616	48,331	236,003	224,459	5,316,823	7,789,447	626,207	703,621	6,459,619
South Atlantic	1,627,030	5,849	16,344	14,906	1,589,931	2,118,076	46,332	65,876	2,005,868
East South Central	1,863,142	10,767	27,002	24,574	1,800,799	2,295,398	125,027	116,628	2,053,743
West South Central	3,441,770	30,545	73,493	68,159	3,269,573	3,845,846	221,594	228,466	3,395,786
Mountain	1,600,346	23,573	110,215	105,184	1,361,374	2,164,996	241,404	227,125	1,681,922
Pacific	663,880	7,418	24,074	24,193	608,195	1,071,232	69,642	75,573	926,017
NEW ENGLAND:									
Maine	61,482	139	265	387	60,691	94,794	1,758	1,925	91,111
New Hampshire	20,267	63	111	125	19,968	38,442	854	667	36,921
Vermont	52,803	137	600	675	51,391	77,832	2,273	2,306	73,253
Massachusetts	25,069	145	115	174	24,635	50,937	1,117	545	49,275
Rhode Island	3,266	36	21	39	3,170	6,615	129	68	6,418
Connecticut	21,253	88	55	72	21,038	38,994	609	360	38,025
MIDDLE ATLANTIC:									
New York	326,309	1,069	3,663	4,053	317,524	543,494	13,185	13,365	516,944
New Jersey	42,753	182	222	339	42,010	78,326	1,004	1,054	76,268
Pennsylvania	362,403	1,431	4,498	4,753	351,721	561,047	15,760	19,861	525,426
E. NORTH CENTRAL:									
Ohio	526,303	3,392	13,673	12,681	496,557	842,318	32,056	42,755	767,507
Indiana	525,399	4,138	14,433	14,517	492,311	817,591	46,424	52,777	718,390
Illinois	954,307	7,996	31,106	30,145	885,060	1,465,126	100,232	115,705	1,249,189
Michigan	389,188	1,341	7,691	6,976	373,180	611,393	17,816	24,599	568,978
Wisconsin	553,270	1,692	12,554	13,070	525,954	687,648	24,092	31,622	631,934
W. NORTH CENTRAL:									
Minnesota	820,311	3,564	26,411	25,750	764,586	943,032	47,642	61,302	834,088
Iowa	1,132,487	7,493	45,313	44,308	1,035,373	1,468,042	96,366	121,672	1,250,004
Missouri	892,868	7,914	32,551	28,807	823,596	1,295,265	124,262	127,957	1,043,046
North Dakota	619,840	3,685	23,962	24,419	567,774	863,555	70,058	74,113	719,384
South Dakota	640,511	7,639	37,663	35,682	559,527	832,151	75,036	84,234	672,881
Nebraska	853,269	7,786	31,650	30,054	783,779	1,061,243	85,857	96,571	878,815
Kansas	866,330	10,250	38,453	35,439	782,188	1,326,159	126,986	137,772	1,061,401
SOUTH ATLANTIC:									
Delaware	27,412	185	359	360	26,508	37,191	818	1,289	35,084
Maryland	123,150	1,161	2,925	2,739	116,325	173,962	6,006	8,574	159,382
District of Columbia	173	-------	-------	2	171	343	2	1	340
Virginia	297,747	2,549	7,355	6,165	281,678	409,295	16,399	21,768	371,128
West Virginia	124,958	753	3,334	2,858	118,013	184,129	6,935	9,670	167,524
North Carolina	381,024	475	1,060	1,153	378,336	428,005	6,922	10,061	411,022
South Carolina	219,392	140	274	364	218,614	297,681	2,916	5,353	289,412
Georgia	390,958	294	462	696	389,506	506,854	4,452	6,923	495,479
Florida	62,216	292	575	569	60,780	80,616	1,882	2,237	76,497
E. SOUTH CENTRAL:									
Kentucky	500,205	4,856	12,358	9,829	473,162	675,299	41,976	40,708	592,615
Tennessee	493,942	3,385	9,689	9,245	471,623	670,431	49,582	45,682	575,167
Alabama	396,973	822	1,686	1,906	392,559	426,600	10,903	10,928	404,769
Mississippi	472,022	1,704	3,269	3,594	463,455	523,068	22,566	19,310	481,192
W. SOUTH CENTRAL:									
Arkansas	499,255	1,764	4,894	4,300	488,297	574,603	27,433	27,640	519,530
Louisiana	319,394	2,209	3,910	3,853	309,422	358,871	13,580	13,513	331,778
Oklahoma	820,973	9,304	27,938	25,506	758,225	1,075,078	92,836	100,315	881,927
Texas	1,802,148	17,268	36,751	34,500	1,713,629	1,837,294	87,745	86,998	1,662,551
MOUNTAIN:									
Montana	458,417	5,814	38,422	34,805	379,376	678,185	86,266	76,394	512,187
Idaho	213,322	2,566	10,735	10,930	189,091	300,858	29,044	28,553	243,261
Wyoming	177,223	2,473	15,277	15,777	143,696	201,710	27,977	26,798	146,935
Colorado	358,468	4,691	20,498	18,994	314,285	451,829	45,630	47,947	358,252
New Mexico	164,058	3,274	9,988	9,201	141,595	203,055	17,085	18,420	167,550
Arizona	91,009	2,459	5,872	5,858	76,820	148,159	15,834	9,367	111,751
Utah	94,124	1,383	5,422	5,565	81,754	128,264	13,559	13,056	101,649
Nevada	43,725	913	4,001	4,054	34,757	52,936	6,009	6,590	40,337
PACIFIC:									
Washington	204,677	1,372	6,543	6,919	189,843	319,472	21,402	23,193	274,877
Oregon	192,330	2,796	10,312	10,512	168,710	285,934	25,113	25,948	234,873
California	266,873	3,250	7,219	6,762	249,642	465,826	23,127	26,432	416,267

TABLE 1.—HORSES AND MULES ON FARMS, 1930 AND 1920, WITH PER CENT OF DECREASE, BY DIVISIONS AND STATES—Continued

[Decreases in italics]

DIVISION OR STATE	ACTUAL DECREASES								
	All horses	All mules	All horses and mules	Colts 1-year class			Colts, 2-year class		
				Horse	Mule	Horse and mule	Horse	Mule	Horse and mule
United States	*6,256,322*	*57,374*	*6,313,696*	*703,474*	*307,903*	*1,011,377*	*870,968*	*304,449*	*1,175,417*
GEOGRAPHIC DIVISIONS:									
New England	*122,976*	*498*	*123,474*	*5,512*	*61*	*5,573*	*4,306*	*93*	*4,399*
Middle Atlantic	*443,290*	*8,112*	*451,402*	*19,689*	*1,877*	*21,566*	*21,109*	*4,026*	*25,135*
East North Central	*1,425,846*	*49,763*	*1,475,609*	*100,268*	*40,895*	*141,163*	*154,355*	*35,714*	*190,069*
West North Central	*1,790,232*	*173,599*	*1,963,831*	*270,083*	*120,121*	*390,204*	*372,474*	*106,688*	*479,162*
South Atlantic	*435,317*	*55,729*	*491,046*	*19,832*	*10,156*	*29,988*	*29,454*	*21,516*	*50,970*
East South Central	*454,830*	*22,574*	*432,256*	*38,709*	*59,316*	*98,025*	*33,890*	*58,164*	*92,054*
West South Central	*636,638*	*232,562*	*404,076*	*83,529*	*64,572*	*148,101*	*92,792*	*67,515*	*160,307*
Mountain	*564,189*	*461*	*564,650*	*126,772*	*4,417*	*131,189*	*118,098*	*3,843*	*121,941*
Pacific	*383,004*	*24,348*	*407,352*	*39,080*	*6,488*	*45,568*	*44,490*	*6,890*	*51,380*
NEW ENGLAND:									
Maine	*33,392*	80	*33,312*	*1,469*	*24*	*1,493*	*1,525*	*13*	*1,538*
New Hampshire	*18,093*	*82*	*18,175*	*742*	*1*	*743*	*525*	*17*	*542*
Vermont	*24,952*	77	*25,029*	*1,654*	*19*	*1,673*	*1,606*	*25*	*1,631*
Massachusetts	*25,808*	*60*	*25,868*	*996*	*6*	*1,002*	*356*	*15*	*371*
Rhode Island	*3,341*	*8*	*3,349*	*108*	-------	*108*	*27*	*2*	*29*
Connecticut	*17,390*	*351*	*17,741*	*543*	*11*	*554*	*267*	*21*	*288*
MIDDLE ATLANTIC:									
New York	*215,711*	*1,474*	*217,185*	*9,337*	*185*	*9,522*	*8,942*	*370*	*9,312*
New Jersey	*33,352*	*2,221*	*35,573*	*740*	*42*	*782*	*476*	*239*	*715*
Pennsylvania	*194,227*	*4,417*	*198,644*	*9,612*	*1,650*	*11,262*	*11,691*	*3,417*	*15,108*
E. NORTH CENTRAL:									
Ohio	*315,745*	*270*	*316,015*	*16,096*	*2,287*	*18,383*	*27,486*	*2,588*	*30,074*
Indiana	*273,322*	*18,370*	*292,192*	*18,950*	*13,041*	*31,991*	*26,426*	*11,834*	*38,260*
Illinois	*476,002*	*34,817*	*510,819*	*43,871*	*25,255*	*69,126*	*64,442*	*21,118*	*85,560*
Michigan	*222,849*	644	*222,205*	*9,942*	*183*	*10,125*	*17,346*	*277*	*17,623*
Wisconsin	*137,428*	3,050	*134,378*	*11,409*	*129*	*11,538*	*18,655*	103	*18,552*
W. NORTH CENTRAL:									
Minnesota	*127,701*	4,980	*122,721*	*20,596*	*635*	*21,231*	*35,178*	*374*	*35,552*
Iowa	*338,995*	3,440	*335,555*	*36,929*	*14,124*	*51,053*	*67,655*	*9,709*	*77,364*
Missouri	*309,130*	*93,267*	*402,397*	*34,833*	*56,878*	*91,711*	*44,881*	*54,269*	*99,150*
North Dakota	*243,624*	*91*	*243,715*	*45,604*	*492*	*46,096*	*49,487*	*207*	*49,694*
South Dakota	*195,715*	4,075	*191,640*	*36,886*	*487*	*37,373*	*47,993*	*559*	*48,552*
Nebraska	*207,100*	*874*	*207,974*	*42,469*	*11,738*	*54,207*	*56,514*	*10,003*	*66,517*
Kansas	*367,967*	*91,862*	*459,829*	*52,766*	*35,767*	*88,533*	*70,766*	*31,567*	*102,333*
SOUTH ATLANTIC:									
Delaware	*9,919*	140	*9,779*	*335*	*124*	*459*	*615*	*314*	*929*
Maryland	*47,242*	*3,570*	*50,812*	*2,394*	*687*	*3,081*	*4,408*	*1,427*	*5,835*
District of Columbia	*167*	*3*	*170*	*1*	*1*	*2*	2	*1*	1
Virginia	*109,291*	*2,257*	*111,548*	*6,366*	*2,678*	*9,044*	*11,032*	*4,571*	*15,603*
West Virginia	*56,510*	*2,661*	*59,171*	*3,154*	*447*	*3,601*	*5,912*	*900*	*6,812*
North Carolina	*84,720*	*37,739*	*46,981*	*2,789*	*3,073*	*5,862*	*2,514*	*6,394*	*8,908*
South Carolina	*47,020*	*31,269*	*78,289*	*1,658*	*934*	*2,642*	*1,730*	*3,259*	*4,989*
Georgia	*63,178*	*52,718*	*115,896*	*2,069*	*1,921*	*3,990*	*2,226*	*4,001*	*6,227*
Florida	*17,270*	*1,130*	*18,400*	*1,066*	*241*	*1,307*	*1,019*	*649*	*1,668*
E. SOUTH CENTRAL:									
Kentucky	*134,487*	*40,607*	*175,094*	*10,565*	*19,053*	*29,618*	*11,091*	*19,788*	*30,879*
Tennessee	*142,546*	*33,943*	*176,489*	*12,241*	*27,652*	*39,893*	*10,586*	*26,851*	*36,437*
Alabama	*65,622*	*35,995*	*29,627*	*5,277*	*3,940*	*9,217*	*4,117*	*4,905*	*9,022*
Mississippi	*112,175*	*61,129*	*51,046*	*10,626*	*8,671*	*19,297*	*8,096*	*7,620*	*15,716*
W. SOUTH CENTRAL:									
Arkansas	*114,179*	*38,831*	*75,348*	*10,359*	*12,180*	*22,539*	*10,046*	*13,294*	*23,340*
Louisiana	*60,316*	*20,839*	*39,477*	*6,910*	*2,760*	*9,670*	*6,014*	*3,646*	*9,660*
Oklahoma	*232,323*	*21,282*	*254,105*	*39,303*	*25,595*	*64,898*	*48,271*	*26,538*	*74,809*
Texas	*229,320*	*194,174*	*35,146*	*26,957*	*24,037*	*50,994*	*28,461*	*24,037*	*52,498*
MOUNTAIN:									
Montana	*218,459*	*1,809*	*219,768*	*47,753*	*91*	*47,844*	*41,668*	*79*	*41,589*
Idaho	*87,037*	*499*	*87,536*	*17,616*	*693*	*18,309*	*17,296*	*327*	*17,623*
Wyoming	*25,122*	*635*	*24,487*	*12,602*	*98*	*12,700*	*11,032*	*11*	*11,021*
Colorado	*91,360*	*2,001*	*93,361*	*23,184*	*1,948*	*25,132*	*27,608*	*1,345*	*28,953*
New Mexico	*41,563*	*2,566*	*38,997*	*6,206*	*891*	*7,097*	*7,975*	*1,244*	*9,219*
Arizona	*56,468*	*682*	*57,150*	*9,671*	*291*	*9,962*	*2,781*	*728*	*3,509*
Utah	*34,253*	*113*	*34,140*	*7,787*	*350*	*8,137*	*7,245*	*246*	*7,491*
Nevada	*9,927*	*716*	*9,211*	*1,963*	*55*	*2,008*	*2,493*	*43*	*2,536*
PACIFIC:									
Washington	*113,878*	*917*	*114,795*	*13,527*	*1,332*	*14,859*	*15,397*	*877*	*16,274*
Oregon	*92,684*	*920*	*93,604*	*13,810*	*991*	*14,801*	*14,715*	*721*	*15,436*
California	*176,442*	*22,511*	*198,953*	*11,743*	*4,165*	*15,908*	*14,378*	*5,292*	*19,670*

TABLE 1.—HORSES AND MULES ON FARMS, 1930 AND 1920, WITH PER CENT OF DECREASE, BY DIVISIONS AND STATES—Continued

[Decreases in italics]

DIVISION OR STATE	PER CENT DECREASE [1]								
	All horses	All mules	All horses and mules	Colts, 1-year class [2]			Colts, 2-year class [2]		
				Horse	Mule	Horse and mule	Horse	Mule	Horse and mule
United States	*31.7*	*1.1*	*25.1*	*58.7*	*79.1*	*63.7*	*65.3*	*77.8*	*68.1*
GEOGRAPHIC DIVISIONS:									
New England	*40.3*	*19.4*	*40.1*	*82.6*	*87.1*	*82.7*	*75.0*	*70.5*	*74.9*
Middle Atlantic	*39.8*	*11.9*	*38.2*	*70.9*	*86.5*	*72.0*	*71.0*	*88.6*	*73.3*
East North Central	*34.7*	*16.0*	*33.4*	*57.8*	*86.9*	*64.0*	*68.9*	*82.0*	*71.1*
West North Central	*25.8*	*20.5*	*25.2*	*56.7*	*80.1*	*62.3*	*65.8*	*77.5*	*68.1*
South Atlantic	*41.9*	*5.2*	*23.2*	*57.8*	*84.5*	*64.7*	*70.3*	*89.7*	*77.4*
East South Central	*43.5*	+1.8	*18.8*	*72.0*	*83.3*	*78.4*	*72.7*	*83.1*	*78.9*
West South Central	*29.5*	+13.8	*10.5*	*62.8*	*72.9*	*66.8*	*68.1*	*73.3*	*70.2*
Mountain	*27.2*	*0.5*	*26.1*	*54.8*	*44.8*	*54.3*	*54.4*	*38.5*	*53.7*
Pacific	*39.5*	*24.1*	*38.0*	*63.8*	*77.3*	*65.4*	*67.1*	*74.0*	*68.0*
NEW ENGLAND:									
Maine	*35.4*	+18.0	*35.1*	*84.8*	*92.3*	*84.9*	*80.5*	*41.9*	*79.9*
New Hampshire	*47.4*	*33.1*	*47.3*	*87.2*	*93.3*	*87.0*	*80.9*	*94.4*	*81.3*
Vermont	*32.3*	*12.8*	*32.2*	*73.5*	*82.6*	*73.6*	*70.7*	*73.5*	*70.7*
Massachusetts	*51.0*	*18.1*	*50.8*	*89.6*	*100.0*	*89.7*	*67.3*	*93.8*	*68.1*
Rhode Island	*51.1*	*10.7*	*50.6*	*83.7*	-------	*83.7*	*42.9*	*40.0*	*42.6*
Connecticut	*45.6*	*40.4*	*45.5*	*91.0*	*91.7*	*91.0*	*80.4*	*75.0*	*80.0*
MIDDLE ATLANTIC:									
New York	*40.2*	*20.1*	*40.0*	*72.1*	*79.4*	*72.2*	*69.4*	*77.9*	*69.7*
New Jersey	*45.9*	*38.9*	*45.4*	*77.6*	*84.0*	*77.9*	*60.2*	*90.9*	*67.8*
Pennsylvania	*38.4*	*8.0*	*35.4*	*69.3*	*87.4*	*71.5*	*72.8*	*89.7*	*76.1*
EAST NORTH CENTRAL:									
Ohio	*38.9*	*0.9*	*37.5*	*55.0*	*81.9*	*57.3*	*69.7*	*77.5*	*70.3*
Indiana	*38.2*	*18.3*	*35.7*	*59.4*	*89.9*	*63.9*	*67.6*	*86.5*	*72.5*
Illinois	*36.7*	*20.7*	*34.9*	*61.8*	*86.4*	*69.0*	*71.7*	*81.9*	*73.9*
Michigan	*36.8*	+10.9	*36.3*	*56.7*	*63.1*	*56.8*	*71.8*	*64.6*	*71.6*
Wisconsin	*20.1*	+71.2	*19.5*	*47.9*	*49.6*	*47.9*	*59.6*	+31.1	*58.7*
WEST NORTH CENTRAL:									
Minnesota	*13.7*	+48.6	*13.0*	*44.2*	*60.2*	*44.6*	*58.4*	*36.3*	*58.0*
Iowa	*24.4*	+4.2	*22.9*	*46.4*	*84.0*	*53.0*	*62.5*	*71.9*	*63.6*
Missouri	*34.1*	*24.0*	*31.1*	*62.4*	*83.1*	*73.8*	*71.4*	*83.3*	*77.5*
North Dakota	*28.5*	*1.2*	*28.2*	*65.9*	*60.9*	*65.8*	*67.4*	*30.0*	*67.1*
South Dakota	*24.0*	+27.0	*23.0*	*50.5*	*25.2*	*49.8*	*58.4*	*26.9*	*57.6*
Nebraska	*21.5*	*0.9*	*19.6*	*60.6*	*74.4*	*63.1*	*68.8*	*69.4*	*68.9*
Kansas	*34.0*	*37.8*	*34.7*	*64.4*	*79.4*	*69.7*	*73.0*	*77.2*	*74.3*
SOUTH ATLANTIC:									
Delaware	*35.7*	+1.5	*26.3*	*50.8*	*78.5*	*56.1*	*66.1*	*87.7*	*72.1*
Maryland	*38.4*	*10.9*	*29.2*	*47.0*	*75.3*	*51.3*	*63.9*	*85.1*	*68.1*
District of Columbia	*58.7*	*9.4*	*49.6*	*100.0*	*100.0*	*100.0*	-------	*100.0*	+100.0
Virginia	*35.0*	*2.3*	*27.3*	*49.1*	*77.9*	*55.1*	*67.2*	*85.4*	*71.7*
West Virginia	*33.4*	*17.8*	*32.1*	*49.8*	*74.0*	*51.9*	*68.9*	*82.5*	*70.4*
North Carolina	*49.4*	+14.7	*10.9*	*80.0*	*89.5*	*84.7*	*80.1*	*92.4*	*88.5*
South Carolina	*60.7*	*14.2*	*26.3*	*88.4*	*94.6*	*90.6*	*89.1*	*95.5*	*93.2*
Georgia	*62.9*	*13.0*	*22.9*	*89.5*	*89.7*	*89.6*	*88.5*	*90.7*	*89.9*
Florida	*44.8*	*2.7*	*22.8*	*66.8*	*84.6*	*69.4*	*69.2*	*84.9*	*74.6*
EAST SOUTH CENTRAL:									
Kentucky	*35.2*	*13.9*	*25.9*	*57.0*	*81.2*	*70.6*	*65.2*	*83.5*	*75.9*
Tennessee	*44.8*	*9.6*	*26.3*	*74.8*	*83.2*	*80.5*	*73.9*	*82.4*	*79.8*
Alabama	*50.3*	+12.2	*6.9*	*82.8*	*86.9*	*84.5*	*79.8*	*85.1*	*82.6*
Mississippi	*52.2*	+19.8	*9.8*	*84.9*	*86.3*	*85.5*	*80.0*	*82.9*	*81.4*
WEST SOUTH CENTRAL:									
Arkansas	*45.3*	+12.0	*13.1*	*80.9*	*83.3*	*82.2*	*82.0*	*86.4*	*84.4*
Louisiana	*33.7*	+11.6	*11.0*	*67.0*	*84.4*	*71.2*	*66.7*	*81.1*	*71.5*
Oklahoma	*31.5*	*6.3*	*23.6*	*68.4*	*72.4*	*69.9*	*75.2*	*73.4*	*74.6*
Texas	*23.1*	+23.0	*1.9*	*51.4*	*68.1*	*58.1*	*55.9*	*66.6*	*60.3*
MOUNTAIN:									
Montana	*32.7*	*13.8*	*32.4*	*55.8*	*12.1*	*55.5*	*55.0*	+11.9	*54.4*
Idaho	*29.7*	*6.5*	*29.1*	*62.9*	*67.3*	*63.0*	*62.3*	*42.0*	*61.7*
Wyoming	*12.7*	+18.6	*12.1*	*45.7*	*22.8*	*45.4*	*41.9*	+2.4	*41.1*
Colorado	*21.7*	*6.4*	*20.7*	*56.0*	*46.4*	*55.1*	*62.5*	*35.4*	*60.4*
New Mexico	*22.8*	+12.6	*19.2*	*41.1*	*44.5*	*41.5*	*49.4*	*55.0*	*50.0*
Arizona	*41.5*	*5.7*	*38.6*	*63.1*	*56.5*	*62.9*	*33.4*	*69.4*	*37.5*
Utah	*27.3*	+4.0	*26.6*	*60.0*	*61.4*	*60.0*	*57.6*	*50.9*	*57.4*
Nevada	*19.7*	+29.2	*17.4*	*34.6*	*15.2*	*33.4*	*40.8*	*8.8*	*38.5*
PACIFIC:									
Washington	*38.4*	*4.0*	*35.9*	*69.3*	*70.9*	*69.4*	*71.5*	*52.7*	*70.2*
Oregon	*34.1*	*6.4*	*32.7*	*58.9*	*60.1*	*58.9*	*60.3*	*46.4*	*59.5*
California	*43.8*	*35.5*	*42.7*	*64.3*	*85.6*	*68.8*	*70.7*	*86.9*	*74.4*

[1] A plus sign (+) denotes increase.
[2] See text.

The net difference in the trend during the decade may be brought out by the percentage of decreases which amounted to 31.7 per cent for horses and only 1.1 per cent for mules. The rapidly changing situation is further brought out by the decreases in horse and mule colts. For all practical purposes the effective birth or breeding rate is indicated by the ratio of colts of each class to the total number of animals. In colts of the 1-year class this ratio decreased 58.7 per cent as compared with 31.7 per cent decrease in all horses from 1920 to 1930. For mules, it decreased 79.1 per cent compared with a decrease of 1.1 per cent in all mules. In the 2-year class, horse colts decreased 65.3 per cent compared with 31.7 per cent for all horses, and mule colts decreased 77.8 per cent compared with 1.1 per cent for all mules. For numerous reasons, such as infant mortality of colts, no accurate deductions can be made from difference in numbers of colts of the 1 and 2-year classes, but the relationship of either or both of these classes of colts to the total emphasizes the tremendous decline in breeding rate.

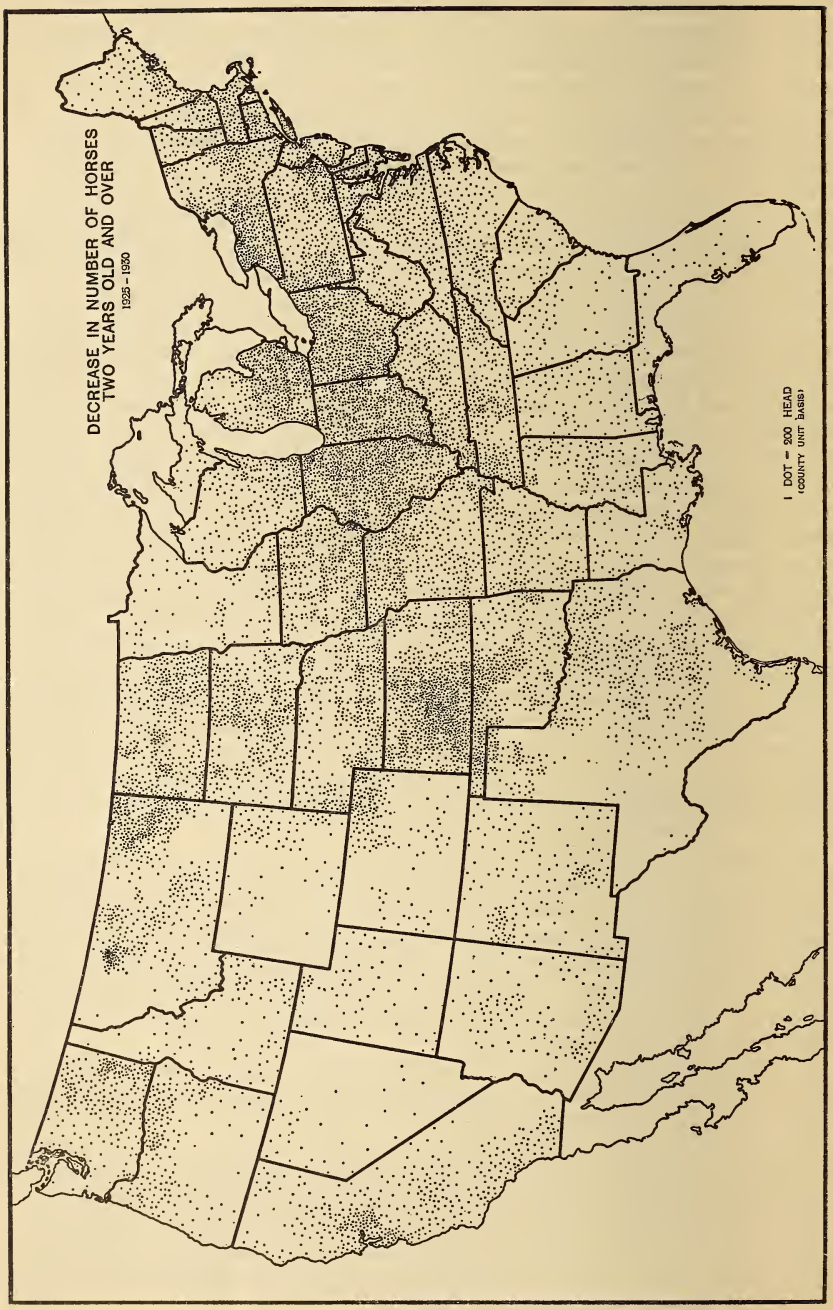
The New England division, taken as a whole, showed the greatest percentage decreases in the total number of horses and mules and colts of the 1-year class. The Middle Atlantic States had the next most important decreases in total numbers, and also showed very heavy decreases in colts. The Pacific division was third but the breeding rate was somewhat higher than in other divisions. The West North Central and the Mountain divisions showed the smallest decline in horses and breeding rate, but the cotton States showed the smallest decline in the total number of horses and mules due to the influence of mules, which made heavy increases in the West South Central States. A rather large number of States showed increases in mules but no State recorded any increases in horses, and every State without exception showed a heavy decline in the breeding rate, ranging from 34.6 per cent in Nevada to 91 per cent in Connecticut. (Ratio of colts of the 1-year class.) In mules the range was from 12.1 per cent in Montana to 100 per cent, or the entire absence of production of mules, in Massachusetts. Attention is called to the significant decrease in the raising of mules in the States of Missouri, Kentucky, and Tennessee, where a large part of the mules were formerly raised. It may be said that the Mountain States are now the only States which even begin to approximate the production of colts necessary to offset the mortality rate. In most of the other States the number is less than half of the number required for replacement.

A glance at the accompanying map illustrating the decrease in farm horses (2 years old and over, period 1925–1930) will show that the areas where the heaviest declines have occurred, include portions of the New England States, New York, Pennsylvania, New Jersey, and Maryland, the East and West North Central States, Oklahoma, the eastern parts of Montana and Colorado and the grain areas of Oregon and Washington. Attention is directed particularly to the central portion of Kansas which probably illustrates decreases due to combines or harvester threshers.

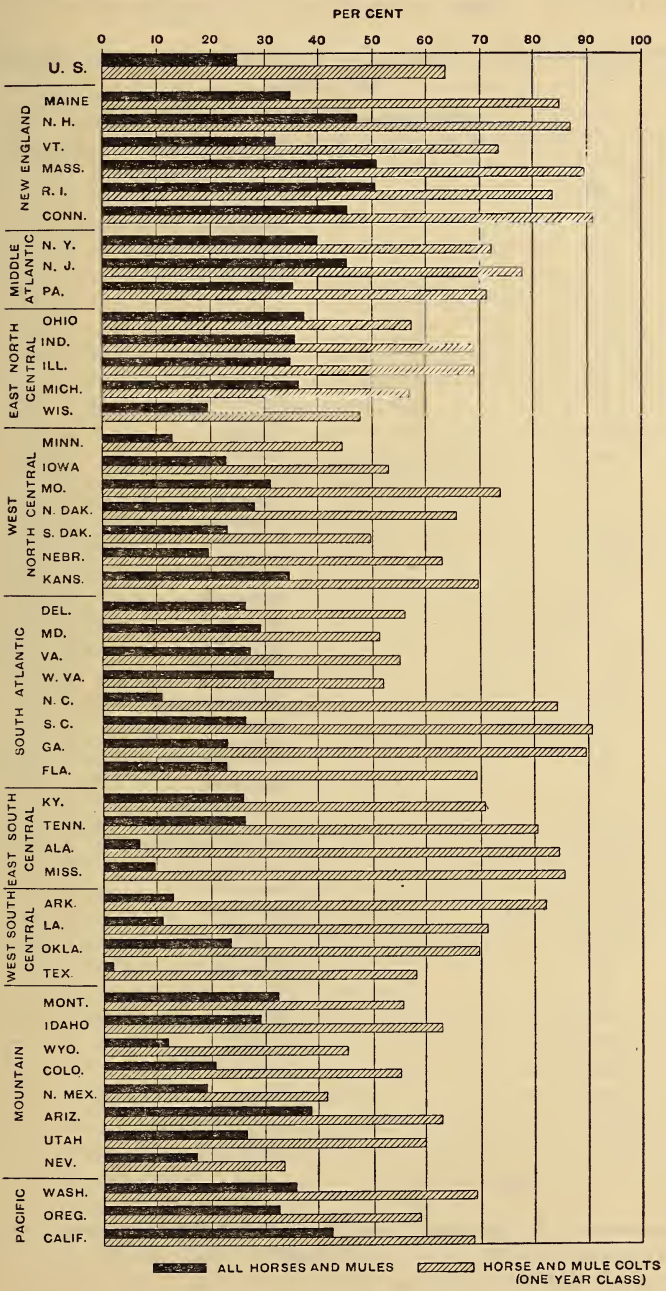
It is suggested that this map be compared with the map showing tractors on farms to give a fair idea of the relationship of the horse decreases and the area of greatest use of such machines.

Two very important phases of the problem are presented by the two graphs on adjoining pages and tables following. One shows the difference between the horse and the mule situation at the time of the census, the other shows the difference between the decrease in total numbers contrasted with the breeding rates in 1920 and 1930, as illustrated by colts of the 1-year class (3 to 15 months in 1930, under 1 year in 1920). For the 2-year class, 15 to 27 months, see discussion of birth and mortality rates for explanations.

130056—33——3

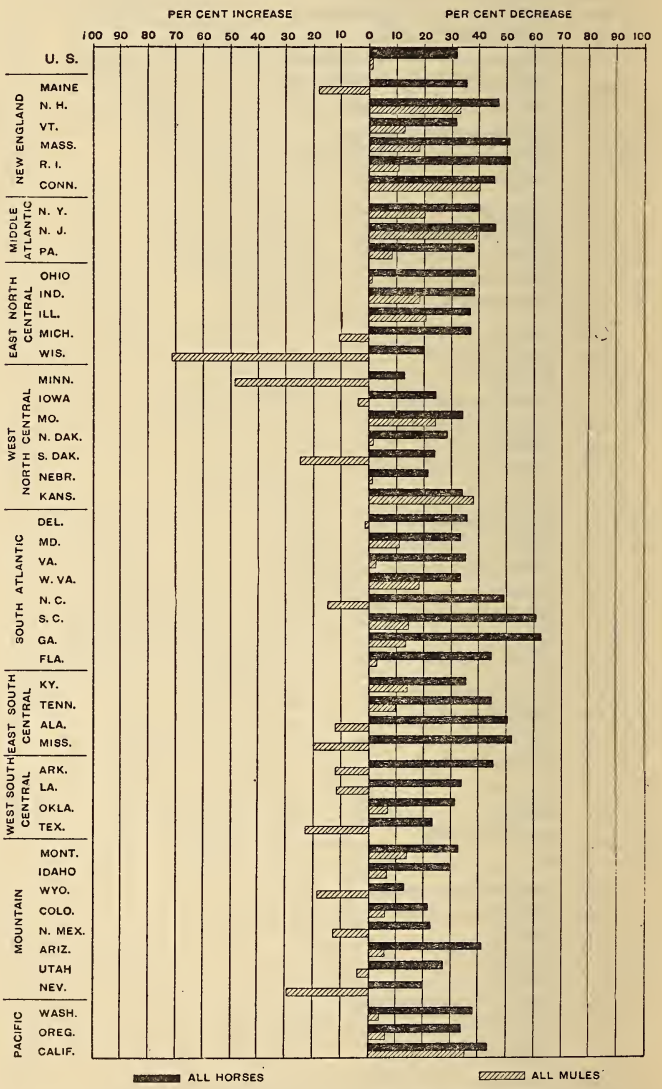

DECREASE IN NUMBER OF HORSES
TWO YEARS OLD AND OVER
1925 - 1930
1 DOT = 200 HEAD
(COUNTY UNIT BASIS)

PER CENT DECREASE OF ALL FARM HORSES AND MULES, AND OF HORSE AND MULE COLTS (1-YEAR CLASS), BY STATES: 1920–1930



The chart that illustrates the different trends of horses and mules in the last decade, will bring out clearly the essential difference between horses which are used for all purposes, and mules which are almost universally beasts of burden, and also which have not been much affected by the use of heavy machinery on

PER CENT INCREASE OR DECREASE OF ALL FARM HORSES AND MULES, BY STATES: 1920–1930



the farms, because of their use in the Cotton Belt where 1-horse plows predominate. In connection with other data, especially birth rate of mules, it indicates a similar trend to that now being followed by horses. These graphs and the data may be interpreted to show that the mule situation is duplicating what has occurred in horses but following it in point of time, i. e., first an increase in

the cities, then an increase in the country, followed by a decrease in the cities and next a decrease on the farms.

THE USES OF FARM HORSES

The popular conception of the farm horse is that of a general purpose animal. Many farm horses doubtless serve several of the purposes for which a horse may be kept: (*a*) Transportation, (*b*) traction, (*c*) power, (*d*) pleasure, (*e*) racing, (*f*) breeding, and in the end may be sent to slaughter. In the analysis of the uses of the farm horse attention is usually given to the problems of farm work, principally plowing and cultivation. Examination of the statistics, however, particularly in attempting to trace the effect of automobiles, seems to indicate that transportation equals or exceeds traction in importance. In the past, in addition to regular farm work, the average farm horse was used to draw loads to market or for a buggy or saddle horse, as necessity required. Even the heavy draft and racing stock often served these purposes. In a similar way mules, which are essentially work stock, were used as buggy or saddle animals.

Although many farmers were not able to keep horses solely for riding or driving, it is apparent that there were a rather large number of family horses which were kept principally for those purposes, and have now been displaced by the automobile. This is evident in the decrease in the acreage of crop land harvested per work animal in territory where there are few tractors.

The changes in the numbers of registered horse of various breeds, particularly the serious decrease in the number of light coach horses and standard-bred trotters, also indicate that the driving horse has been largely replaced. Keeping horses for pleasure is so closely connected with utility purposes, racing, and breeding, that it is rather difficult to separate them and analyze the situation. It is highly significant, however, that the registered Arabian and American saddlers have increased, while all other registered horses have declined in numbers. While the increase in these animals may be because of their use in breeding and in improving range and light farm horses, on the other hand it may be that increase in the numbers of these animals is principally due to their use for pleasure and has little to do with utilitarian purposes.

In past years there were many farms that derived some of their cash income from raising horses and mules. The number of such farms has apparently diminished materially. Also at one time a large proportion of the farms outside the cotton belt produced colts occasionally and most farm mares were also brood mares. At the high point recorded by the census of 1910, there were over 2,000,000 horse and mule colts under 1 year old and 2,000,000 colts 2 years old on farms. There are now approximately only one-fourth that number, 576,000 colts of the 1-year class being reported in 1930.

Horses raised for racing are included in the farm-horse statistics. While they are not thought of as such, they are of considerable importance especially in the range area where they are used for improving the stock. Abandonment of many of the racing establishments has resulted in the decrease of horses on farms although this is not important numerically. The change in racing stock is of interest from a farm standpoint principally as it relates to the quality and breeding of light farm animals. The number of race horses on the farm is important only in such States as Maryland, Tennessee, and Kentucky.

Horses for slaughter have become important in the last few years. In the East they are mostly worn-out work animals, in the West they are range stock, including wild horses. At the high point in 1930 there were 138,827 animals slaughtered in Federally inspected plants. Information from other than census sources indicates that an additional number were killed for fertilizer and glue in

plants not Federally inspected. A large part of horses killed in such plants were believed to be wild range horses. In such cases they would not be included in census farm statistics. If they were owned or branded stock, however, it would materially affect the disappearance rate.

HORSES SLAUGHTERED UNDER FEDERAL MEAT INSPECTION

1932	64,165
1931	118,001
1930	138,827
1929	128,881

The slaughter of horses on farms has become of considerable importance. The animals killed furnish meat for feeding animals or fowls on large-scale poultry farms and fur farms. The census schedule did not call for horses slaughtered on farms although it did call for other animals slaughtered. The enumerators often voluntarily reported the number of horses slaughtered, particularly where rather a large number of horse hides were recorded, adding a note to explain how and why the animals were killed. About 58,000 horse and mule hides were sold from farms. Some of these hides doubtless came from animals which died of natural causes, but in numerous cases the number of hides was the same as the number of animals slaughtered. In some cases the number of animals slaughtered was much in excess of the number of hides sold. The total number of horses slaughtered on farms and at packing plants, therefore, was probably not under 200,000 and in the peak year may have been considerably more than that number. The importance of this item can be realized when compared with the number of colts which represented the current horse replacement figure. The number of colts born in 1929 was between five and six hundred thousand, so that as a minimum, the number slaughtered has reached at least one-third of the number born annually. It is very possible the slaughter is much in excess of the proportion mentioned.

Because of the advancing price of horses and the exhaustion of the supply of city horses, there has been a marked decrease in slaughter recently.

AVAILABLE CENSUS STATISTICS

The census figures of 1930 and previous census years form a rather adequate basis for the study of the farm horse. 1. There are the statistics on numbers of the horses and mules by age groups, with the number of farms reporting each age group. 2. There are statistics of registered purebred horses by sex, which furnish valuable indication of trend in type as well as numbers. Because many of the principal States breeding farm horses require registration of stallions, excellent checks can be made and the trend determined by accurate State data. Furthermore the number of colts can be calculated and the number compared with the census data. Most of the stallions are registered purebreds, only a very small percentage of half-breeds or common stallions being allowed to breed by various State authorities. By computing the breeding ratio of the stallions an idea can be secured of the number of colts and potential horse supply in the coming four years. 3. The census presents the figures needed for computing the changes in total farm animal units and the various feeding requirements and the acreages of crops and pasture required. 4. The statistics of all crops are very complete and in most cases sufficiently comparable, so that the increases and decreases of the various crops can be determined. 5. The numbers of automobiles, trucks, and tractors with the number of farms reporting are available, also data on the inventory value of farm machinery and the amount spent for such machinery

during 1929. These data are very helpful in the study of the causes of decreases in horses and in determining the average amount of farm power. 6. In following the trend of farm population the census figures are very complete and helpful in addition to special inquiry on the movement of the farm population to and from cities on the General Farm Schedule of 1930. 7. Prices on all commodities were secured by the Census and the Department of Agriculture in cooperation.

In addition to the census data, statistics compiled by other Government agencies such as the Bureau of Foreign and Domestic Commerce, the United States Department of Agriculture, and the State agricultural departments, and also the results secured by research workers, have been used where helpful in describing and clarifying the subject. It has not been possible to publish in this bulletin all the basic data which are used. Very complete and detailed statistics are published in Volume IV of the Fifteenth Census Reports on Agriculture. The separate chapters on Livestock on Farms and Livestock Products, Individual Crops and Farms and Farm Property contain practically all the data which are used; or if individual county data are desired they can be secured from State census bulletins of which there are three series, the first containing major crops and livestock, the second, minor crops, sheep, goats, and livestock products, and the third, selected statistics by type of farm. In most respects the census figures of 1930 are very closely comparable with those of previous census years. One difficulty is presented by changes in the enumeration date. The difficulty is not of great consequence in the case of horses since the age groups are fairly comparable as will be explained in discussing births, mortality, and average age.

UNKNOWN FACTORS IN STATISTICS

It is apparent from the study of statistics of farm horses and mules that some unknown factors enter into the situation, and that the attempt to gage the extent of influencing factors has not been successful. Otherwise it would be possible, from census statistics of 1910, 1920, 1925, and 1930, to compute the mortality and birth rate with sufficient accuracy so that a forecast of the horse population for the next 5 or 10 years could be made which would be practically exact. This is true of supporting statistics, particularly those of the Department of Agriculture and the State assessor's records, and those of horse-breeding associations. Such a forecast would be particularly valuable at this time on account of the changing conditions and because independent investigators believe that a material decrease in the number of horses and mules is at hand due to the large proportion of horses and mules in the old-age class. Among the unknown factors which have upset past calculations are:

1.—City horses and mules.
2.—Horses and mules of American Expeditionary Forces not included in export figures.
3.—Farm slaughter.
4.—(*a*) Inclusion of wild horses in the statistics of animals slaughtered in inspected packing plants.
(*b*) Inclusion or exclusion of horses on the range, on the border line between wild and tame horses; whether or not they have been branded.
5.—Minor difficulties in the census returns.
(*a*) Because of the common use of the term "horse colts" to apply to males and "mare colts" to females, there appears to have been some tendency to report under the designation, "horse colts," on the census schedule only male colts, although the term "horse colts" is used by the census to cover colts of both sexes and to distinguish them from mule colts.

An extremely small proportion of such errors, if they exist, might upset calculations on birth or mortality rates, as mortality rates are based not on reported deaths but on net disappearance plus births.

(*b*) Because of the position on the schedule of the heading "Horses and mules, April 1, 1930," there may have been a tendency to report both horse and mule colts on the first line below instead of just horse colts as intended; or even a tendency to report all horses and mules on that line. If a sufficient number of such entries occurred, it would, of course, secure a higher number of horse colts than should be the case and a smaller number of mules or mule colts. Comparison with other statistics seems to indicate that this might have been the case. However, the fact that the production of mules in 1930 seems to have reached a similar turning point to that reached by horses slightly prior to 1920 might account for the unexpectedly small number of mules and mule colts.

(*c*) There may have been other misplaced entries such as figures in the wrong block or section of the schedules.

(*d*) Probability that some horses escaped enumeration.

(*e*) Horses and mules in transit are likely to be omitted.

(*f*) Infant mortality of horses and mules.

The difficulties introduced by city horses and mules are very serious. In the first place the change in their numbers has been at a different rate from the change in the number of farm horses and mules. Second, the change occurred much in advance of the change in farm horses and mules. Third, there has been a decrease from 3,453,160 city horses and mules in 1910 to probably not over a few hundred thousand in 1930. This means that in 20 years the farmers have been relieved of the necessity of producing 3,500,000 colts as a minimum, and raising crops each year needed to feed that number of animals, which would require approximately 17,000,000 acres. Fourth, the furnishing of these million animals to the city has upset the numerical proportions of the horses and mules of each age on farms, so that there are no satisfactory data showing the age distribution of farm horse population. Fifth, the age of city horses materially differs from that of farm horses, because few colts are raised in the city. Moreover city horses are usually purchased at the beginning of actual working life, 4 or 5 years old, and they are worn out quickly on city pavements, and either die or in a short span of years are returned to the farm, sore footed or stove up. These doubtless represent a very high percentage of the total number of city horses. Sixth, there has been a change in the relative numbers of saddle and driving animals in cities. It is likely most of the driving horses have disappeared and that a large proportion of those that remain are either saddle, racing horses or draft animals. Seventh, as the only satisfactory method of determining mortality is from the net increases or decreases of the total number of horses and mules on farms, a similar figure must be computed for all horses and mules with a correction made to allow for the city factor. This correction raises the average mortality rate of all farm horses for the period 1920–1930 from 8.02 to 8.44, and of all horses and mules from 7.18 to 7.50.

The killing of horses for animal food on poultry and fur farms apparently has reached considerable proportions in recent years, but its extent is problematic and it is therefore not considered in computing the birth or mortality figures other than as its effects show in the net disappearance.

Wild horses introduced complications which are interesting but probably not of great numerical significance. The number of horses slaughtered is, however, a factor of considerable importance since there are well over 100,000 animals

slaughtered annually. The difficulty arises from the fact that in the West, there is no way of telling whether the animals slaughtered were owned range horses, such as were enumerated by the census, or wild mustangs rounded up to kill, which were not enumerated.

Wild horses further affect statistics of birth rate, age, mortality, and net change when material numbers are caught and branded. There is no way of ascertaining the number of such horses from census data and no authentic figures from any other source. The number of wild horses is unknown, estimates ranging from a few thousand to several hundred thousand. As a potential source of supply, and the basis for breeding light saddle or farm horses, they are of sufficient importance to merit consideration.

TABLE 2.—RATIO OF COLTS TO ALL HORSES AND MULES ON FARMS, BY DIVISIONS AND STATES: 1930 AND 1920

DIVISION OR STATE	RATIO OF COLTS TO ALL HORSES				RATIO OF HORSE AND MULE COLTS TO ALL HORSES AND MULES			
	1-year class		2-year class		1-year class		2-year class	
	1930 (born in 1929)	1920 (born in 1919)	1930 (born in 1928)	1920 (born in 1918)	1930 (born in 1929)	1920 (born in 1919)	1930 (born in 1928)	1920 (born in 1918)
United States	3.66	6.06	3.42	6.74	3.05	6.30	2.91	6.84
GEOGRAPHIC DIVISIONS:								
New England	0.64	2.19	0.79	1.88	0.63	2.19	0.80	1.91
Middle Atlantic	1.20	2.49	1.28	2.67	1.15	2.53	1.25	2.90
East North Central	2.73	4.22	2.59	5.44	2.69	4.99	2.62	6.04
West North Central	4.00	6.86	3.75	8.15	4.05	8.04	3.85	9.03
South Atlantic	2.40	3.30	2.06	4.03	1.00	2.19	0.92	3.11
East South Central	2.55	5.14	2.16	4.46	1.45	5.45	1.32	5.08
West South Central	3.25	6.16	2.86	6.31	2.14	5.76	1.98	5.94
Mountain	6.93	11.16	6.55	10.46	6.89	11.20	6.57	10.49
Pacific	3.77	6.31	3.71	6.83	3.63	6.50	3.64	7.05
NEW ENGLAND:								
Maine	0.43	1.84	0.61	2.01	0.43	1.85	0.63	2.03
New Hampshire	0.54	2.23	0.62	1.70	0.55	2.22	0.62	1.74
Vermont	1.14	2.91	1.27	2.94	1.14	2.92	1.28	2.96
Massachusetts	0.46	2.20	0.70	1.05	0.46	2.19	0.69	1.07
Rhode Island	0.66	1.97	1.13	0.96	0.64	1.95	1.19	1.03
Connecticut	0.26	1.57	0.31	0.87	0.26	1.56	0.34	0.92
MIDDLE ATLANTIC:								
New York	1.13	2.42	1.23	2.40	1.12	2.43	1.24	2.46
New Jersey	0.54	1.31	0.80	1.09	0.52	1.28	0.79	1.35
Pennsylvania	1.37	2.74	1.40	3.17	1.24	2.81	1.31	3.54
EAST NORTH CENTRAL:								
Ohio	2.66	3.61	2.41	4.86	2.60	3.81	2.41	5.08
Indiana	2.92	4.45	2.86	5.45	2.75	5.68	2.76	6.46
Illinois	3.31	5.48	3.10	6.93	3.26	6.84	3.16	7.90
Michigan	1.98	2.89	1.78	3.99	1.98	2.91	1.79	4.02
Wisconsin	2.28	3.49	2.31	4.58	2.27	3.50	2.36	4.60
WEST NORTH CENTRAL:								
Minnesota	3.23	4.99	3.12	6.46	3.22	5.05	3.14	6.50
Iowa	4.07	5.74	3.87	7.80	4.00	6.56	3.91	8.29
Missouri	3.51	6.16	3.01	6.93	3.65	9.59	3.23	9.88
North Dakota	3.86	8.09	3.91	8.58	3.87	8.11	3.94	8.58
South Dakota	5.83	8.95	5.50	10.06	5.88	9.02	5.57	10.12
Nebraska	3.66	7.29	3.40	8.54	3.71	8.09	3.52	9.10
Kansas	4.08	7.57	3.65	8.95	4.44	9.58	4.09	10.39
SOUTH ATLANTIC:								
Delaware	1.82	2.38	1.77	3.35	1.31	2.20	1.31	3.47
Maryland	2.87	3.60	2.65	4.88	2.38	3.45	2.22	4.93
District of Columbia	----	0.32	1.39	----	----	0.58	1.16	0.29
Virginia	3.25	4.15	2.65	5.25	2.47	4.01	2.07	5.32
West Virginia	2.82	3.74	2.37	5.07	2.67	3.77	2.29	5.25
North Carolina	0.80	2.03	0.72	1.83	0.28	1.62	0.30	2.35
South Carolina	0.71	2.42	0.69	2.50	0.12	0.98	0.17	1.80
Georgia	0.65	2.30	0.77	2.50	0.12	0.88	0.18	1.37
Florida	2.49	4.14	2.13	3.82	0.92	2.33	0.91	2.77
EAST SOUTH CENTRAL:								
Kentucky	3.21	4.84	2.39	4.45	2.47	6.22	1.96	6.03
Tennessee	2.35	5.15	2.13	4.51	1.96	7.40	1.87	6.81
Alabama	1.69	4.88	1.61	3.96	0.42	2.56	0.48	2.56
Mississippi	1.84	5.82	1.97	4.71	0.69	4.31	0.76	3.69

TABLE 2.—RATIO OF COLTS TO ALL HORSES AND MULES ON FARMS, BY DIVISIONS AND STATES: 1930 AND 1920—Continued

DIVISION OR STATE	RATIO OF COLTS TO ALL HORSES				RATIO OF HORSE AND MULE COLTS TO ALL HORSES AND MULES			
	1-year class		2-year class		1-year class		2-year class	
	1930 (born in 1929)	1920 (born in 1919)	1930 (born in 1928)	1920 (born in 1918)	1930 (born in 1929)	1920 (born in 1919)	1930 (born in 1928)	1920 (born in 1918)
WEST SOUTH CENTRAL:								
Arkansas	1.78	5.08	1.60	4.86	0.98	4.77	0.86	4.81
Louisiana	2.87	5.77	2.54	5.04	1.22	3.78	1.21	3.77
Oklahoma	3.60	7.78	3.14	8.69	3.40	8.64	3.11	9.33
Texas	3.34	5.29	2.94	5.13	2.04	4.78	1.91	4.74
MOUNTAIN:								
Montana	8.39	12.79	7.57	11.32	8.38	12.72	7.59	11.26
Idaho	5.05	9.56	5.08	9.48	5.03	9.65	5.12	9.49
Wyoming	8.63	13.89	8.84	13.28	8.62	13.87	8.90	13.29
Colorado	5.54	9.85	5.02	10.49	5.72	10.10	5.30	10.61
New Mexico	6.29	8.26	5.80	8.84	6.09	8.41	5.61	9.07
Arizona	7.09	11.25	6.95	6.11	6.45	10.69	6.44	6.32
Utah	5.70	10.35	5.84	10.02	5.76	10.57	5.91	10.18
Nevada	9.11	11.19	8.90	12.09	9.15	11.35	9.27	12.45
PACIFIC:								
Washington	3.29	6.59	3.36	7.26	3.20	6.70	3.38	7.26
Oregon	5.40	8.64	5.41	8.98	5.36	8.78	5.47	9.07
California	2.88	4.54	2.64	5.06	2.71	4.96	2.53	5.67

BIRTH AND MORTALITY

Fairly accurate birth ratios can be worked out from census data based on the ratio of colts of various age classes to all horses, to all horses and mules, to brood mares, etc. Entirely adequate mortality figures are not available, but reasonably satisfactory figures can be computed from the census data for the United States, although the State and geographic division figures will not be of sufficient accuracy because of the interstate movement and sales.

One of the age classes, colts born since January 1, 1930, somewhat disturbed comparisons with 1920 when colts under 1 year of age were enumerated. However, this is not as serious as it at first appears, as a fair basis for seasonal computation is presented by the 1910 census which occurred April 15. In the next age group, the "1-year class" represents one calendar year's production. Theoretically, the difference between colts of the "1-year class" in 1920 and in 1930 is represented by the unknown number of colts of that class that died between January 1 and April 1. In other words if we could add to the 1929 colts as enumerated in 1930 the number that died between January 1 and April 1, 1930, or subtract from the 1919 colts as enumerated in 1920 the number that died between January 1 and April 1, 1920, we would have numbers that were exactly comparable. A still closer comparison can be made for the next age group, i. e., colts born in 1928, 15 to 27 months with the group 1 to 2 years old, comprising colts born in 1918. There should be practically no difference in the mortality ratio in these two ages as the two groups represent the second calendar year preceding the census. Similar figures are available for both horses and mules.

Both mortality and birth rate percentages are necessary to determine the net yearly loss or failure of replacement (i. e., the amount by which the births fail to

equal the deaths). The percentage shown is the ratio of horse and mule colts of one calendar year's production to all horses and mules on farms. A similar figure is worked out for horses alone. A figure for all horse and mule colts is necessary for the reason that all colts must be considered in order to get a complete picture of the situation. The difference between the ratio of horse colts alone in the other index will indicate the influence of the mule colts. The production of the calendar year preceding the census is used to avoid the difficulty introduced by inclusion of colts born between January 1 and April 1. A comparison between 1920 and 1930 as regards the mortality of colts in the 2-year class should be fairly correct as it represents the period for which the mortality should be practically the same, although there is a difference of three months in the age of colts in this class in 1919 and in 1929. A ratio calculated on the basis of colts to all other horses and mules might be better in some respects, but comparisons are lacking for certain calendar years. A ratio calculated upon the number of colts compared to the number of mares would also be of considerable interest. It would indicate the breeding rate and would reflect the difficulty introduced by mule colts. Ratio of the colts in the 2-year class to all horses and mules, in some ways would be the most acceptable figure because it would give indication of the net effective replacement, as the period of high colt mortality had passed. While all of the ratios indicated have theoretical objections and can not be considered as a true birth rate index, each of them may, in varying measure, form the basis of calculating the birth rate and of computing net yearly deficiencies.

Inasmuch as nearly all of the city horses are produced on farms, to obtain a true index it would be necessary to include the city horses, particularly as the net disappearance must take into consideration the disappearance of city horses and as that change would affect the mortality figure. Ratios calculated on farm animals alone, for example, was 3.05 (all horses and mules in the 1-year class, to all horses and mules). The ratio calculated with the inclusion of city horses and mules was 3.02.

The table showing the change in birth rates by divisions indicates very clearly that the peak of breeding in the United States was reached about 1910 when the ratios (effective birth rate) of colts of the 1-year class, to all horses and mules, was 8.51, which had declined to 3.05 in 1930 or on horses alone from 8.73 to 3.66. It is of interest to note that only two of the geographic divisions had a birth rate above 4 per cent, the West North Central and Mountain divisions, and these were producing only about half the rate that they were breeding in 1920. Mortality rate: For the United States it is possible to derive a fairly satisfactory mortality rate. The net disappearance, i. e., the number of animals in 1930 subtracted from the number in 1920 represents a balance of all the horses that have died in excess of the replacements represented by births, therefore the number born plus the deficiency represented by the net disappearance would be equal to the mortality. To compute the mortality rate per year, therefore, the average birth rate in the period 1920 to 1930 is added to the net disappearance rate. This results in a mortality rate of 7.18 per hundred for farm horses and mules. As previously mentioned, the city horses must be included to get a fair idea of the total. Following the same method the mortality rate for all horses and mules in the United States was 7.50 per hundred. The importation and exportation of horses and mules in the United States, which would theoretically affect the totals, has ceased to be of much importance since 1920.

TABLE 3.—RATIO OF COLTS 1-YEAR CLASS TO ALL HORSES AND MULES ON FARMS, 1900 TO 1930, BY GEOGRAPHIC DIVISIONS

GEORGRAPHIC DIVISION	HORSE COLTS TO ALL HORSES				HORSE AND MULE COLTS TO ALL HORSES				HORSE AND MULE COLTS TO ALL HORSES AND MULES			
	1930	1920	1910	1900	1930	1920	1910	1900	1930	1920	1910	1900
United States	3.66	6.06	8.73	7.20	4.26	8.03	10.31	8.46	3.05	6.30	8.51	7.18
New England	.64	2.19	2.81	1.90	.64	2.21	2.83	1.96	.63	2.19	2.81	1.95
Middle Atlantic	1.20	2.49	4.74	3.84	1.24	2.69	4.86	3.94	1.15	2.53	4.66	3.81
East North Central	2.73	4.22	8.44	6.81	2.96	5.36	9.14	7.37	2.69	4.99	8.64	7.01
West North Central	4.00	6.86	9.80	7.82	4.58	9.02	11.48	9.14	4.05	8.04	10.38	8.49
South Atlantic	2.40	3.30	6.88	5.28	2.71	4.46	7.80	6.14	1.00	2.19	4.66	4.05
East South Central	2.55	5.14	8.10	6.42	4.57	11.96	13.22	11.28	1.45	5.45	7.04	6.57
West South Central	3.25	6.16	8.16	7.72	4.82	10.26	11.66	10.14	2.14	5.76	7.53	7.14
Mountain	6.93	11.16	11.63	11.79	7.29	11.63	12.15	12.10	6.89	11.20	11.75	11.86
Pacific	3.77	6.31	9.73	7.50	4.10	7.18	10.55	8.19	3.63	6.50	9.68	7.45

It would be highly desirable to compute separate mortality figures for each division and State. Owing, however, to the very heavy movement between States, the net disappearance figure for divisions and States prevent accurate computation of satisfactory mortality rates and also prevent the computation of the net deficiency by divisions and States, although for the United States the net deficiency is accurately and easily obtained by subtraction. If for purposes of obtaining a rough approximation the birth-rate figure is deducted from the mortality figure, rather interesting deficiency figures occur for the various divisions, running from 0.29 in the Mountain division to 6.55 in the New England division. This method of using a United States mortality figure rather than an actual State mortality figure has been used by independent statisticians and is probably sufficiently accurate for a rough idea of the situation. Mortality figures computed by other statisticians, however, are considerably less than those indicated by the census figures. Table No. 1 shows the number of animals of each class with helpful percentage computations.

THE AVERAGE AGE OF HORSES

One of the most important phases of the horse situation is the average age of horses or the number of horses of each age group. It is obvious that if the average age of horses has increased that the mortality rate would be higher and that if there was any considerable change in the proportion of each age it would make a material difference in the number of animals that die each year. If the number of farm horses were not influenced by unforeseen factors, it would be possible by taking the number of colts born each year and computing the mortality for those colts, to determine the number of survivals at the end of any given period. Because of the fact that we have age groups at the 1920, 1925, and 1930 censuses, it is possible to make adjustments in each age group, based on the average change during five years and upon the age relationship of the various colt-age groups. If such computation, based upon accurate figures and the mortality rate, is sufficiently accurate, the total number of horses at the end of a given period could be computed by adding together each age group. Even though the computations have a material proportion of error they will be harmonious within themselves; that is, the relationship of the numbers in succeeding years will be practically correct. To put it in other words, if there be an error of 5 per cent in calculating the number of horses at the end of a 10-year period, the error between any 2 years would only be one-half of 1 per cent and the proportion of any age group born of the total (with a check at the end of each 5-year period) would

probably approximate, with considerable exactness, percentage of each age group constituted or the total number of animals.

A computation, based upon the proportion of horses of each age in 1925, was made by the Department of Agriculture from the records of selected individual farmers. Such supporting data are of very great benefit in checking the computations and age groups, but subject to numerous difficulties because of the variation, particularly in the age groups of horses on farms where they have had the best attention, from those of the average farm. Naturally the horses reported in such inquiry live to a greater age than those on the average farm where the care was probably not as good. It is to be further noted that computations based upon such age groups, with the proportion of horses over 9.7 years old higher than usual, appear to forecast a rapid diminution in numbers and an early period at which the horse situation may become acute. This method of computing the mortality of colts born in each year and the survivals in the end of any specified period also has the advantage of indicating what will happen to the horse population in the next three or four years, inasmuch as it is not possible to produce horses of working age in less than four years, and that rapid changes from year to year are very difficult to make, and few such are on record. Rapid changes in numbers are difficult to bring about because in many of the main horse-raising States breeding stallions are limited to purebreds which must be registered and inspected by the State. The one unknown factor would be the difference in the mortality per year for the coming years, which does not ordinarily vary greatly in the United States as a whole, although in the range district it might vary sufficiently so that the United States mortality percentage might be perceptibly affected. Deductions drawn from the average age or from the decrease in the number of colts indicate that a further very material decrease will occur in the total number of horses in the very near future, and that it will be greater than the average yearly decrease which has occurred in the past. This prospective decrease should be considered in connection with the present reported increase since 1930 in the number of farm population. (This is computed as about a million and a half to December 31, 1932, by the Department of Agriculture.) It theoretically would require at least 400,000 if they used horses at the same rate as the remainder of the farm population. It should also be considered in connection with cumulative surpluses in the present economic situation and its remedy.

The average age of farm horses worked out on this basis for 1930 was 9.67 and for horses and mules in the United States 9.52. This will illustrate the necessity of including mules with horses in any discussion of the horse situation. It also shows how mules have prevented a more acute shortage in the number of work animals in the past.

Of the two graphs previously presented one is designed to show the difference in the rate of decreases of horses and that of mules and the territory where a net increase of mules occurred during the decade. It also shows clearly the territory where mules have not followed the general trend of work animals. The other graph is intended to bring out the decreases in all horses and mules compared with the tremendous decreases in colts of the 1-year class which, of course, reflects a great decrease in the birth rate. It is intended to emphasize the fact that, while the decrease in absolute numbers has been very important, the tremendous decrease in the number of horse and mule colts born is much more serious and indicates a very material decrease during the next four years in the United States as a whole and a decided shortage in farm power unless it be supplied by machinery.

Owing to the time it takes to produce marketable work horses, the situation can not be remedied quickly.

REGISTERED PUREBRED HORSES

Registered purebred horses on farms declined from 120,540 in 1920 to 67,378 in 1930. The number of farms reporting decreased in even greater proportion, from 48,125 to 23,535. The most striking feature, however, of the decline was that of stallions from 45,704 to 18,125. This indication of decrease is of special interest because in many of the States breeding males must be inspected and must also be purebred. It offers additional evidence and support of the deductions drawn from the decrease in colts compared with the decrease in all horses. It must be noted that registered animals not on farms or ranges are not included and that registered or purebred city horses may considerably affect conclusions drawn from the figures on registered farm stock. Of all registered horses only American Saddle, Arabian, and Thoroughbreds show increases.

TABLE 4.—REGISTERED PUREBRED HORSES ON FARMS [1] IN THE UNITED STATES—CLASSIFIED BY BREED AND SEX: 1930 AND 1920

BREED	NUMBER OF REGISTERED PUREBRED HORSES					
	Total		Males		Females	
	1930 (Apr. 1)	1920 (Jan. 1)	1930 (Apr. 1)	1920 (Jan. 1)	1930 (Apr. 1)	1920 (Jan. 1)
Registered purebred horses (all breeds)	**67,378**	**120,540**	**18,125**	**45,704**	**49,253**	**74,836**
American Saddle	2,443	1,459	498	400	1,945	1,059
Arabian [2]	315		105		210	
Belgian	8,841	10,838	3,362	5,077	5,479	5,761
Cleveland Bay [2]	18		17		1	
Clydesdale	1,454	4,248	359	1,488	1,095	2,760
French Coach [2]	19		15		4	
French Draft [3]		2,964		1,187		1,777
German Coach	37	697	10	417	27	280
Hackney	245	564	56	173	189	391
Morgan [2]	763		279		484	
Percheron [3]	33,033	70,613	9,178	27,669	23,855	42,944
Shetland ponies [2]	451		112		339	
Shire	1,506	5,617	550	2,632	956	2,985
Standardbred	2,334	4,021	409	1,055	1,925	2,966
Suffolk Punch [2]	235		73		162	
Thoroughbred	10,953	3,801	1,892	694	9,061	3,107
Other and unspecified breeds [4]	4,731	15,718	1,210	4,912	3,521	10,806

[1] The number of farms reporting registered purebred horses in 1930 was 23,535 and in 1920 was 48,125.
[2] Figures for 1920 not available; included with "Other and unspecified breeds."
[3] French Draft included with Percheron in 1930.
[4] Figures include Welsh horses.

In heavy breeds, such as Percherons and Belgians, material declines are noted. Special attention is invited to the fact that Percheron males decreased from 27,669 to 9,178 and Belgians in like manner but not to such a great degree. Percherons still remain the most numerous of the heavy, draft animals. The number of lighter breeds of horses, of the type of French and German Coach, is so small as to be negligible. There are about half as many Standardbred trotters as in 1920.

Facts brought out by the new census figures are corroborated by State figures such as those of Iowa which show decreases yearly to as late a date as January, 1932.

CHANGES IN TYPES OF HORSES

With the introduction of the tractor considerable numbers of heavy, farm draft horses of a high type were disposed of to the city trade. Horses remaining on farms were often of the lighter type of saddle, draft, or general-purpose types,

differing considerably from the horses sold. For several years, moreover, there have been shipments of the lighter types of western horses into the main breeding States. While these horses are suitable for many purposes they do not form a good basis for breeding of heavy types of farm horses, particularly in those areas where Percheron and Belgian draft breeds predominate. This factor doubtless contributes in no small measure to the decrease in the number of colts in the farm-breeding area of the Mid-Western States, particularly Iowa, Missouri, and Nebraska. The lighter-type animals, however, are suitable for raising the lighter type of cotton mules, but that such breeding is not general may be seen from the very material decrease in mule colts. Perhaps the most important changes in type are indicated by the changes in numbers of registered breeding animals of the lighter type, i. e., coach horses, hackneys, Cleveland Bay, Morgans, etc. The breeding of trotting and saddle horses still continues although the Standardbred trotters are much fewer in number. This type of breeding is not carried on very generally by farmers, but rather by specialists and horse breeders. The rearing of saddle horses, as indicated by the association records, appears to have held its own. The slight change in numbers of this type of horses in the range areas is worthy of note. Even in that section the replacement rate is less than the mortality. What influence the inferior or lighter weight animals will have upon the future supply of horses is rather difficult to forecast, but the increasing proportion of such animals offers a handicap to the production of a satisfactory grade and number of heavy, draft animals.

EXPORTS AND IMPORTS OF HORSES AND MULES

Because our basic figures of birth rate and mortality are derived from computations which included the net disappearance recorded in each census, imports and exports must be taken into account.

In the past decade the number of exports or imports yearly has been so small as to be scarcely worthy of mention, particularly as they tend to offset. Between 1910 and 1920, however, approximately a million horses were exported and over 300,000 mules, the total value of both being $600,000,000. The animals were in the prime of life and consequently acted as a drain on the horse population, leaving an undue proportion of older animals which survived beyond 1920 and influenced the mortality rate during the past decade.

The further results were to somewhat obscure and somewhat palliate the effects of machines on the horse industry. Breeding was relatively profitable until the slump came in prices when there was a heavy drop corresponding to the price drop. From the slump in breeding there has been no important recovery. However, the large number of colts and young horses on hand in 1920 made available ample work stock for many years. The survivors of these colts, however, are now 15 years old, and full effects of the drop in breeding are now about to be felt. At present only a few thousand horses are exported, principally to Canada, Cuba, and Mexico. As for mules, Mexico is the only country to receive any number.

Imports of horses (aside from improvement of stock) have never been of any moment. The peak was reached in 1914 when 33,000 were purchased, of which 25,000 came from Mexico. In 1930 the imports were down to about 3,200.

One interesting feature of the table appended is the fact that many more mules have been exported than horses since 1922 and that the number, although small, is now great enough to constitute an appreciable percentage of the number produced each year. For example, the number exported in 1929 was 12,126, while the number of mule colts born, as reported to the census, was 81,376.

This shift and the reason for it merit the attention of breeders of horses and mules, particularly in view of the short production of mules.

TABLE 5.—UNITED STATES EXPORTS AND IMPORTS OF HORSES AND MULES,[1] 1910 TO 1931

YEAR ENDED JUNE 30	EXPORTS		IMPORTS	YEAR ENDED JUNE 30	EXPORTS		IMPORTS
	Horses	Mules	Horses		Horses	Mules	Horses
Total 1910-1920	1,178,673	381,348	108,196	Total 1920-1930	131,735	146,903	31,948
1910	28,910	4,512	10,965	1920	18,952	8,991	4,906
1911	25,145	6,585	8,161	1921	12,638	6,770	4,044
1912	34,828	4,901	5,505	1922	17,827	11,241	3,136
1913	28,707	4,744	7,312	1923	8,641	12,719	2,816
1914	22,776	4,883	28,276	1924	11,693	16,170	2,458
1915	289,340	65,788	11,226	1925	10,879	18,169	2,142
1916	357,553	111,915	14,588	1926	15,245	18,833	2,762
1917	278,674	136,689	12,719	1927	10,016	19,722	2,579
1918	84,765	28,879	5,410	1928	18,255	18,993	3,286
1919	27,975	12,452	4,034	1929	7,589	15,295	3,819
				1930	5,472	12,126	3,183
				1931	3,061	3,667	1,942

[1] Source: Bureau of Foreign and Domestic Commerce; Imports of mules not available.

THE WORLD HORSE SITUATION AND POTENTIAL SOURCES OF SUPPLY

The world horse situation is of interest to us principally as it indicates a source of supply in case of shortage or in studying the reaction to the introduction of the automobile, tractor and improved heavy machinery similar to the reaction that has occurred in the United States. Exclusive of Russia, a material decrease occurred in the last five years, but not equal in proportion to that occurring in the United States. In Australia and New Zealand the readjustment appears to be taking place similar to that in this country. A like tendency is noted in England and Scotland.

In Canada and Mexico, which offer a potential source of supply in case of shortage in this country, no great changes have been recorded in the period from 1926 to 1930. (Recent authentic Mexican statistics are not available.) It is probable, in case of necessity, that a considerable number of light horses could be imported which would be suitable for saddle or for light cultivation in the cotton belt, or for breeding cotton mules. The maximum number which has ever been imported from Mexico is 25,000. It does not appear that the Mexican horses would immediately help the situation in case of local shortage.

The importations from Canada have never greatly exceeded 6,000 and the potential supply from that source appears to be very limited. In South America, Argentina could probably supply a large number of lighter horses in case of necessity. Argentina is one of the countries which have made material increase to the period ending in 1930.

Countries of Europe, outside of Russia, appear to need all their horses although Belgium and France could doubtless furnish a considerable number of high class breeding animals in case there should be a revival of horse raising. A summary of this situation does not show any convenient source of supply and it is apparent that this country will find it expedient to raise its own horses or to utilize power to supply any deficiency which may occur in the near future.

VALUE OF HORSES AND MULES

No story of the farm horse would be complete without the discussion of values. The accompanying table presents two series of values, those recorded at the various census years and those estimated by the Department of Agriculture. It will be noted that there is a very slight difference in the two figures, so slight an amount as to be scarcely worth noting. The Department of Agriculture data is appended in order to show exactly comparable figures up to the time this was written, and in order that the census price indexes may be converted and compared on the same basis to price index of all farm commodities, 1910 to 1913. The figures for December, 1932, and January, 1933, were also included in order that a picture of the horse situation at the present moment may be secured. We believe this is important for several reasons; first, because the price index of horses, 40.9, appears to be lower than any other farm commodity except grain, index 33 (all farm commodities, index 50); second, because it indicates the very great potential opportunities offered farmers and horse breeders, if our analysis of the horse situation be correct. In other words, horses and mules are about the cheapest of any farm product and they offer the greatest opportunity for profit. January 1, 1932, horses were the cheapest they had been since the beginning of the century, but a very slight reaction was visible January, 1933, and a still further advance was recorded in the February price received by producers.

TABLE 6.—AVERAGE VALUE OF FARM HORSES AND MULES WITH COMPARISONS AND SELECTED PRICE INDEX NUMBERS: 1910 TO 1933

	CENSUS		UNITED STATES DEPARTMENT OF AGRICULTURE						
	Average value per head	Price index based on 1910 prices	Average value animals on hand, Jan. 1	Price index based on Jan. 1, 1910 price	Price received by producers on Jan. 15	Price index based on Jan. 15, 1910–1913 Average [1]	Price received by producers on Dec. 15	Price index based on Dec. 15, 1910–1913 Average [1]	Price index of all farm commodities based on August 1909–January 1914 average
HORSES									
1910	$105.06	100.0	$108.03	100.0	$140	100.7	$141	102.9	103
1920	90.15	85.8	96.48	89.3	118	84.9	97	70.8	205
1930	67.51	64.3	69.86	64.7	77	55.4	64	46.7	117
1931			60.42	55.9	65	46.8	56	40.9	80
1932			53.37	49.4	56	40.3	56	40.9	57
1933 [2]			54.15	50.1	59	42.4			51
MULES									
1910	124.80	100.0	120.20	100.0					103
1920	143.45	114.9	148.25	123.3					205
1930	82.60	66.2	83.76	69.7	93	60.4	74	48.7	117
1931			69.19	57.6	74	48.0	63	41.4	80
1932			60.64	50.4	63	40.9	61	40.1	57
1933			60.31	50.2	63	40.9			51

[1] Horses: $139, January; $137, December. Mules: $154, January; $152, December (supplied on basis of spread between horse and mule prices).

[2] Price received by producer on Feb. 15, was $62. Price index 43.1 based on Feb. 15, 1910–1913 average.

If the value of horses of different ages be analyzed it will be found that colts under 1 year and colts from 1 to 2 years on January 1, 1932, were relatively the cheapest they have ever been in the past 20 years. For example, in 1919 the value of year-old colts was 42.6 per cent of the average value of all horses, while in 1932 it had declined to around 36 per cent. The 2-year-old class had declined from 67.2 per cent to 56.1 per cent.

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The price index for mules was 40.1 compared with 40.9 for horses. The index, however, was computed by supplying the spread between horse and mule figures, as the official index did not reach back to 1914. The aggregate value of horses declined from $1,782,077,487 to about $905,881,187 between 1920 and 1930 and that of mules from about $779,294,411 to about $442,766,112. This represents the net decrease in the inventory value of these two classes of stock of about $1,212,724,599. This huge sum constitutes about 6 per cent of the decline in farm property since 1920. The same considerations that affected horses affect mules in a similar manner. There was usually a spread of not over $16 in the price of farm horses and farm mules as returned to the Department of Agriculture. This spread narrowed in recent years, which indicates that the index price of mules is lower relatively than that of horses. Owing to the fact that the cash purchases of mules in the South is much in excess of that of horses, the opportunities for raising mules at a profit logically would be much superior to that of horses, except perhaps for the fact that the mule shortage has not reached such an advanced stage as the horse shortage at this writing.

In using the figures from this price index, however, one very essential factor must be considered which somewhat tends to modify the conclusions which might be drawn from a price index based on all farm horses. This factor is the influence of age upon value. The relative proportion of animals of various ages has been previously discussed. It will be noted that an undue proportion of horses and mules are now of excessive age. They also appear to be of maximum value at about 6 years of age. If this be considered 100 per cent at 6 years of age, the relative value at other ages would be materially less. A table of approximation on this basis follows:

INFLUENCE OF AGE ON VALUE OF WORK HORSES [1]

AGE	Per cent of maximum value	AGE	Per cent of maximum value	AGE	Per cent of maximum value
Birth	16	6 years	99	11 years	76
6 months	25	Maximum	100	12 years	70
1 year	38	7 years	99	13 years	62
2 years	57	8 years	96	14 years	55
3 years	74	9 years	91	15 years	48
4 years	88	10 years	84	16 years	40
5 years	97				

[1] Professional Bulletin No. 413, United States Department of Agriculture, office of the Secretary. By J. C. McDowell, agriculturist, office of Farm Management.

Many reasons can be advanced why the value of horses is low in relation to other farm products, including other livestock. Some of them throw very important light upon the horse situation. First is the surplus of power caused by introduction of automobiles and tractors, etc. Second, the surplus colts raised for city markets and for which there was no market after the coming of automobiles. Third, other farm commodities depend upon city demand and follow city purchasing power, but horses are dependent on farm demand and all agricultural products and purchasing power are low in proportion to city purchasing power. Fourth, it takes about three years after birth to produce horses ready for market, but other stock can be readily marketed almost anywhere at from a few months upward. Fifth, regular work mares are used in breeding colts and time is lost in busy season. Sixth, horses need more grain than cattle, sheep, etc., which can make most of their gain on pasture, corn fodder, and other waste, and so cost less per pound to raise than horses. Seventh, horses founder when

overfed, other animals seldom have such trouble. Eighth, psychological effect of introduction of automobile, heavy machinery, etc., on farmers' idea of horse situation. Ninth, it was cheaper to buy horses than to raise them until the price of grain dropped recently. Grain price index did not fall below 100 per cent until 1930. In January, 1933, it had fallen to 34.

Colts are low in relation to all horses and the price index has fallen constantly for a number of years. All reasons which resulted in damaging price of horses were accentuated in the case of colts. As long as the index of all farm commodities was relatively higher than that of horses the unprofitability of raising horses was reflected in the young animals. A change of importance in the situation would affect the prices of horses. Grain being, at this writing, the only commodity relatively cheaper than horses (grain 34, horses 40.9), it would appear profitable to utilize grain in raising horses, provided any market for horses appears probable.

The long expected reaction and the public realization of the horse situation appear in the horse and colt price index figures, which show an upward trend in the latest published figures (February 15).

Mule colts, as distinguished from horse colts, appear to have been relatively dearer. However, a base figure for 1914 for mules and mule colts is not available. A figure was supplied to compute the index (allowing for the spread between horse and mule on inventory figures and later "prices received by farmers"). It appears to be substantially correct.

To produce mule colts is considerably more trouble than to produce horses but the mule colts are easier to raise. Also the regular southern market for mules adds to the more favorable outlook for the future.

CHAPTER II.—HORSES AND MULES IN RELATIONSHIP TO TYPE OF FARM

The number of work animals by type of farm throws considerable light upon the general situation and acreage released by decreases in work animals. The basic data appear in Table 7. The terms used to describe the various type farms are self explanatory in most cases, and are based upon the value of products from a particular source in relation to the value of products from all sources. Products used on the farm itself are not included except those for family consumption. The classification was determined on the basis of 40 per cent or more of the total value of all products coming from that particular source.

The distinction between ranches and animal-specialty farms lies in the ratio of pasture land to crop land, the stock-ranch being one where emphasis is placed upon livestock for grazing while the animal-specialty farms place the emphasis upon feeding. Abnormal farms are those which do not conform to the usual understanding of what constitutes a farm.

It is evident that there is a close relationship between the type of farm and the number of work animals. The number of work animals per farm, crop land harvested, the average crop land harvested per work animal, and the per cent of farms that report work animals, each has considerable bearing on the problem. Slightly less than 80 per cent of all farms reported work animals on hand, the percentage being higher for animal-specialty, general farms and stock-ranches, in the order named, and lowest for fruit farms and abnormal farms.

Of the abnormal and unclassified farms only 53.1 per cent reported work animals. This percentage varied from 32.3 per cent in the Pacific division to 66.6 per cent in the West South Central division. The increasing number of part-time farms a very low proportion of which report horses and mules has considerable bearing on the horse situation in the United States, particularly in explaining the decrease in driving horses brought about by the automobile. The census data was analyzed intensively by type of farm for the first time in 1930 and therefore there are no closely comparable statistics available for earlier censuses. It is to be further noted in connection with the use of the automobile and the horse that about one-third of all farmers spent approximately one-third of their working days at work away from the farm. This, to a large extent, was made possible by the great distance that can be covered by the automobile in a short time, and this greater speed and range of the motor car, to a large extent explains the very material decrease in driving and general purpose farm horses which has taken place since 1920. A summary of the important facts indicated by the study of work animals by type is as follows:

General farms.—Of general farms 89.8 per cent reported work animals on hand in April with an average of 3.5 per farm for those farms which reported work animals. The average acreage for crop land harvested was 18.5. This was slightly below the average for other types but it must be noted that the general average of all types was very greatly affected by the high average acreage per animal of cash-grain farms.

Cash-grain farms.—A consideration of the factors involved in the operation of cash-grain farms is of especial importance in studying the present and future trend of the number of work animals. In the first place the average number of work animals on cash-grain farms was 5.5, a figure higher than for any other type of farm except the stock-ranch, and higher than any other type of farm where

draft animals as distinguished from other types of horses and mules, were involved. The average number of animals on cash-grain farms reporting work animals was 6.3. The average crop land harvested per cash-grain farm was 202.4 acres, which is much in excess of that for any other type of farm. It is further to be noted that out of about 359,000,000 acres of crop land harvested, 92,000,000, or more than 25 per cent, were in cash-grain farms, although such farms constituted only 7.2 per cent of all farms. In other words, in case of shortage of horses and mules, a relatively small number of horses could handle a very much larger percentage of crop acreage, in this type than in any other type, and this fact suggests a minor reason for the increase in cash-grain acreages which are occurring and have occurred. Another way of stating it would be to say that one-seventh of the work animals in the United States are on cash-grain farms and handle one-fourth of the crop acreage. Another feature of the situation is that this large number of work animals per farm indicates that the use of tractors would be relatively economical in displacement of horses by tractors. Tractors could be very readily used on cash-grain farms whereas on other type farms the average number of work animals is usually too small to warrant the general purchase of tractors, and their profitable use is therefore mostly confined to the larger farms of other types. It is of further significance that the average number of work animals per cash-grain farm is 5.5, corresponding almost exactly with the average equivalent *horse duty* per tractor for the United States as computed from entirely independent sources. Further discussion of the point will be found in the chapter dealing with tractors, trucks and their equivalent horse replacement, and in dealing with the wheat surplus in study of acreage release, by replacement of horses.

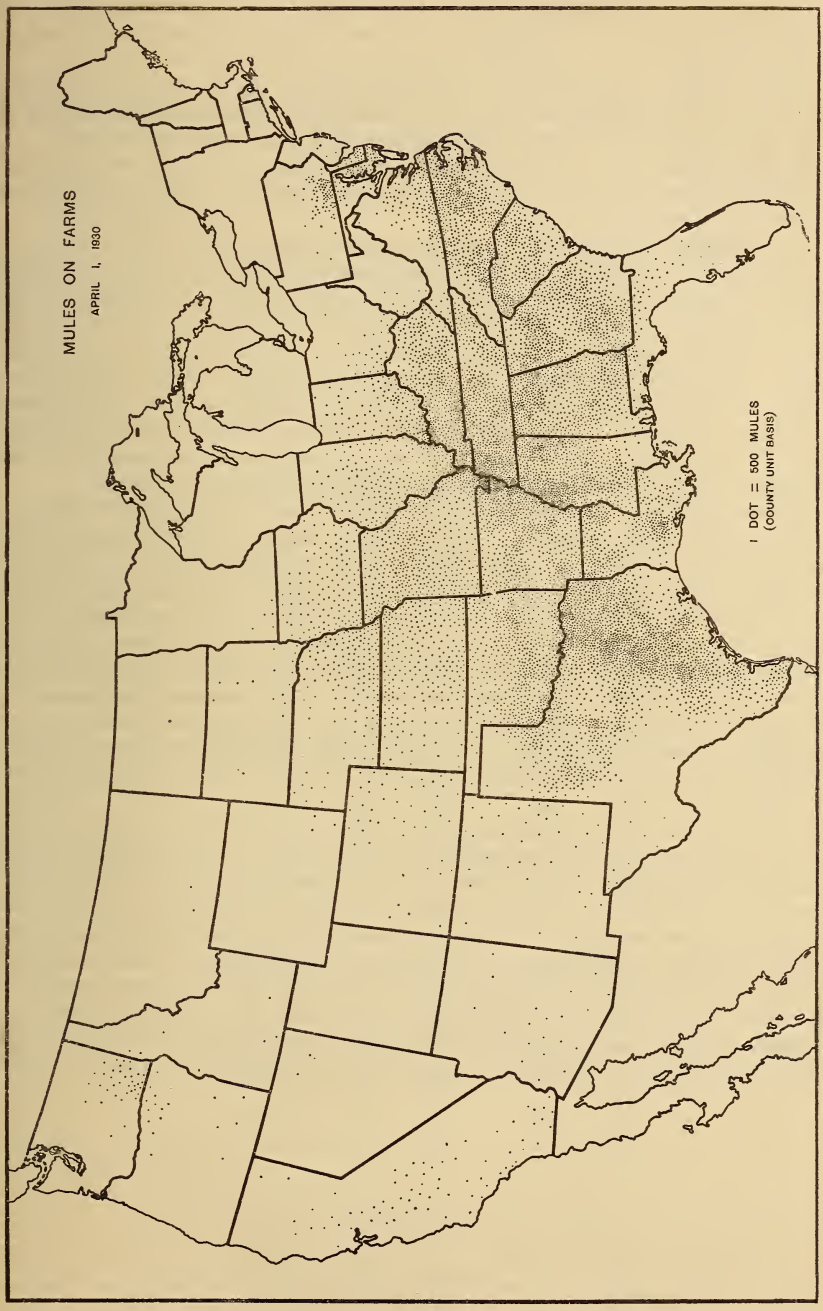
Cotton farms.—One million six hundred forty thousand and twenty-five cotton farms have been reported with an average of 2.6 work animals for all farms which report them. It is to be noted that only 80.6 per cent of all cotton farms reported work animals. This is probably due to the fact that work animals on plantations are often kept in a stockade and reported with animals on the home farm. The average acreage of crop land harvested per work animal on cotton farms was 18.0. The close relation of mules and cotton farms will appear from accompanying map. Note how much more dense the mule population is in the cotton belt. Cotton is produced on a 1-unit basis and its acreage expanded from 1920 to 1930, requiring more mules. Hence the difference in trend between horses and mules, and between the situation in the cotton belt and the remainder of the United States.

Crop-specialty farms.—Since a large number of divergent crops are grown, a general discussion would be of little value. The principal crop of which a surplus is grown is tobacco. Tobacco farms are rather small and require a large amount of hand labor as distinguished from horse labor.

Fruit farms.—Only slightly over half of the fruit farms report horses and mules and a relatively large acreage per work animal is recorded for this type. This bears out the observation that very large numbers of tractors and improved machinery are used upon fruit farms. This is particularly true of the Pacific division where only 42.8 per cent of the fruit farms report work animals.

Truck farms.—Truck farms are relatively unimportant in so far as the work animal is concerned. The introduction of small garden tractors is now effecting some replacement of horses.

Dairy farms.—Dairy farms closely approach the average in the number of farms reporting work animals and the average acreage of crop land harvested. From the standpoint of the horse and mule situation, dairy farms are important as they still contribute to the use of horses and mules in the delivery of milk, and as they have a very important bearing on the number of trucks used on farms. Although no exact data are obtainable on this feature of the situation, observation seems to indicate that a large portion of farm trucks are used on dairy farms.


MULES ON FARMS
APRIL 1, 1930
1 DOT = 500 MULES
(COUNTY UNIT BASIS)

Animal-specialty farms.—Logically animal-specialty farms should have a relatively high number of horses. This is borne out by statistics which show them to rank third in the average number of horses and mules per farm. Horses on animal-specialty farms would necessarily include a reasonable proportion of saddle and general purpose animals which are necessary in handling stock.

Stock ranches.—The large number of horses and mules reported on stock ranches is to be expected both from the necessity for horses in handling cattle and from the availability of pasture for keeping saddle stock or raising horses.

Poultry farms.—Poultry farms resemble dairy farms in the use of trucks but differ from them in the low crop acreage per work animal. Many poultry farms do not raise their feed but buy it.

Self-sufficing farms.—These small farms are important chiefly from the standpoint of family subsistence and not as regards the production of any commercial crop. They have a relatively small acreage, small number of animals per farm, small acreage of crop land harvested, and only 73.7 per cent reported horses. Many of the self-sufficing farms do not warrant the owning of a horse for farm work. Of these the influence of the automobile or truck is of note on that portion which are owned by comparatively well-to-do people who use farming as a secondary enterprise. For example, elderly farmers who have retired, residing near cities, formerly owned driving horses but now use automobiles for transportation, and hire small amounts of work done by neighboring farmers.

Abnormal farms.—This classification contains two sub-classes which are of interest in the study of horses. Part-time farms which are closely related to the self-sufficing farms, and the horse farms of which there still remain a considerable number in Kentucky and some of the range States. Part-time farms are of growing importance and tend to add to the decrease in horses and mules. The horse farms may be divided into two or three classes, those which raise racing and saddle stock and those which produce working horses and mules. There may still be a sufficient number of these establishments to be of considerable importance in the renewal of the horse industry if the acute shortage which is expected, occurs. The table appended will furnish the principal basic statistics for intensive study. See Summary, Type of Farms and Volume IV, Chapter XIV for further explanation and data.

The map in Chapter IV showing the number of acres per work animal on a county basis will be helpful in locating the various areas. For example, the cash grain area of the mid-western plains extending from North Dakota through the Panhandle of Texas, the region in which a large portion of the surplus wheat acreage has been developed. This is the principal area of the combine and heavy farm machinery, which taken in connection with the decrease in horses and mules, has probably been instrumental in bringing about one of the critical periods of American agriculture and readjustment in American life. It is suggested that students interested in this phase of the subject consult all related data in Type of Farm bulletins and in Volume IV, General Report on Agriculture, Census of 1930.

TABLE 7.—NUMBER OF FARMS, ACREAGE OF CROP LAND HARVESTED AND NUMBER OF WORK ANIMALS BY TYPE OF FARM, WITH AVERAGES AND PERCENTAGES; BY GEOGRAPHIC DIVISIONS: CENSUS OF 1930

GEOGRAPHIC DIVISIONS AND TYPE OF FARM	All farms (number)	Farms reporting work animals (number)	Work animals (horses and mules) (total)	AVERAGE NUMBER OF WORK ANIMALS PER FARM		Crop land harvested (acres) all farms	Average acreage crop land harvested per farm (all farms)	Average acreage crop land harvested per work animal (all farms)	Per cent of farms that report work animals
				All farms	Farms reporting				
UNITED STATES									
All types	6,288,648	5,024,234	17,611,905	2.8	3.5	359,242,091	57.1	20.4	79.9
General	1,044,266	938,216	3,291,174	3.2	3.5	60,934,592	58.4	18.5	89.8
Cash-gain	454,726	398,629	2,510,053	5.5	6.3	92,014,943	202.4	36.6	87.7
Cotton	1,640,025	1,322,781	3,475,068	2.1	2.6	62,730,828	38.2	18.0	80.6
Crop-specialty	431,379	346,389	1,009,199	2.3	2.9	18,579,839	43.1	18.4	80.3
Fruit	141,418	77,271	180,712	1.3	2.3	4,611,935	32.6	25.5	54.6
Truck	84,561	62,149	150,239	1.8	2.4	2,433,622	28.8	16.2	73.5
Dairy	604,837	539,167	1,806,790	3.0	3.4	34,178,665	56.5	18.9	89.1
Animal-specialty	479,042	453,020	2,493,806	5.2	5.5	53,779,614	112.3	21.6	94.6
Stock-ranch	71,000	63,417	759,549	10.7	12.0	8,631,032	121.6	11.4	89.3
Poultry	166,517	98,602	245,212	1.5	2.5	3,530,145	21.2	14.4	59.2
Self-sufficing	498,019	367,158	749,519	1.5	2.0	7,698,974	15.5	10.3	73.7
Abnormal and unclassified	672,858	357,435	940,584	1.4	2.6	10,117,902	15.0	10.8	53.1
NEW ENGLAND									
All types	124,925	82,702	180,893	1.4	2.2	3,659,340	29.3	20.2	66.2
General	17,177	13,064	26,159	1.5	2.0	492,961	28.7	18.8	76.1
Cash-grain	31	15	41	1.3	2.7	1,447	46.7	35.3	48.4
Cotton									
Crop-specialty	12,138	8,856	25,650	2.1	2.9	608,361	50.1	23.7	73.0
Fruit	2,674	1,239	2,184	0.8	1.8	84,262	31.5	38.6	46.3
Truck	3,216	1,859	3,022	0.9	1.6	54,753	17.0	18.1	57.8
Dairy	39,822	32,962	80,006	2.0	2.4	1,617,408	40.6	20.2	82.8
Animal-specialty	2,053	1,568	3,724	1.8	2.4	72,909	35.5	19.6	76.4
Stock-ranch									
Poultry	10,002	4,279	6,265	0.6	1.5	116,311	11.6	18.6	42.8
Self-sufficing	11,113	6,996	10,759	1.0	1.5	175,318	15.8	16.3	63.0
Abnormal and unclassified	26,699	11,864	23,083	0.9	1.9	435,610	16.3	18.9	44.4
MIDDLE ATLANTIC									
All types	357,603	266,673	711,255	2.0	2.7	14,323,597	40.1	20.1	74.6
General	80,935	68,729	189,012	2.3	2.8	3,635,925	44.9	19.2	84.9
Cash-grain	3,613	2,580	9,680	2.7	3.8	248,051	68.7	25.6	71.4
Cotton									
Crop-specialty	18,354	12,796	39,237	2.1	3.1	924,498	50.4	23.6	69.7
Fruit	11,989	8,429	19,628	1.6	2.3	517,617	43.2	26.4	70.3
Truck	13,575	9,864	23,069	1.7	2.3	389,665	28.7	16.9	72.7
Dairy	118,255	104,172	304,029	2.6	2.9	6,618,792	56.0	21.8	88.1
Animal-specialty	4,169	3,527	11,957	2.9	3.4	235,316	56.4	19.7	84.6
Stock-ranch	30	24	78	2.6	3.3	1,162	38.7	14.9	80.0
Poultry	26,323	14,497	29,234	1.1	2.0	492,211	18.7	16.8	55.1
Self-sufficing	24,322	16,611	30,794	1.3	1.9	415,646	17.1	13.5	68.3
Abnormal and unclassified	56,038	25,444	54,537	1.0	2.1	844,714	15.1	15.5	45.4
EAST NORTH CENTRAL									
All types	966,502	814,457	2,773,062	2.9	3.4	56,644,354	58.6	20.4	84.3
General	275,921	249,761	796,817	2.9	3.2	15,493,263	56.2	19.4	90.5
Cash-grain	84,415	76,094	400,541	4.7	5.3	11,238,178	133.1	28.1	90.1
Cotton	75	59	191	2.5	3.2	2,247	30.0	11.8	78.7
Crop-specialty	36,791	29,788	87,221	2.4	2.9	1,991,749	54.1	22.8	81.0
Fruit	12,540	9,595	22,292	1.8	2.3	487,661	38.9	21.9	76.5
Truck	14,705	10,787	24,593	1.7	2.3	377,528	25.7	15.4	73.4
Dairy	235,322	217,702	711,266	3.0	3.3	13,430,208	57.1	18.9	92.5
Animal-specialty	109,552	101,545	447,301	4.1	4.4	9,874,465	90.1	22.1	92.7
Stock-ranch	42	32	127	3.0	4.0	2,992	71.2	23.6	76.2
Poultry	36,794	25,563	62,730	1.7	2.5	952,435	25.9	15.2	69.5
Self-sufficing	52,397	38,549	84,345	1.6	2.2	910,007	17.4	10.8	73.6
Abnormal and unclassified	107,948	54,982	135,638	1.3	2.5	1,883,621	17.4	13.9	50.9
WEST NORTH CENTRAL									
All types	1,112,755	990,365	5,316,823	4.8	5.4	138,715,660	124.7	26.1	89.0
General	265,723	248,611	1,179,194	4.4	4.7	25,774,151	97.0	21.8	93.6
Cash-grain	245,869	222,273	1,446,947	5.9	6.5	55,775,513	226.9	38.5	90.4
Cotton	13,588	9,160	31,768	2.3	3.5	555,681	40.9	17.5	67.4
Crop-specialty	16,073	13,035	66,748	4.2	5.1	1,901,346	118.3	28.5	81.1
Fruit	3,977	2,969	7,444	1.9	2.5	129,349	32.5	17.4	74.6
Truck	4,318	3,169	7,752	1.8	2.4	104,231	24.1	13.4	73.4
Dairy	106,088	97,953	408,689	3.8	4.2	8,203,672	77.3	20.1	92.3
Animal-specialty	285,984	275,884	1,674,371	5.8	6.1	38,210,168	133.6	22.8	96.5
Stock-ranch	11,932	11,339	139,525	11.7	12.3	3,250,892	272.5	23.3	95.0
Poultry	31,934	23,376	73,882	2.3	3.2	1,073,523	33.6	14.5	73.2
Self-sufficing	49,240	37,874	112,598	2.3	3.0	1,174,702	23.9	10.4	76.9
Abnormal and unclassified	78,029	44,722	167,905	2.2	3.8	2,562,432	32.8	15.3	57.3

TABLE 7.—NUMBER OF FARMS, ACREAGE OF CROP LAND HARVESTED, AND NUMBER OF WORK ANIMALS BY TYPE OF FARM, WITH AVERAGES AND PERCENTAGES; BY GEOGRAPHIC DIVISIONS: CENSUS OF 1930—Continued

GEOGRAPHIC DIVISIONS AND TYPE OF FARM	All farms (number)	Farms reporting work animals (number)	Work animals (horses and mules) (total)	AVERAGE NUMBER OF WORK ANIMALS PER FARM		Crop land harvested (acres) all farms	Average acreage crop land harvested per farm (all farms)	Average acreage crop land harvested per work animal (all farms)	Percent of farms that report work animals
				All farms	Farms reporting				
SOUTH ATLANTIC									
All types	1,058,468	822,872	1,589,931	1.5	1.9	27,519,597	26.0	17.3	77.7
General	124,971	109,822	250,491	2.0	2.3	4,029,143	32.2	16.1	87.9
Cash-grain	6,984	5,706	23,321	3.3	4.1	492,871	70.6	21.1	81.7
Cotton	368,491	310,266	557,976	1.5	1.8	11,758,199	31.9	21.1	84.2
Crop-specialty	186,289	155,414	291,814	1.6	1.9	4,629,668	24.9	15.9	83.4
Fruit	22,317	11,356	26,450	1.2	2.3	835,056	37.4	31.6	50.9
Truck	18,658	14,022	32,370	1.7	2.3	568,555	30.5	17.6	75.2
Dairy	19,644	16,705	54,384	2.8	3.3	947,102	48.2	17.4	85.0
Animal-specialty	17,676	15,883	49,257	2.8	3.1	867,267	49.1	17.6	89.9
Stock-ranch	2,494	2,148	7,369	3.0	3.4	106,352	42.6	14.4	86.1
Poultry	14,790	9,687	19,566	1.3	2.0	265,144	17.9	13.6	65.5
Self-sufficing	141,547	100,260	157,749	1.1	1.6	1,829,021	12.9	11.6	70.8
Abnormal and unclassified	134,607	71,603	119,184	0.9	1.7	1,191,219	8.8	10.0	53.2
EAST SOUTH CENTRAL									
All types	1,062,214	783,460	1,800,799	1.7	2.3	25,148,170	23.7	14.0	73.8
General	122,592	108,500	286,944	2.3	2.6	3,477,833	28.4	12.1	88.5
Cash-grain	6,989	4,597	16,689	2.4	3.6	338,480	48.4	20.3	65.8
Cotton	529,684	387,419	822,996	1.6	2.1	13,747,684	26.0	16.7	73.1
Crop-specialty	92,581	68,587	190,829	2.1	2.8	2,492,177	26.9	13.1	74.1
Fruit	3,085	2,353	5,860	1.9	2.5	112,739	36.5	19.2	76.3
Truck	7,728	5,851	12,761	1.7	2.2	141,985	18.4	11.1	75.7
Dairy	16,476	14,101	45,533	2.8	3.2	550,135	33.4	12.1	85.6
Animal-specialty	24,231	22,034	92,192	3.8	4.2	1,196,542	49.4	13.0	90.9
Stock-ranch	938	790	4,565	4.9	5.8	30,599	32.6	6.7	84.2
Poultry	4,091	2,860	6,262	1.5	2.2	67,945	16.6	10.9	69.9
Self-sufficing	147,611	110,047	205,155	1.4	1.9	2,087,508	14.1	10.2	74.6
Abnormal and unclassified	106,208	56,321	111,013	1.0	2.0	904,543	8.5	8.1	53.0
WEST SOUTH CENTRAL									
All types	1,103,134	921,344	3,269,573	3.0	3.5	56,837,540	51.5	17.4	83.5
General	101,631	93,374	346,030	3.4	3.7	4,830,613	47.5	14.0	91.9
Cash-grain	46,443	36,620	195,493	4.2	5.3	9,247,613	199.1	47.3	78.8
Cotton	719,596	609,102	2,030,680	2.8	3.3	35,925,913	49.9	17.7	84.6
Crop-specialty	12,669	10,872	52,494	4.1	4.8	948,580	74.9	18.1	85.8
Fruit	11,461	8,970	19,463	1.7	2.2	288,734	25.2	14.8	78.3
Truck	8,902	7,267	19,524	2.2	2.7	257,862	29.0	13.2	81.6
Dairy	17,168	14,149	55,314	3.2	3.9	714,346	41.6	12.9	82.4
Animal-specialty	15,257	14,302	85,367	5.6	6.0	1,202,889	78.8	14.1	93.7
Stock-ranch	17,001	15,251	166,017	9.8	10.9	991,881	58.3	6.0	89.7
Poultry	9,500	6,918	22,565	2.4	3.3	247,944	26.1	11.0	72.8
Self-sufficing	52,041	43,585	106,879	2.0	2.4	884,412	17.0	8.3	83.8
Abnormal and unclassified	91,465	60,934	169,747	1.8	2.8	1,296,753	14.2	7.6	66.6
MOUNTAIN									
All types	241,314	197,552	1,361,374	5.6	6.9	23,279,028	96.5	17.1	81.9
General	34,007	30,350	165,169	4.9	5.4	2,429,133	71.4	14.7	89.2
Cash-grain	42,664	36,299	264,456	6.2	7.3	9,593,889	224.9	36.3	85.1
Cotton	5,620	4,540	22,072	3.9	4.9	413,124	73.5	18.7	80.8
Crop-specialty	40,842	35,704	204,173	5.0	5.7	3,791,212	92.8	18.6	87.4
Fruit	5,189	3,198	8,047	1.6	2.5	122,967	23.7	15.3	61.6
Truck	4,530	3,365	10,238	2.3	3.0	134,701	29.7	13.2	74.3
Dairy	16,010	13,614	62,255	3.9	4.6	827,264	51.7	13.3	85.0
Animal-specialty	14,984	14,060	108,462	7.2	7.7	1,764,123	117.7	16.3	93.8
Stock-ranch	30,106	26,798	363,485	12.1	13.6	3,369,259	111.9	9.3	89.0
Poultry	5,932	2,819	8,847	1.5	3.1	106,332	17.9	12.0	47.5
Self-sufficing	10,437	8,436	30,298	2.9	3.6	152,873	14.6	5.0	80.8
Abnormal and unclassified	30,993	18,369	113,872	3.7	6.2	574,151	18.5	5.0	59.3
PACIFIC									
All types	261,733	144,809	608,195	2.3	4.2	13,114,805	50.1	21.6	55.3
General	21,309	16,005	51,358	2.4	3.2	771,570	36.2	15.0	75.1
Cash-grain	17,718	14,445	152,885	8.6	10.6	5,078,901	286.7	33.2	81.5
Cotton	2,971	2,235	9,385	3.2	4.2	327,980	110.4	34.9	75.2
Crop-specialty	15,642	11,337	51,033	3.3	4.5	1,292,248	82.6	25.3	72.5
Fruit	68,186	29,162	69,344	1.0	2.4	2,033,550	29.8	29.3	42.8
Truck	8,929	5,965	16,910	1.9	2.8	404,342	45.3	23.9	66.8
Dairy	36,052	27,809	85,314	2.4	3.1	1,269,738	35.2	14.9	77.1
Animal-specialty	5,136	4,217	21,175	4.1	5.0	355,935	69.3	16.8	82.1
Stock-ranch	8,457	7,035	78,383	9.3	11.1	877,895	103.8	11.2	83.2
Poultry	27,151	8,603	15,861	0.6	1.8	208,300	7.7	13.1	31.7
Self-sufficing	9,311	4,800	10,942	1.2	2.3	69,487	7.5	6.4	51.6
Abnormal and unclassified	40,871	13,196	45,605	1.1	3.5	424,859	10.4	9.3	32.3

CHAPTER III.—REPLACEMENT OF HORSES AND MULES BY MACHINERY

Automobiles, trucks, tractors, improved farm machinery, electric motors, and gas engines have in varying degrees displaced horses and mules. Of these the automobile, the truck, and the tractor have probably resulted in the greatest displacement, although the amount is hard to measure. In the cities automobiles and trucks have displaced about nine-tenths of the horses and mules, relatively few tractors being used in cities for hauling purposes. At the high point, about 1910, there were close to 3,500,000 city horses and mules. In the decade 1910 to 1920 this had fallen to about 2,100,000. The major portion of these had disappeared by 1930. To the automobile, whether passenger vehicle or truck, may be attributed in the past 20 years a decrease of more than 3,000,000 city animals. Prior to 1910, of course, the replacement had begun but had not reached a sufficient magnitude to be of importance.

It is true that no exact measure of replacement can be offered inasmuch as the automobile has introduced into American life a new source of enjoyment, not exactly identical with, but far greater than that of driving or saddle horses. Moreover the acquisition of an automobile by no means causes the displacement of a horse. Some farmers probably own automobiles who have not owned driving or saddle horses. So far as the general public is concerned, however, the motor car has replaced those animals. The remaining saddle and driving animals, for the most part, are owned by the very well-to-do, or by farm or range interests which require those animals rather than automobiles for the conduct of their operations. Those, with the racing and breeding establishments which remain, account for most of the saddle and driving horses which are still in use.

Logically the decrease in horses and mules would be expected to become apparent first in the cities and such appears to have been the case, the automobile first replacing the pleasure animals and somewhat later the general purpose and delivery horses and mules. The situation on the farms is a somewhat different matter. While a considerable number of animals were kept only for riding or driving, by far the greatest proportion were general-purpose animals. The saddle and driving animals were replaced much more slowly than those in cities and their disappearance was scarcely noted in the decade 1910 to 1920 because of the increase in agriculture. the heavy demand for animals during the war and the relatively slow displacement by the automobile. By 1920, however, judging by the percentage of farms reporting automobiles, about half of such horses had been, or were being, replaced by automobiles. On many farms the horses were retained because of sentiment after automobiles had actually taken their places for general use. The matter of sentiment can not be overlooked in the study of the horse situation. It appears to be one of the principal reasons for the very long retention of older horses. A striking example of the influence of this factor is to be noted in New England, where over 60 per cent of the farmers were 45 years of age or over on April 1, 1930, and where our study of mortality indicated a similar percentage of farm horses over 10 years old. The obvious interpretation of this situation is that the elderly farmers retain the horses until the horses die of old age. A comparison of the percentage of farmers of advanced age, with the computed age of work animals in each State presents a striking similarity.

Perhaps a fair idea of the general use of automobiles on farms and the replacement of horses and mules may be secured from the fact that 3,650,003 farms reported automobiles in 1930 and the number reporting trucks was 845,335, while 5,024,713 farms reported horses and/or mules The total number of automobiles and trucks taken together reported on farms was over 5,000,000. Analysis of the purposes for which horses and mules are used, presented earlier in the study, indicated that on the larger part of farms at least, draft animals constitute the principal problem at *present*. The tables which will follow will show a very close relationship between work animals and their replacement by tractors and trucks.

The table appended illustrates the replacement of work animals for each State, using the average replacement of 5.5 animals by tractors and 2.0 by trucks for each State. It is known, of course, that in the States using larger tractors the replacement would be greater, but in some States the number of horses replaced would not be so great. This replacement is termed "work-animal equivalent." The term "work animals" applies to horses and mules, excluding colts of the 1 and 2 year class. It is to be noted that in 1930 the colts excluded were all of those under 2 years and 3 months old, while at the previous census periods those excluded were under 2 years old. This difference is due to the change in the date of the census, from January 1, 1920, to April 1, 1930.

The table as presented will give an approximate idea for the United States as a whole, but for the States it will be only a rough guide because the local true animal equivalent differs more or less from the United States average which is used for all computations in the table. No equivalent is shown for automobiles, principally because they constitute an entirely new factor, although it is known that a replacement of horses and mules is due to that fact. One of the points brought out by the table is that if the average be correct, in 1930, there was a small surplus of power in addition to the surplus represented by automobiles. This surplus was sufficient to take care of a material acreage and is important as explaining why the horse situation has not become acute at an earlier date. If a similar table be worked out for animals for 1925 to 1930 supplying the number of trucks in 1925 on the basis of the average change from 1920 to 1930 for the year 1925, it would indicate the work-animal equivalent supplied the increase in by tractors and trucks as only 32,000 more than the actual decrease in work animals. While the table is, to a large extent, hypothetical, it is important as an illustration to show how closely the changes in numbers of horses and mules may be tied up with the introduction of tractors and trucks. Another local complication which should be taken into consideration in the changes of work animals is the fact that in the Western States there is a large proportion of work animals, changes in the numbers of which are not closely connected with changes in the crop acreage or changes in the numbers of tractors.

The relative importance of trucks and tractors in the replacement of farm work animals, when computed on the basis indicated in Table 8 shows that tractors replaced more than twice as many work animals as trucks. In New England trucks were almost as important in this respect as tractors. In a number of the Southern States, particularly Georgia, Alabama, Mississippi, and Louisiana, the theoretical replacement by trucks was greater than that by tractors. In all other States, it will be seen that the tractors were very much more important. In the South Atlantic, East South Central, and Mountain States it appears that the replacement of horses is greater than can be accounted for by the increase in tractors and trucks. Automobiles doubtless account for a part of those differences.

In South Carolina and Georgia decreases in horses and mules can be accounted for by the millions of acres thrown out of cultivation during the decade 1919–1929 because of the boll weevil. In the Mountain States the decreases in horses and

TABLE 8.—DECREASES IN WORK ANIMALS ON FARMS AND INCREASES IN TRACTORS, TRUCKS, AND AUTOMOBILES, WITH THEORETICAL WORK ANIMAL EQUIVALENTS [1]; BY DIVISIONS AND STATES: 1920–1930

[Decreases or deficiencies in italics]

DIVISION OR STATE	Decrease in work animals [2]	Increase in tractors	Theoretical work animal equivalent	Increase in trucks	Theoretical work animal equivalent	Theoretical work animal equivalent increase of tractors and trucks	Net surplus of work animal equivalent	Increase in automobiles
United States (net)	*4,260,689*	673,938	3,706,659	761,216	1,522,432	5,229,091	968,402	1,988,313
GEOGRAPHIC DIVISIONS:								
New England	*114,110*	11,712	64,416	29,853	59,706	124,122	10,012	44,533
Middle Atlantic	*407,383*	67,830	373,065	98,778	197,556	570,621	163,238	151,570
East North Central	*1,162,936*	191,241	1,051,826	172,098	344,196	1,396,022	233,086	325,809
West North Central	*1,142,796*	220,276	1,211,518	147,482	294,964	1,506,482	363,686	382,546
South Atlantic	*415,937*	36,147	198,808	79,159	158,318	357,126	*58,811*	281,590
East South Central	*252,944*	19,014	104,577	40,415	80,830	185,407	*67,537*	248,862
West South Central	*126,213*	54,118	297,649	87,336	174,672	472,321	346,108	352,366
Mountain	*320,548*	30,494	167,717	48,153	96,306	264,023	*56,525*	84,293
Pacific	*317,822*	43,106	237,083	57,942	115,884	352,967	35,145	116,744
NEW ENGLAND:								
Maine	*30,420*	2,775	15,262	9,661	19,322	34,584	4,164	13,658
New Hampshire	*16,953*	889	4,890	3,822	7,644	12,534	*4,419*	5,816
Vermont	*21,862*	1,982	10,901	4,419	8,838	19,739	*2,123*	10,448
Massachusetts	*24,640*	3,329	18,310	6,037	12,074	30,384	5,744	8,329
Rhode Island	*3,248*	510	2,805	1,165	2,330	5,135	1,887	1,174
Connecticut	*16,987*	2,227	12,248	4,749	9,498	21,746	4,759	5,108
MIDDLE ATLANTIC:								
New York	*199,420*	32,872	180,796	49,715	99,430	280,226	80,806	67,163
New Jersey	*34,258*	7,142	39,281	11,373	22,746	62,027	27,769	8,676
Pennsylvania	*173,705*	27,816	152,988	37,690	75,380	228,368	54,663	75,731
E. N. CENTRAL:								
Ohio	*270,950*	42,505	233,778	31,891	63,782	297,560	26,610	73,168
Indiana	*226,079*	32,749	180,120	26,366	52,732	232,852	6,773	52,434
Illinois	*364,129*	46,526	255,893	34,217	68,434	324,327	*39,802*	53,783
Michigan	*195,798*	28,695	157,822	31,882	63,764	221,586	25,788	68,485
Wisconsin	*105,980*	40,766	224,213	47,742	95,484	319,697	213,717	77,939
W. N. CENTRAL:								
Minnesota	*69,502*	32,954	181,247	32,754	65,508	246,755	177,253	77,893
Iowa	*214,631*	45,988	252,934	23,759	47,518	300,452	85,821	62,954
Missouri	*219,450*	17,110	94,105	15,073	30,146	124,251	*95,199*	90,237
North Dakota	*151,610*	24,599	135,294	16,216	32,432	167,726	16,116	31,087
South Dakota	*113,354*	20,898	114,939	10,463	20,926	135,865	22,511	23,721
Nebraska	*95,036*	29,629	162,960	19,497	38,994	201,954	106,918	36,691
Kansas	*279,213*	49,098	270,039	29,720	59,440	329,479	50,266	59,963
SOUTH ATLANTIC:								
Delaware	*8,576*	1,361	7,486	2,692	5,384	12,870	4,294	4,710
Maryland	*43,057*	5,683	31,256	8,479	16,958	48,214	5,157	20,270
Dist. of Columbia	*169*	16	88	52	104	192	23	2
Virginia	*89,450*	7,378	40,579	16,915	33,830	74,409	*15,041*	57,504
West Virginia	*49,511*	2,220	12,210	6,496	12,992	25,202	*24,309*	25,851
North Carolina	*32,686*	9,149	50,319	15,887	31,774	82,093	49,407	88,669
South Carloina	*70,798*	2,158	11,869	5,230	10,460	22,329	*48,469*	28,942
Georgia	*105,973*	3,618	19,899	12,822	25,644	45,543	*60,430*	38,638
Florida	*15,717*	4,564	25,102	10,586	21,172	46,274	30,557	17,004
E. S. CENTRAL:								
Kentucky	*119,453*	5,293	29,112	5,650	11,300	40,412	*79,041*	56,638
Tennessee	*103,544*	4,993	27,462	7,609	15,218	42,680	*60,864*	65,472
Alabama	*12,210*	3,853	21,191	11,658	23,316	44,507	32,297	57,042
Mississippi	*17,737*	4,875	26,812	15,498	30,996	57,808	40,071	69,710
W. S. CENTRAL:								
Arkansas	*31,233*	3,862	21,241	9,973	19,946	41,187	9,954	49,527
Louisiana	*22,356*	2,204	12,122	8,407	16,814	28,936	6,580	32,570
Oklahoma	*123,702*	19,752	108,636	21,775	43,550	152,186	28,484	75,385
Texas	51,078	28,300	155,650	47,181	94,362	250,012	301,090	194,884
MOUNTAIN:								
Montana	*132,811*	11,384	62,612	13,390	26,780	89,392	*43,419*	16,094
Idaho	*54,170*	3,104	17,072	5,444	10,888	27,960	*26,210*	16,320
Wyoming	*3,239*	3,035	16,692	3,517	7,034	23,726	20,487	6,119
Colorado	*43,967*	8,344	45,892	13,902	27,804	73,696	29,729	21,428
New Mexico	*25,955*	2,006	11,033	4,735	9,470	20,503	*5,452*	9,377
Arizona	*34,931*	1,628	8,954	2,481	4,962	13,916	*21,015*	4,834
Utah	*19,895*	843	4,637	3,617	7,234	11,871	*8,024*	8,917
Nevada	*5,580*	150	825	1,067	2,134	2,959	*2,621*	1,204
PACIFIC:								
Washington	*85,034*	5,753	31,642	15,465	30,930	62,572	*22,462*	26,203
Oregon	*66,163*	6,768	37,224	7,922	15,844	53,068	*13,095*	25,217
California	*166,625*	30,585	168,217	34,555	69,110	237,327	70,702	95,324

[1] See text pages 4, 40, and 42.

[2] Horses and mules 2 years old and over.

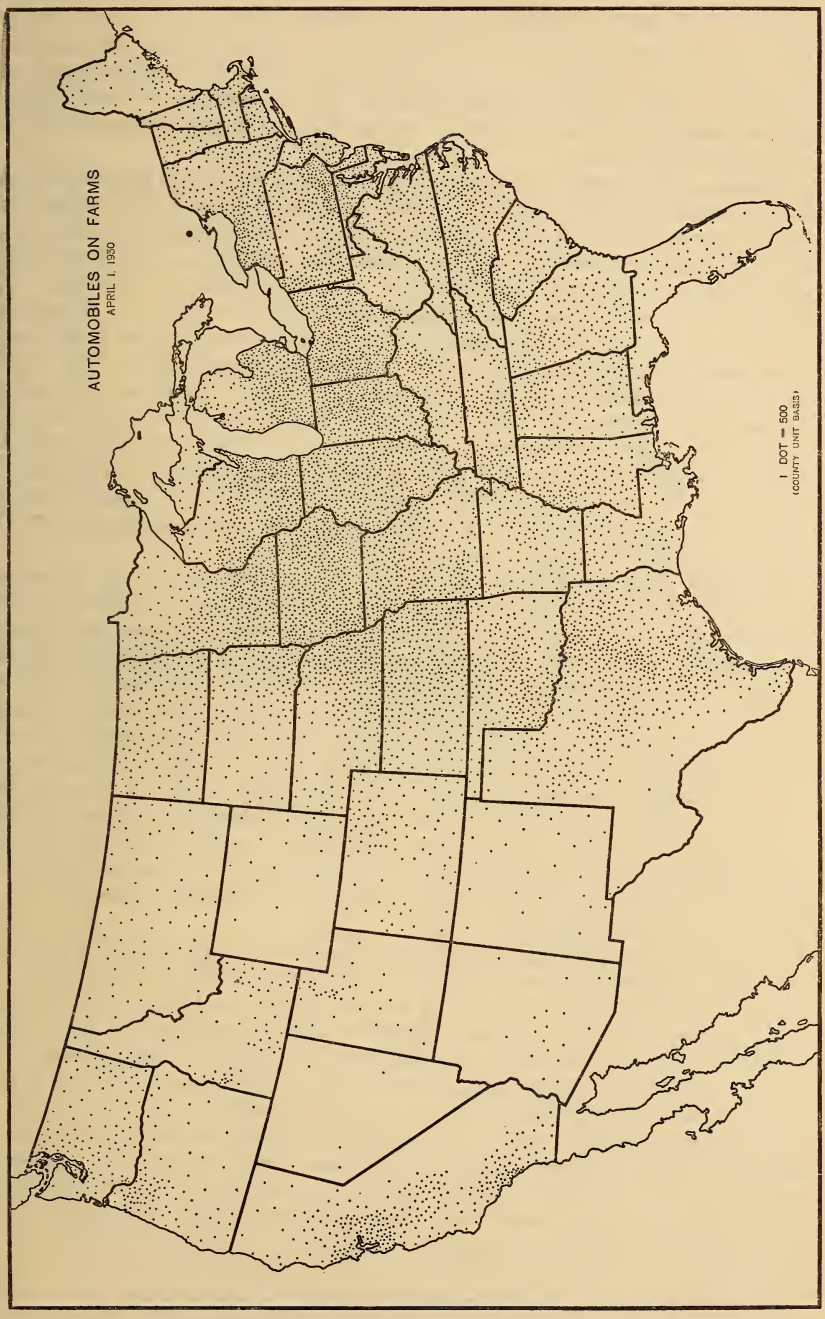
mules may be accounted for by sales of range horses which have no immediate connection with crop production or power replacement in that area.

Automobiles.—Automobiles have not been computed on the basis of horse and mule replacement because they introduce such an entirely new factor for which horses and mules furnish no equivalent that it was practically impossible to arrive at such a figure. It is certain that the number of automobiles has reduced the requirement for surplus animals on farms which was formerly believed to be about one-fourth or one-fifth of the total number of animals necessary for the usual farm operations, and this may be the reason why, with the tremendous decrease in horses and mules which occurred, no acute shortage in work animals has been noted until the present season. A comparison of surplus farm horses and mules in 1920, worked out on the basis of one-fourth being surplus, showed figures in some States very close to the number of automobiles on farms in 1930.

The indicated deficiencies of replacement for Missouri, Kentucky, and Tennessee may be explained by the decline in the horse and mule breeding in those States. One of the other points worthy of mention as regards this table is the fact that all States have great increases in trucks and tractors and corresponding decreases in numbers of work animals, with the exception of Texas. In that State the expansion in crops, principally cotton, was so great that it required an increase in work animals, as well as an increase in tractors, to handle the additional acreage, and there was an actual increase in work animals of 51,078. Texas also offers an interesting example of the working out of this method of computation. The increase in work animals plus the work-animal equivalent of the increases in trucks and tractors, would account for an increase of 5,389,511 acres, whereas the increase in crop land based on the census was 5,606,597 acres, using crops with acreage report in 1920, or 5,738,316 acres using acreage in all crops. In a similar manner the changes in numbers of work animals in most States may be correlated with the increase in tractors and trucks and with changes in crop acreages.

Trucks.—Only 2 per cent of the farms reported trucks in 1920 but a total of 845,335 farms or 13.4 per cent reported them in 1930. Judging from the percentage of farms reporting they are of greatest utility in the Mountain and Pacific States where distances are great, and in New England and Middle Atlantic States where roads are generally excellent and where direct marketing of farm products is quite commonly carried on. The greatest percentage of farms reporting farm trucks was found in the Middle Atlantic States, with 30.7 per cent, closely followed by New England with 26.7 per cent. The lowest percentage was found in the East South Central States with 4.1. It is to be noted that all cotton States where rapid marketing of the main crop is not necessary, showed a low proportion of trucks. These data are not available by type of farm. Such types as dairy, poultry, truck, and fruit farms need trucks to satisfactorily market their products.

Trucks constitute a rather different problem from that of other automobiles and from tractors. It is rather difficult to compute the replacement of horses and mules which they represent because they perform very much more service in the point of distance than did a team of horses to which they are theoretically considered equivalent. The relation of trucks to the marketing of farm products constitutes one of the principal current marketing problems, and indeed it has been one of national interest, inasmuch as it affects the railroads, taxation, problems of farm crops, farm management, etc. Irrespective of the changes in purchasing of automobiles and of tractors, it is apparent that the truck has become an essential part of the working operations of the farm and no material recession in numbers could occur without very greatly affecting farm operations. Dairying, growing of vegetables, and raising of poultry are becoming relatively more important all the time. As these products are now being transported and sold direct

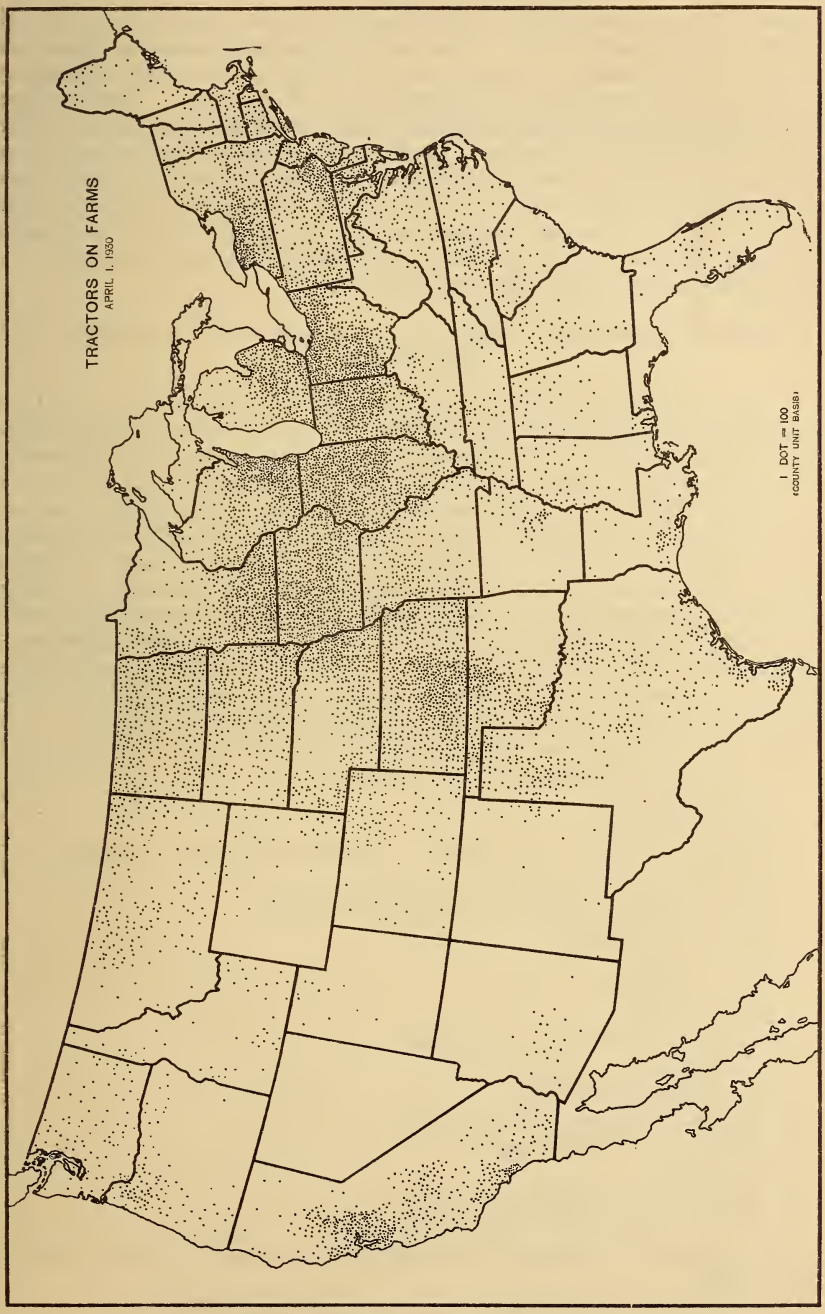

AUTOMOBILES ON FARMS
APRIL 1, 1930
1 DOT = 500
(COUNTY UNIT BASIS)

by the farmer great distances from the farm, those types of farms will probably increase in number, and, resulting in the continued displacement of horses and mules on that account, must be considered. The obsolescence of trucks presents a similar problem to that of other automobiles. Since trucks are an essential part of the farm operations it is believed that trucks will be purchased when required. Other types of automobiles can not be replaced by many farmers whose incomes have been so greatly reduced during the past few years that they can not buy new cars.

Tractors.—The census enumerated all tractors on farms and included not only those tractors actually used for the performance of farm work but also those used in working in the timber, grading roads, and heavy hauling of various kinds not directly connected with the farm. In certain sections these tractors probably constitute an appreciable percentage of the total number of tractors. Data regarding the size or horsepower of the tractors were not secured. In all computations in this chapter the equivalent utilization in terms of horses is used rather than rated horsepower, drawbar, or other methods of rating power. The average figure for the United States which has been used, 5.5, is based upon various farm-management records. Of course it is approximate but, it has some supporting census data. The average number of horses upon grain farms, the type best adapted to use of tractors and upon which the largest number of tractors are believed to be, was also 5.5. The theoretical replacement of horses by tractors on this basis, calculated upon the increase in tractors from approximately 246,000 in 1920 to 920,000 in 1930, would be about 3,707,000.

Improved farm machinery.—Among the various farm machines which have contributed to the decrease in the number of horses, are combined harvester-threshers, headers, multiple row cultivators, gang plows and listers, and improved corn and cane harvesters. Heavy gang plows were in use in the preceding decade. Most of this machinery is better adapted to the use with tractors than with horses (other things being equal) and this fact has contributed to the increase in tractors; or rather the use of these types of machines and tractors together has been advantageous under working conditions on farms and with the prices of farm commodities prevailing during the decade 1920 to 1930. The use of these machines with horses, while not releasing so many horses or so many men as when they were used in conjunction with tractors, still is responsible for considerable decrease in both horses and farm hands required, particularly in the East and West North Central States and in the grain-growing sections of the Mountain and Pacific States.

There are no complete published data at hand for the numbers of combines in the United States but some idea may be obtained from State assessor's data. In Nebraska 3,391 combines were listed and in Kansas something over 7,000. The total number of horses and men released or made unnecessary by the combines can not be exactly calculated, but where used in conjunction with tractors there appears to be a material decrease in the number of horses and mules and amount of labor required per farm. There is a tendency to keep more work stock and more hired help than necessary when tractors are first introduced, and until the final adjustment is made. There seems to be a further tendency to increase the size of the farm until the most economical size of the operation is reached, which somewhat upsets other conclusions. The header which is in use in grain sections has tendencies similar to combines. Large improved drills, cultivators, corn harvesters and other similar machinery have similar tendencies, that is they enable fewer men to cultivate greater acreage in shorter time thus releasing animals and men for other work. Kansas and Nebraska, of the grain States, offer good illustrations of resultant changes. This tendency, with occasional


TRACTORS ON FARMS
APRIL 1, 1930
1 DOT = 100
(COUNTY UNIT BASIS)

exceptions, may be noted in the constant increase in the size of the farms in the larger size groups recorded by the Census.

Electric motors, gas engines, and waterpower motors.—Electric motors, gas engines, and waterpower motors have had little influence upon the numbers of horses where they furnish power which might have otherwise been furnished by tractors in the performance of the stationary work on the farm. They have perhaps, to a small extent, where tractors are used principally for belt work, operated to retard the use of tractors. Practically no release of horsepower can be noted from the direct effects of such motors. Several decades ago mills, saws, gins, threshers, ensilage cutters, etc., were run by horsepower, but few of these are in use to-day. The only common use of horsepower at present is crushing sugar cane or sorghum for sirup in little home plants and this is a seasonal operation which does not conflict with regular farm work.

FACTORS DETERMINING THE USE OF HORSES AND MACHINERY ON THE FARM

Owing to the expense of operating tractors and to the fact that many of them are worn out or in need of expensive repairs, and in view of the present very low price of farm products and reduced farm income, many farmers owning tractors, or considering the purchase of tractors have been undecided whether or not to use horses in the future. As the horses consume a considerable portion of the output of the farm, and as under certain conditions they can perform work more cheaply than can be done by tractors, a number of observers have recorded a tendency to increased use of horses during the present emergency. If there should be a considerable increase in the use of horses and mules and discarding of tractors, the results might have a profound effect upon the farm situation by again utilizing, for growing horsefeed, the acreage now producing surplus crops. This point is worthy of consideration because of the possible opportunity for profitably employing horses and mules and raising colts on many farms.

Some of the many factors which determine whether the use of horses or machinery is the more profitable, are listed below:

1. Size of operations.
2. Nature of terrain.
3. Crops grown on the farm, type of farm and nature of farm enterprise.
4. Amount of pasture.
5. Labor employed. (Race, kind of labor, and cost.)
6. Original cost of tractor.
7. Cost of gasoline.
8. Cost of repairs.
9. Life of tractor.
10. Original cost of horses and mules.
11. Cost of feed.
12. Life of horses and mules.
13. Market for young horses and mules.
14. Facilities for breeding mares.
15. Sentiment.
16. Relative prices of horses and mules.
17. Relative prices of horses and cattle, etc.
18. Changes in the numbers of horses and mules as related to automobiles and motor trucks.
19. Utilization of waste material, hay, corn, forage, pasture, etc.
20. Days used during the year.
21. Present equipment.

22. Tax situation.
23. Farm fertility. Necessity for use of farm fertilizer.
24. Location of farm.
25. Other transportation facilities.
26. New equipment making the use of the horse and mule more advantageous than formerly.
27. Hard surface roads unsuitable for use of horses and mules for hauling.
28. Aptitude and inclination of individual farmers for mechanical work or animal husbandry.

CHAPTER IV.—EFFECTS OF MACHINERY ON ACREAGE AND PRODUCTION OF CROPS AND LIVESTOCK

The effects of the introduction of tractors, trucks, automobiles, and improved farm machinery on agriculture will perhaps be better illustrated by the change in the average acreage per work animal of crop land harvested. In the United States as a whole the average increased from 16.7 acres per animal in 1924 to 20.4 acres in 1929. Exactly comparable data for 1919 are not available but on the basis of total acres of crops with acreage reports it would have been 15.9 acres. This represents an increase of almost one-fourth of the land worked per animal, and also shows what a tremendous further expansion may be possible under certain conditions. These averages are based on all farms and not on farms reporting work animals and the figures therefore constitute not an "acre duty" per animal but the relationship of all work animals to all crop land harvested.

The averages for 1924 and 1929 are unusually good registers of the net effect brought about by improved machinery, for example, in Kansas the average acreage per work animal rose from 20.7 to 31.1 acres illustrating the tremendous increase brought about by the combine and other improved machinery. Similar conditions exist in the other grain States, such as the Dakotas and Montana. On the other hand the small net effect of the introduction of machinery is illustrated by Georgia, with change of average of 20.6 acres per work animal to 21.4 acres per work animal in 1929. These examples will bring out strongly the contrast in areas where crops, such as wheat, lend themselves to production on a large scale with heavy machinery, and those sections where crops such as cotton must be produced on a small family basis with very light tools and which under present conditions, can not be produced profitably or at all through the use of heavy machinery.

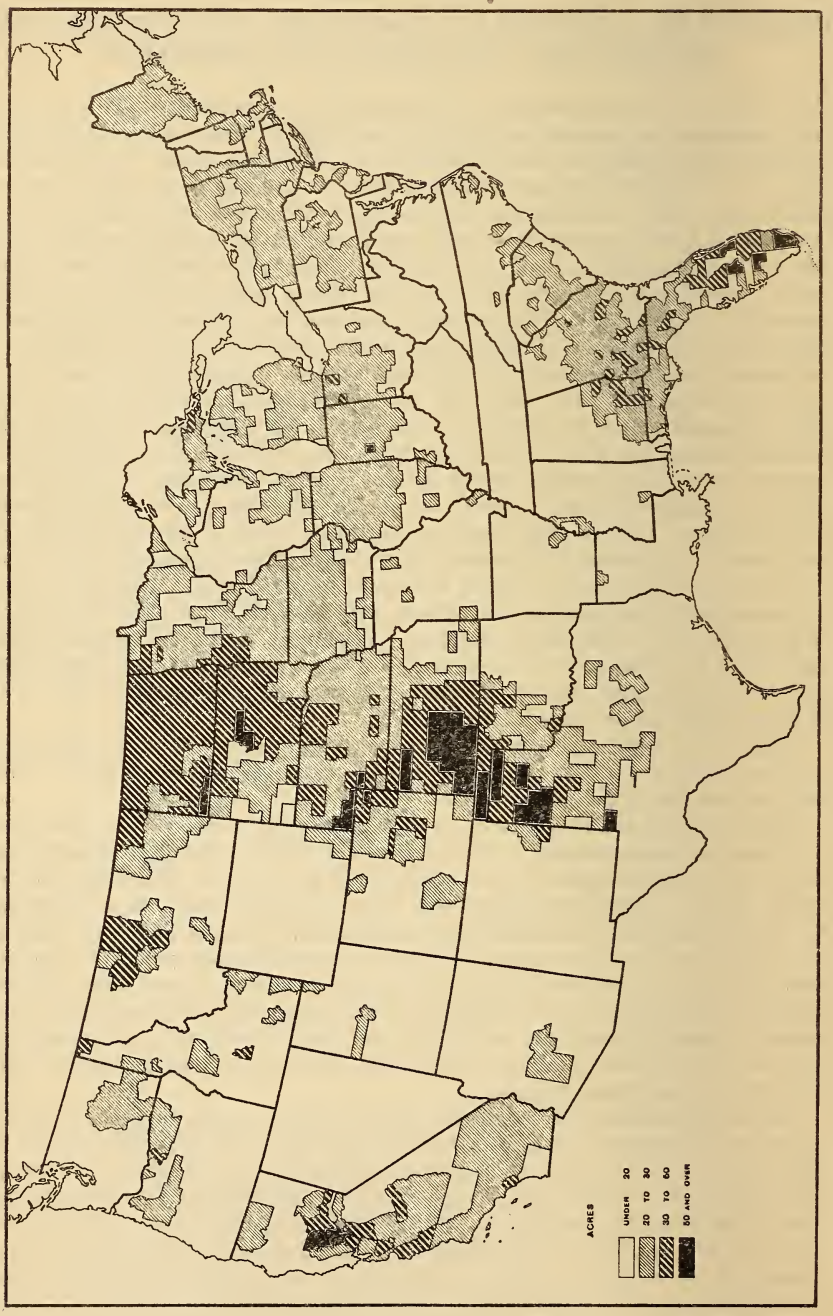
Table No. 7 will be helpful in connection with the factors which determine whether horses and mules or tractors are advantageous and in connection with the study of size of farms.

Among the factors which tend to distort judgment upon this point are: 1. Number of range animals. 2. The stretching of the production capacity per work animal when horsepower is short, as is now the case. 3. The disappearance of the surplus numbers of horses and mules formerly found on most farms. 4. The discontinuance of breeding which was formerly common practice and which took from heavy work a certain portion of the animals each year for a definite period of time. 5. Seasonal factors, such as the condition of the animal, amount of grass in the fields and the difficulty of cultivation, amount of moisture in the ground, making plowing easy or difficult, the length of the working season, etc. All these factors taken together seldom affect the State average "acre duty" per work animal more than an acre.

The acreage released by the displacement of work animals represents what is probably the greatest change in American agriculture. In itself it is worthy of intensive study, but in its effect it is so far-reaching as to influence the entire economic fabric. To the net decrease of over 6,000,000 farm horses and mules must be added a decrease of nearly 2,000,000 city horses and mules. The total decreases in one decade represent 8,000,000 or more animals for which feed previously had to be grown. The net decrease in work animals (horses and mules over 2 years of age) on farms, however, was somewhat over 4,000,000. In other words farm power was needed sufficient to replace 4,000,000 work animals, but

AVERAGE ACREAGE OF CROP LAND HARVESTED PER WORK ANIMAL, 1929

[Based on all farms]



the acreage released to other crops must be calculated upon twice that amount, because of necessary inclusion of and allowance for animals not of working age and city horses, and mules.

At the present time the changes had not yet reached the point of adjustment but the decreases were still taking place and the cumulative results were affecting prices and conditions in increased measure. Moreover the adjustment of acreage, released in the previous decade 1910–1920, which had partly been taken care of by greatly expanded wheat and rye acreages, appears to have been of a temporary nature to meet war needs. The series of attempted readjustments gave us first a heavy reduction of wheat, followed by an increase after 1925 in an attempt to establish a balance, or to find a solution of the new problem forced upon farmers by surplus acreages no longer needed for horsefeed.

For this reason while we are endeavoring to show what has become of the acreage released in the past 10-year period, it must constantly be borne in mind that the situation created in the preceding 10-year period had not been satisfactorily liquidated. This is partly necessary because of the great war-time wheat acreage which had been built up and which obscured the other causes of the wheat changes.

So far as this study is concerned principal attention is given to the effect upon the major cash export crops and livestock products of which this country produces a surplus, namely, cotton, wheat, tobacco, and pork products, and upon the principal crops fed to work animals, corn, oats, barley, sorghum, and hay.

ACREAGE RELEASED

While the acreage of crop land previously devoted to growing feed for horses and mules can not be exactly determined, and while the amount of that acreage which has been devoted to other crops can not be measured with precision, it is possible to approximate upper and lower limits of both amounts, and to arrive at a fairly satisfactory figure for the acreage released.

A number of methods have been used to reach a reasonable approximation of this amount.

1. The actual decreases of each of the crops usually fed to horses and mules have been totaled and compared with decreases in horses and mules for the United States as a whole.

2. The decreases by States have been totaled and compared with the States showing decreases. (In other words the decreases which are directly traceable to local conditions and capable of local explanation.)

3. Theoretical feed requirements of horses and mules have been computed and these requirements converted into acreage required to produce the feed for the number of horses and mules recorded in the decrease, on both maintenance and standard ration, which will be explained later.

4. Possible decrease in horses and mules has been calculated from decreased acreage in crops on the basis of the number of acres required to feed an animal. (Number of horses and mules which the decrease of acreage of crops would have fed, 1919–1929.)

5. Maximum theoretical releases of grain acreage were computed on the supposition that work animals be fed upon such grain as a sole grain ration (hay of course fed as usual).

6. Similar figures were computed for hay requirements and for various separate hay crops.

7. Requirement of each grain plus hay added to show maximum probable release and minimum release.

8. State and division changes computed on basis of feeding various crops to horses and mules and to other animals.

9. Total animal unit figures and requirements computed in order to determine the part of change attributable to decrease in horses and mules.

The results of these methods of computing the acreages are listed and compared.

Summary of all methods made on a judgment basis in an attempt to arrive at an approximately correct figure.

Base tables of the changes in numbers of horses and mules and in crops are appended for convenience and comparison.

Sufficient allowance must be made for feeding city horses and mules in 1920 and the small remaining number in 1930.

Numerous objections might be raised to each of the methods and it is recognized that each method is subject to discounts and difficulties. It may be pointed out, however, that if each method were exact and infallible the results given by each would be identical. The uniformity with which the figures fall within a certain range is a very strong indication that they result in a rough approximation of the truth. It is not possible to answer here, the series of objections which might be found to any of the derived acreages. The results are listed in order that the reader may make his own deductions.

Three things must be pointed out, however, that will explain most of the trouble: First, the fact that grains and hay are shipped across State boundaries so that United States totals must often be used as the basis of computations; second, the fact that changes in range animals have no close relationship with crop acreages, particularly local crop acreages; and third, the fact that city horses must be included together with their requirements of grain and hay. Because of the very material influence of the last class of horses in 1919 and their present almost negligible importance, their decrease must be taken into account. Our computations of city horses and mules and their requirements are based on unpublished census figures covering a limited number of cities.

The decrease in farm animals measured in terms of theoretical feed requirements and acreage equivalents, and the reverse, the actual acreage decreased worked back into number of animals that could be fed by such acreages have been calculated independently; and the fact that the results differ by only a small per cent for the United States, is also very strong evidence of approximate correctness.

TABLE 9.—HYPOTHETICAL ACREAGE OF EACH GRAIN REQUIRED (AND HAY) TO FEED NUMBER OF HORSES AND MULES REPRESENTED BY DECREASE 1920 TO 1930, WHEN COMPUTED ON BASIS OF STANDARD AND MAINTENANCE RATION[1]

	Grain	HAY		GRAIN	
		Standard ration basis	Maintenance ration basis	With standard hay	With maintenance hay
FOR FARM HORSES AND MULES					
OATS (fed alone with hay):	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Standard ration	26,517,523	10,733,283	5,366,642	37,250,806	31,884,165
Maintenance ration	13,258,761	10,733,283	5,366,642	23,992,044	18,625,403
CORN (fed alone with hay):					
Standard ration	15,784,240	10,733,283	5,366,642	26,517,523	21,150,882
Maintenance ration	7,892,120	10,733,283	5,366,642	18,625,403	13,258,762
BARLEY (fed alone with hay):					
Standard ration	23,360,675	10,733,283	5,366,642	34,093,958	28,727,317
Mainteance ration	11,680,338	10,733,283	5,366,642	22,413,621	17,046,980
FOR CITY HORSES AND MULES					
OATS (fed alone with hay):					
Standard ration	7,861,888	3,182,193	1,591,096	11,044,081	----------
CORN (fed alone with hay):					
Standard ration	4,679,695	3,182,193	1,591,096	7,861,888	----------
FOR ALL HORSES AND MULES					
OATS (fed alone with hay):					
Standard ration	34,379,411	13,915,476	----------	48,294,887	----------
Farm horses and mules maintenance ration and city horses and mules standard ration	21,120,649	13,915,476	----------	35,036,125	----------
CORN (fed alone with hay):					
Standard ration	20,463,935	13,915,476	----------	34,379,411	----------
Farm horses and mules maintenance ration and city horses and mules standard ration	12,571,815	13,915,476	----------	26,487,291	----------

[1] See text.

TABLE 10.—THEORETICAL REDUCTION IN NUMBER OF HORSES AND MULES ON FARMS, INDICATED BY STATES WITH DECREASE OF ACREAGE OF SPECIFIED CROPS, USING STANDARD AND MAINTENANCE RATION; SAME INDICATED BY SIMILAR NET UNITED STATES ACREAGE DECREASES: 1920–1930

[Based on average yields]

CROPS	BASED ON STATE DECREASES		BASED ON UNITED STATES NET DECREASE	
	Standard ration	Maintenance ration	Standard ration	Maintenance ration
Oats (grain)	1,188,481	2,376,962	1,077,375	2,154,750
Corn (grain)	4,134,642	8,269,284	1,844,031	3,688,062
Corn (total) [1]	1,890,598	3,781,196	----------	----------
Sorghum (grain)	119,442	238,884	----------	----------
Barley	74,968	149,936	----------	----------
Total grain	5,517,533	11,035,066	2,921,406	5,842,812
Hay (total)	4,705,466	9,410,932	2,912,935	5,825,870
Hay (tame)	3,009,879	6,019,758	----------	----------

[1] Not included in total grain.

Another point that is of considerable interest in working out this problem is that the change in the total number of animals on farms from 1920 to 1930 is almost the same as the change in the number of horses and mules, because the decrease in cattle practically offset the increase in sheep, and the increase of chickens practically offset the decrease in swine, when each of the above was converted to an animal unit basis,[1] for the United States as a whole.

Very material difficulties occur in computing the animal unit equivalent for each class of animals. Some of these are due to the date of taking the census, and the unusual proportions of young animals, particularly sheep and swine which were enumerated; the necessary inclusion of animals which secure their food on the range and which cross the State lines at various dates; the feeding of straw, corn, fodder, sorghum, and other roughage; the use of wheat and rye as feed and the use of corn and oats for human food. These necessarily greatly affect animal unit figures so that it has been considered better in view of all facts, to base most computations on the changes in horses and mules only, and to use the other calculations of animals and animal units and feed requirements principally to explain apparent discrepancies and differences which occur between State decreases in horses and mules and decreases in crops. The most important of such cases will be mentioned under crops or work-animal changes. One example may be cited here, the increases of barley in the West North Central States, are explained by the increases in swine, to which a large portion is fed.

With all of these points in mind the appended acreage decreases are listed.

The acreage releases which are attributable to decrease in numbers of horses and mules with examples may be divided roughly as follows:

1. Direct releases from feed crops like corn and hay to surplus crops like cotton, wheat, and tobacco.

2. Feed-crop acreage in cotton territory shifted to cash crops and feed purchased in other States. For example, Mississippi purchased feed grown in Iowa. Increase of Mississippi cash-crop acreage and increase of Iowa feed crop.

3. The release of feed crops previously used for horses and mules for use of other animals. For example, release of corn in Kansas used for horses and mules, to corn used for swine.

4. Decreases of feed-crop acreages previously devoted to growing feed for city horses and mules.

5. Release of plowable pasture to surplus crops. For example, plowable pasture in Texas released for production of cotton and wheat.

6. Decrease of acreage of grain used for horses and mules and increase of grain grown for shipment to other States to supply deficiencies. For example, Illinois.

7. Decrease of feed acreages and increase of minor crops utilized for other purposes. For example, soy beans for oil in Illinois.

Of the possible releases cited only a few can be satisfactorily traced and measured. Tracing the remainder depends upon very complete local knowledge checked from other data and reasoning, together with the use of numerous computations which have been suggested in the preceding pages.

Further complications exist from shifts between cash crops, land going out of cultivation, new ground being broken, fallow or idle ground, etc.

Acreages of the individual crops can not be satisfactorily handled separately but constitute a part of a fairly fixed crop acreage total. This total changes slightly from year to year and is much less affected by conditions than popularly supposed. For example, if for any reason there is a decrease in cotton for

[1] That is, when each was computed on the basis of body weight, food consumption, or other measure, in terms of a basic unit. For example, mature horses, one unit; mature cattle, one unit; mature swine, one-fifth unit (5 swine, 1 unit); pigs, one-tenth unit; mature sheep, one-seventh unit; lambs, one-fourteenth unit; and chickens, one-seventieth unit.

any one year, there is likely to be an opposite or complementary increase in corn, tobacco, hay, peanuts, etc., or if there is a decrease in wheat, there is likely to be an increase in corn, hay, flax, or minor crops. For this reason if there is any violent change in any crop or group of crops, there is ordinarily a change in the opposite direction of one or more of the remaining crops which go to make up the total. Of the violent upsets in agriculture, which have resulted in exceptions to this general rule, crop failure in the Southern States due to the boll weevil and failure of grain acreages in the dry land area, are the two principal recent ones which have left persisting effects over any period of time. Therefore, in ordinary years it may be assumed that a decrease of one crop will result in increase in others.

In studying crop acreages 10 years removed, only the net result of a 10-year period is apparent. In the interim many changes may have occurred and adjustments made which are not possible to trace from census figures. The net effect of great, important changes, however, is very apparent, and with due allowance for the fact that census acreages are *harvested* and not *planted* acreages, the assumption that increases in certain crops have opposite effects on other crops, increases offsetting decreases, will hold good for the 10-year period as well as the changes from year to year. The Census secures figures of crop failure which will, in most cases, enable correction of the difference between planted and harvested acreages for the census year.

TABLE 11.—CHANGES IN CROP ACREAGE IN THE UNITED STATES, BY DIVISIONS AND STATES: 1919–1929

[Decreases in italics]

DIVISION OR STATE	All crops	Selected major crops	Corn (total)	Oats (grain)	All hay	Barley	Mixed grains
United States (net)	**13,396,008**	**2,051,548**	**9,969,140**	**—4,524,977**	**—4,951,989**	**6,417,884**	**1,861,000**
Sum of State decreases	*16,989,221*	*22,536,876*	*6,414,160*	*6,070,917*	*7,788,718*	*255,331*	*134*
GEOGRAPHIC DIVISIONS:							
New England	*609,890*	*694,958*	58,502	*92,777*	*608,974*	*8,768*	4,354
Middle Atlantic	*2,600,045*	*2,793,785*	57,638	*726,768*	*1,285,876*	*27,080*	147,837
East North Central	*5,006,994*	*6,584,467*	1,058,871	*829,674*	*323,299*	194,114	383,729
West North Central	12,373,675	8,948,971	12,952,436	*71,265*	*2,144,707*	5,193,863	1,173,544
South Atlantic	*3,967,368*	*5,534,150*	*2,310,621*	*522,139*	*137,369*	29,822	12,277
East South Central	*1,542,503*	*1,760,889*	*2,245,780*	*431,478*	*56,252*	4,217	3,852
West South Central	6,454,983	5,698,112	*643,135*	*1,691,705*	*563,117*	109,383	38,973
Mountain	7,709,535	6,069,336	1,048,530	40,497	733,957	864,760	61,971
Pacific	584,615	*1,296,622*	*7,301*	*199,668*	*566,352*	57,573	34,463
NEW ENGLAND:							
Maine	*224,486*	*327,418*	5,329	*12,570*	*307,567*	*1,886*	2,177
New Hampshire	*131,423*	*132,525*	1,621	*11,542*	*119,804*	*703*	*47*
Vermont	*71,130*	*38,189*	38,381	*49,974*	*12,455*	*5,365*	2,113
Massachusetts	*85,909*	*101,359*	8,904	*8,192*	*96,077*	*446*	79
Rhode Island	*6,869*	*10,775*	765	*913*	*10,136*	*129*	----------
Connecticut	*90,073*	*84,692*	3,502	*9,586*	*62,935*	*249*	32
MIDDLE ATLANTIC:							
New York	*1,148,234*	*1,266,598*	237,548	*379,091*	*890,839*	*40,175*	129,607
New Jersey	*219,126*	*239,842*	*64,289*	*38,872*	*63,247*	220	1,014
Pennsylvania	*1,232,685*	*1,287,345*	*115,621*	*308,805*	*331,790*	12,875	17,216
EAST NORTH CENTRAL:							
Ohio	*1,472,725*	*1,865,826*	*90,209*	90,522	*401,176*	*28,097*	18,808
Indiana	*1,469,005*	*1,934,854*	*236,469*	*67,593*	*94,345*	*41,595*	21,897
Illinois	*1,064,734*	*1,852,206*	666,223	*434,849*	*97,131*	193,111	90,656
Michigan	*1,252,868*	*1,608,624*	*71,721*	*320,569*	*143,448*	*80,720*	40,562
Wisconsin	252,338	677,043	791,047	*107,185*	412,801	151,415	211,806
WEST NORTH CENTRAL:							
Minnesota	2,174,428	1,823,048	1,977,738	269,189	406,602	1,187,068	703,162
Iowa	2,213,952	1,845,313	2,040,806	352,013	*2,040*	365,127	167,711
Missouri	*2,132,360*	*2,806,383*	*1,034*	*700,261*	803,325	737	17,285
North Dakota	1,914,309	898,658	813,180	*337,701*	*814,783*	1,749,620	91,641
South Dakota	3,301,098	2,508,519	2,338,575	432,810	*1,068,686*	1,306,207	95,230
Nebraska	2,496,251	2,280,186	2,816,744	287,526	*477,455*	431,914	79,339
Kansas	2,405,997	2,399,630	2,966,427	*374,841*	*991,670*	153,190	19,176
SOUTH ATLANTIC:							
Delaware	*46,620*	*67,800*	*37,600*	*2,874*	*6,212*	117	*83*
Maryland	*214,652*	*294,009*	*120,377*	*7,157*	*15,088*	5,944	798
District of Columbia	*520*	*104*	6	*14*	*66*	----------	----------
Virginia	*554,567*	*723,305*	*351,126*	*81,504*	68,992	4,282	1,433
West Virginia	*227,970*	*430,762*	*133,793*	*107,058*	18,157	*427*	1,209
North Carolina	45,404	*111,371*	*326,351*	*76,054*	71,988	18,061	3,188
South Carolina	*1,183,790*	*1,272,711*	*361,425*	*101,919*	*125,804*	1,285	3,263
Georgia	*2,054,316*	*2,464,398*	*837,553*	*129,474*	*122,749*	697	2,473
Florida	269,663	*169,690*	*142,402*	*16,085*	*26,592*	*137*	*4*
EAST SOUTH CENTRAL:							
Kentucky	*956,048*	*1,204,300*	*403,945*	*183,498*	201,312	*641*	1,079
Tennessee	*696,121*	*861,690*	*484,800*	*131,757*	*54,214*	5,321	1,645
Alabama	*112,421*	60,298	*698,822*	*73,099*	*85,630*	483	889
Mississippi	222,087	244,803	*658,213*	*43,124*	*117,720*	20	239
WEST SOUTH CENTRAL:							
Arkansas	91,698	*74,106*	*426,356*	*140,923*	*122,269*	*132*	766
Louisiana	186,718	225,908	*315,611*	*25,727*	*35,368*	*317*	461
Oklahoma	438,251	219,381	596,740	*810,232*	*262,261*	*6,250*	14,774
Texas	5,738,316	5,326,929	*497,908*	*714,823*	*143,219*	116,082	22,972
MOUNTAIN:							
Montana	4,066,706	3,582,358	115,134	41,362	468,590	214,013	33,951
Idaho	476,555	189,981	8,567	*17,271*	*19,136*	65,545	7,449
Wyoming	856,318	713,361	120,344	72,504	239,453	126,787	6,657
Colorado	1,708,518	1,191,596	775,902	*11,971*	*19,167*	451,252	9,051
New Mexico	365,563	264,277	21,190	*19,201*	*50,134*	*1,188*	1,263
Arizona	58,630	*9,372*	5,734	*8,595*	*31,158*	*13,618*	724
Utah	169,756	133,219	555	*16,345*	134,372	22,128	2,505
Nevada	7,489	3,916	1,104	14	11,137	*159*	371
PACIFIC:							
Washington	*340,569*	*515,290*	*2,244*	70,706	*186,020*	*32,624*	5,930
Oregon	58,451	*106,740*	31,234	70,736	*71,524*	11,764	20,091
California	866,733	*674,592*	*36,291*	*58,226*	*308,808*	78,433	8,442

[1] Not included in total of selected major crops.

TABLE 11.—CHANGES IN CROP ACREAGE IN THE UNITED STATES, BY DIVISIONS AND STATES: 1919–1929—Continued

DIVISION OR STATE	Sorghum	Wheat	Cotton	Tobacco	Rye	Corn (grain) [1]	Tame hay [1]
United States (net)	−488,061	−11,099,513	9,487,382	26,885	−4,646,203	−4,610,077	−1,342,180
Sum of State decreases	1,231,445	16,766,967	1,972,546	285,617	4,646,436	11,360,241	5,074,886
GEOGRAPHIC DIVISIONS:							
New England	262	29,120		8,761	9,152	86,179	575,956
Middle Atlantic	5,648	693,756		4,549	255,583	708,940	1,248,413
East North Central	15,603	5,336,014	1,613	34,339	1,683,365	2,694,183	101,711
West North Central	240,928	5,787,310	245,320	1,411	2,373,393	4,976,187	1,211,221
South Atlantic	60,807	1,098,495	1,651,536	253,532	48,814	2,778,796	109,080
East South Central	652	1,078,965	2,247,315	178,433	24,713	2,631,465	60,226
West South Central	137,812	187,459	8,200,991	804	77,745	1,102,640	522,915
Mountain	196,427	3,394,265	230,929	18	109,164	525,416	593,418
Pacific	105,546	657,577	212,750	690	64,274	109,477	528,568
NEW ENGLAND:							
Maine	34	12,759			176	5,391	297,373
New Hampshire	116	1,348		8	594	8,215	112,905
Vermont	44	10,618		60	385	15,588	5,428
Massachusetts	147	1,704		1,014	2,762	20,903	91,731
Rhode Island	5	90			277	5,472	9,856
Connecticut	82	2,601		7,815	4,958	30,610	58,663
MIDDLE ATLANTIC:							
New York	884	224,587		1,789	96,388	209,631	867,390
New Jersey	322	31,318		1	43,027	102,979	57,888
Pennsylvania	4,442	437,851		2,759	116,168	396,330	323,135
EAST NORTH CENTRAL:							
Ohio	4,609	1,358,852		26,214	65,999	651,928	400,921
Indiana	5,791	1,265,626		3,087	252,245	781,454	81,593
Illinois	3,942	2,009,636	1,613	666	257,585	134,315	55,951
Michigan	95	266,542		9	766,272	691,771	124,633
Wisconsin	1,356	435,358		4,863	341,264	434,715	561,387
WEST NORTH CENTRAL:							
Minnesota	4,891	2,478,645		840	238,015	481,807	742,411
Iowa	17,346	1,016,554		43	44,361	676,859	271,231
Missouri	46,232	3,031,459	242,872	549	92,165	729,267	827,237
North Dakota	1,113	871,328		1	1,473,513	53,632	113,349
South Dakota	10,090	352,148			233,379	737,045	280,415
Nebraska	147,810	594,189			115,883	1,890,515	109,014
Kansas	13,446	814,357	2,448	66	176,077	1,972,860	687,710
SOUTH ATLANTIC:							
Delaware	25	20,005		3	1,115	41,329	7,421
Maryland	1,975	157,796		4,424	2,787	155,972	11,759
District of Columbia	2	18			10	293	66
Virginia	5,098	333,538	41,414	53,370	14,795	451,810	73,127
West Virginia	2,430	193,754		4,052	8,614	158,235	23,765
North Carolina	12,586	268,025	266,697	226,063	14,352	419,046	91,136
South Carolina	6,679	32,492	658,491	9,356	195	414,478	130,565
Georgia	29,570	92,841	1,314,055	65,103	6,429	960,359	123,150
Florida	2,447	26	12,899	6,011	907	177,279	24,097
EAST SOUTH CENTRAL:							
Kentucky	17,900	635,856	10,543	165,320	10,074	602,524	208,428
Tennessee	8,502	404,612	237,281	8,588	13,464	607,934	49,047
Alabama	15,379	32,493	938,344	2,888	899	742,882	103,473
Mississippi	10,371	6,004	1,061,147	1,637	276	678,125	116,134
WEST SOUTH CENTRAL:							
Arkansas	35,934	239,676	892,674	390	1,866	535,151	125,302
Louisiana	1,492	751	602,020	327	36	335,272	38,889
Oklahoma	537,782	126,722	1,415,266	45	64,107	440,232	212,434
Texas	710,036	554,608	5,291,031	42	11,808	672,449	146,290
MOUNTAIN:							
Montana	1,795	2,720,057			8,954	3,342	281,802
Idaho	199	153,280			8,254	3,566	6,518
Wyoming	897	158,903			12,184	37,422	145,721
Colorado	154,688	210,298		1	69,080	509,489	30,339
New Mexico	4,811	184,623	126,034	19	3,140	10,666	80,338
Arizona	45,673	21,688	104,895		2	4,644	29,763
Utah	144	2,758			7,382	6,554	146,784
Nevada	76	8,455			172	593	42,355
PACIFIC:							
Washington	574	199,118		1	29,935	24,878	186,818
Oregon	721	4,810		2	22,040	7,112	78,325
California	104,251	453,649	212,750	693	12,299	77,487	262,925

SUCCESSION CROPS

Improved farm management has resulted in the more complete utilization of land by succession crops, i. e., crops which follow other crops, both of which are harvested within the one calendar year. These crops introduce rather serious complications in any allotment of acreage based on the decrease of the number of horses and mules. For example, wheat may be followed by cotton in a very large part of the territory or by cow peas, soy beans, and other legumes cut for hay. The same is true of other small grain crops. Complications introduced by these crops are as follows: 1. A cash crop followed by a cash crop. 2. A cash crop followed by a feed crop. 3. A feed crop followed by a feed crop. 4. A feed crop followed by a cash crop.

If we were attempting to trace an acreage of a feed crop such as corn which had decreased in correspondence with the decrease in horses, we might have twice that acreage devoted to the surplus or cash crops, because each of those crops could be used as succession crops. In this case the surplus traceable to horses would be twice that where only one crop could be grown in the season. This very serious complication has arisen in the northern third of the Cotton Belt, extending from North Carolina to the Panhandle of Texas, where it is a common practice to follow small grain by cotton. The same principles apply to acreage of plowable pasture which may have been put into succession crops. This also is very important in the case of northwest Texas and western Oklahoma where millions of acres of plowable pasture have gone into wheat and cotton in the last decade, a part of which were grown as succession crops.

Where a cash crop, such as wheat, is followed by a feed crop, such as hay, it tends to diminish the amount of feedstuffs attributable to the decrease in horses and mules and thus upsets the attempt to directly trace the changes and serves to obscure the essential truth of our basic theory.

Where a feed crop is followed by a feed crop it acts in a similar manner to obscure the acreage allotments. The relative importance of this factor may be realized from the acreage of legumes, of which there are about 10,000,000 acres, the major portion of which are grown as succession or companion crops.

COMPANION CROPS

Most companion crops, i. e., crops grown with other crops such as peanuts and velvet beans with corn, do not have very much direct bearing upon the horse situation except as they affect the needs of other classes of livestock because the nuts and velvet beans are not very often fed to horses. A very large number of cattle and hogs, however, are fattened upon these legumes grown in corn, and interplanted crops must be taken into consideration in any animal unit computations, particularly in the Cotton Belt.

CORN FODDER

A very serious difficulty is introduced by fodder pulled or cut from acreage of corn from which grain is harvested. This is very different from corn cut for fodder secured by the Census which was distinctly limited in the inquiry to that corn from which no grain was secured. The practice of pulling fodder or topping corn is quite general in all of the Southern States and occasional fields of corn which has been topped, or from which the fodder has been pulled, may be seen even in the States of the Corn Belt. The proportion of the total roughage in the cotton States represented by corn fodder is so great as to materially affect any deductions that may be made from any corn or hay figures. For all of these reasons the tables presented must be considered *hypothetical approximations* rather than relatively exact allotments which they might appear to be, if full

understanding of conditions were not stated. Therefore the acreages which have been indicated as traceable depend chiefly upon the inescapable logic that feed requirements not now necessary for the reduced number of horses and mules have made available acreages for cash crops or for producing feed for other animals.

THE NUMBER OF ACRES REQUIRED TO PRODUCE FEED FOR EACH WORK ANIMAL

Several different approaches might be used in the effort to determine the acreage required to produce feed for each horse and mule. 1. The theoretical amount required on the basis of body weight and the acreage required to produce such feed. 2. The acreage indicated by dividing the total number of acres of feed crops by the total number of work animals. 3. Same on basis of all animal units. 4. Deductions from amount of grain produced, amount of grain sold and the number of animals on hand in territory where all feed is produced on farms.

The terms "standard ration" and "maintenance ration" are used for convenience in describing the amount of grain or hay used in computing the amount required per animal.

Standard ration.—The standard ration might be more accurately described as a light working ration, and is computed on a basis of 11 pounds of grain daily to each thousand pounds of body weight. The horses and mules are computed, for convenience, at 1,000 pounds per animal, although this may vary, in different sections from as little as 800 pounds to more than twice that amount for individual horses and from 850 to about 1,350 as averages. The figure used was intended to be an extremely conservative one. The ration for heavy work, of course, would be very much greater and the ration for heavier animals would be, likewise, greater.

Maintenance ration.—The maintenance ration is a theoretical allowance necessary to keep animals that are not working in a good, thrifty condition. It is to be noted that a maintenance ration of grain may be used with a standard ration of hay when the animal is not working. A common practice is to feed a small amount of grain and as much hay as the animal will eat. Usually the amount of grain fed in the maintenance ration is, very roughly, half of that of the standard or light working ration. In computing the acreage required to feed horses and mules the yearly requirement in pounds of grain was first computed from the above rations and this was converted into bushels, and the total number of bushels of grain divided by the average yield for crops (United States Department of Agriculture), to secure the average acres required or theoretically necessary to support an animal a year on this basis. Similar computations were made for the hay required daily, 12 pounds per thousand pounds of body weight was the basis used. In the case of city horses and mules however, it is to be noted that we have rigidly used our so-called standard ration because of the fact that the city horses and mules are generally at work and have no long off season such as occurs on the farm after the farm work is done.

The figure selected to represent the pounds of grain needed per thousand pounds of body weight was one that conformed well to various grain rations (Extension Service Handbook, Department of Agriculture). If there be any difference of opinion as to amount it can be varied as desired. The net effect will be merely to show slight increases or decreases of the acreage released in accordance with the judgment of the reader. A change of a pound or two would of course affect our acreage figure several per cent but it would not affect the validity of the conclusions. The same rough adjustment can be made to meet the individual judgment of the varying weight of work animals. This will also affect the detail somewhat but will not materially affect the conclusions. In most cases, as

the figures used represent the minimum, it would strengthen the conclusions which have been drawn.

Following this procedure, on the basis of a standard ration, the amount of grain required per animal per year would be: 125.5 bushels of oats or 71.7 bushels of corn, or 83.6 bushels of barley; and of hay, 2.2 tons. On the basis of a maintenance ration, one-half of the above amounts would be required. The 10-year average yield per acre used was 29.6 bushels for oats, 28.2 bushels for corn, 22.8 bushels for barley, and 1.3 tons for hay. The acre requirement per animal worked out on this basis was 4.2 when fed oats, 2.5 when fed corn, 3.7 when fed barley. For the hay portion of the ration, 1.7 acres. See Table 9 for the hypothetical acreage which would be released if work animals were fed upon the specified grain and hay.

Working back from a theoretical feeding requirement on the basis of a standard working ration it would require approximately an average for the United States of 5.9 acres per animal if fed on oats and hay or 4.2 acres if fed on corn and hay or 5.4 acres if fed on barley and hay, these acreage requirements being based on the average yield of the various grains. On the maintenance basis only about one-half as much acreage would be required. The acreage needed in certain States with low yields per acre, of course would be very much greater than United States averages, for example the same basis of computation would require 10.8 acres per animal in Georgia on a ration of oats and hay, or 9.2 acres on a ration of corn and hay. The requirements would also be materially greater in the States where the work animals are heavier than 1,000 pounds. For example, if the average weight of animals were 1,200 pounds instead of 1,000 pounds it would require one-fifth more feed and consequently one-fifth more acreage than upon the basis computed.

On a maintenance ration, grain with sufficient hay, the acreage required would be approximately half of the acreage previously indicated. The maximum acreage which would be required would be very closely indicated by dividing the total number of acres of regular feed crop by the number of work animals. This would indicate a maximum acreage from 7.3 to 7.8 depending upon whether 1909 or 1919 totals be used in the computations. The amount of specified grains which are fed to other animals would necessarily reduce the maximums indicated, or feeding horses other crops than those indicated would likewise affect results. Satisfactory data of the acreage actually required for a work animal in the United States are not available. Theoretically the same method used for setting the upper limit could be worked out from the total animal units and an apportionment made of the amount necessary for horses and mules. This is unsatisfactory on account of the pasturage of the major portion of the other animals, cattle, sheep, and swine.

CHAPTER V.—EFFECTS OF DECREASE OF HORSES AND MULES ON SPECIFIED CROPS, CLASSES OF LIVESTOCK, AND PLOWABLE PASTURE

The general effects on feed crops, other crops, and pasture, resulting from the reduction in the number of horses and mules, of the relative decreases and the general aspects of the situation, have been covered in the previous pages. In this chapter the specific changes which have occurred in the acreage of various feed crops and the increases or changes in the surplus crops and livestock, will be considered. The procedure adopted was as follows: The decreases in the number of work animals and the decreases in the acreage of various feed crops were listed, and the theoretical minimum requirements, i. e., the maintenance rations, were worked out for the number of animals represented by the decreases.

Similar computations were also made on the basis of standard ration. The method was based on the assumption that oats were primarily a horse feed and disposition was made of the oats before utilization of corn was computed.

The number of horses and mules that could be fed by the production of the acres representing the decrease in the acreage of oats was then computed and the number of horses and mules which the oats would not take care of was assumed to have been fed corn for the grain ration. A similar procedure was adopted in the case of hay as for oats. A total was then obtained of the acreage of oats utilized, the acreage of corn utilized, and the acreage of hay utilized to secure a total of the acreage theoretically made available by the decrease in horses and mules when computed on the basis of the maintenance ration. The remaining decreases in acreage which could not be explained directly upon this basis were listed in a separate column and those acreages accounted for separately in the changes of the specific crops.

In this way two figures representing the decreases were secured—the one which was the decrease directly traceable to the decrease in the horses and mules, and the other which represented the decreases or changes in the acreage of the feed crops not directly traceable to the decreases in the horses and mules. Or, in other words, two figures were secured, one of which explained the local changes and the second, or residue figure, which must be explained by interstate shipments, sales and purchases, or other crop shifts or which could be explained upon the basis of feeding heavier rations than that which was used for the basis of computations. It may be pointed out, for example, that if the standard work ration be used as the basis of computation, very roughly twice the acreage which we have computed by the methods outlined above, could be accounted for. The fact should be continually borne in mind that the endeavor of this study is to show, on the most conservative basis possible, the directly traceable effects of these feed-crop decreases upon the great cash crops and surpluses.

The next step in the procedure was to take the minimum acreage directly traceable and to determine to which crops it was devoted. For example, of approximately 3,500,000 acres of feed crops directly traceable to the decrease in horses and mules, approximately 2,500,000 acres can be shown rather conclusively to have been devoted to cotton, with a small amount to tobacco. Of the decrease in feed crops directly traceable to the decrease in horses and mules about half a million acres in Georgia represent acreage that has gone out of cultivation on account of the boll weevil and has not gone into cotton or tobacco. The remaining acreage released by horses and mules not directly traceable, but a large portion

of which has gone into the cash crops, is listed in a separate column. These acreages were then apportioned according to the indicated crop changes necessary to balance the State acreages in the various crops.

Because of the use of the maintenance ration as a basis, a wide latitude must necessarily be allowed in handling such acreages, particularly in view of the fact that the traceable acreage represents a minimum. Further, that such a conservative basis will explain approximately only about half as much acreage change as would be explained if the heavier standard ration basis had been used in the computation. Even under those conditions, however, the traceable acreage is sufficient to have produced the present surpluses of cotton and flue-cured tobacco (the type of tobacco of which there is the greatest exportable amount) which have accumulated during the last decade. The 2,500,000 acres, explainable in cotton acreage derived from feed crop acreage released on account of the decrease in horses and mules, are sufficient with an average yield to produce a million bales of cotton each year, in excess of what would have otherwise been produced. This in the course of the decade would have built up the present surplus of American cotton.

A table is appended which indicates the result worked out upon this basis for the major cotton States. Moreover, the hypothetical figures indicated for the increase of tobacco, due to the released acreage in feed crops by the decrease of horses and mules, are sufficient to entirely account for the surplus in flue-cured tobacco which has occurred. This surplus has occurred in spite of the tremendous increase in the consumption of cigarettes, which took place between 1920 and 1930, which are made principally of the flue-cured tobacco. This type of tobacco also constitutes one of the principal portions of the United States export surplus of tobacco.

Tobacco also is similar to cotton in that it can be stored from year to year, and the result is that stocks of this crop can be built up gradually. While the amount unused may be small in any one year, under current conditions such yearly surpluses tend to become cumulative.

As will be noted from the preceding table, there was an actual decrease in oats, corn, and hay of 8,902,011 acres in the main cotton belt. Of this amount 3,510,215 acres were directly traceable to the decrease in horses and mules, leaving a balance of 5,391,796 acres. Of the 3,510,215 acres traceable to the decrease in horses and mules, 2,431,733 acres have gone into cotton, but 3,340,297 acres have gone into cotton due to the decrease in corn, oats and hay which were not directly explainable as being due to the change in the number of work animals (computed on maintenance ration basis but which could be explained on the basis of standard ration). There is little doubt, from the study of the State detail, that the major portion of the decreases in the feed crops in the Cotton Belt have gone into cotton with the exceptions indicated in the table. In fact, in studying the individual State acreages as a whole, there is no other way in which they can be explained. It is to be noted also that all wheat acreage decreased in the selected cotton States, with the exception of Texas, during the 10-year period, 1919 to 1929, which was a natural readjustment after the war. Most of these wheat acreages went back to cotton with the exception of North Carolina, where apparently some went into tobacco.

Cotton.—In North Carolina, during the decade, there was a decrease of 495,100 acres in oats and corn. Of this, 196,564 acres are traceable to the decrease in horses and mules when computed on the maintenance ration basis, leaving a balance of 298,536 acres to be accounted for. Actual increases occurred in cotton of 266,697 acres and in tobacco of 226,063 acres, which would utilize the major portion of the oats and corn acreage which has disappeared. However,

the decrease of 268,025 acres of wheat must be accounted for and indications are that part of this went into cotton, part into tobacco, and part into other crops.

In South Carolina and Georgia the conditions vary from other portions of the cotton belt and the situation is very similar in the two States. Due to the tremendous damage done by the boll weevil to cotton during the decade, 1919–1929, 55,134 farms in Georgia went out of cultivation and 34,762 in South Carolina. The recorded decrease of acreage in Georgia in oats, corn, and hay was 1,212,582 acres and in cotton 1,314,055 acres. In South Carolina the decrease in oats, corn, and hay was 642,196 acres and in cotton, 658,491 acres. In other words, most of the acreage released by the decrease of feed crops did not go into cotton but largely represented the discontinuance of farms that formerly grew the acreage of feed crops and cotton just mentioned. However, to a very small extent some of this acreage was shifted to tobacco and minor crops. A portion of the increase of tobacco acreages in these States must be allotted to new ground and to shifts from cotton.

Alabama offers a particularly good indication of change with 901,611 acres representing the actual decrease of oats, corn, and hay. Of this 180,733 is attributable to the release of acreage required by the horses and mules which have disappeared, leaving the balance of the decrease, 720,878 acres. These acreages taken together appear to have been shifted directly to cotton, the acreage of which showed an actual increase of 938,344 acres. A very great increase of cotton acreage will be found in the States of Mississippi, Arkansas, Louisiana, and Oklahoma, in all of which a very material portion of the acreage decrease in feed crops, due to decline in numbers of horses and mules, can be accounted for by a direct transfer to cotton. The very heavy decreases emphasize a point to be remembered in these States.

While the hypothetical release of crop acreage due to the decrease of horses and mules has resulted in many instances in a decrease in feed acreages, planters in some areas are not growing their own grain and this results in a very heavy importation from the grain-producing States to feed the work animals engaged in producing cotton. This change will help to explain the increase in corn acreage in such States as Iowa and Kansas, and the increase in oat acreage in Nebraska and Iowa, which otherwise could not be accounted for. In other words, the decrease of oats, corn, and hay acreages in the cotton belt, aside from those which can be closely allotted, call for corresponding increases in feed grains in the major surplus producing States. This is another way of saying that a great many cotton growers, ceasing to grow their own grain, have put the acreage in cotton, and are now buying their grain from the North.

In Texas the situation was entirely different from other cotton States. Although there was a decrease in the total number of horses and mules, there was a slight increase in work animals, so that only a small portion of the cotton increase can be directly explained on this basis. The great increase in cotton was derived from two sources, first from an enormous shift from the feed crops to cotton, in a way somewhat similar to that which took place in the rest of the cotton belt, and second from the development of vast areas of new land and of land which was previously in plowable and other pasture.

Unfortunately, increased acreage in cotton has had far reaching effects, in addition to the surplus of lint cotton which has been built up in recent years. Most important of these secondary effects arise from the exceedingly valuable and important products of cottonseed. These products are four in number, oil, cottonseed meal, cottonseed hulls, and linters. The oil is used very largely in the manufacture of shortening and cooking compounds and other purposes for which oils are used. These compounds come into almost direct competition with lard which is one of the the principal surpluses or export products.

The cottonseed meal is one of the highest concentrates and one of the most valuable cattle feeds. Its nutritive ratio is very high and the actual feeding value derived from an acre is equal to about half that of the corn that could be grown upon the same land. Cottonseed meal is also used as a fertilizer furnishing ammonia in a cheap and satisfactory form. This phase of cotton production, i. e., secondary use of the seed as a feed crop, is usually entirely overlooked and the vast expansion of cotton acreage has very greatly affected the Nation's supply of feedstuffs. Very large amounts of cottonseed meal and cottonseed cake are exported which should be considered with surpluses.

Cottonseed hulls are quite generally used for feeding cattle in the South where they often take the place of other roughage. They must be taken into consideration in all feeding calculations.

The fourth by-product of cotton, (the linters) or very short lint which is combed from cottonseed after the lint has been taken off in the gin, has become of considerable importance in recent years. It is used principally for three purposes, first, for gun cotton for which it is better adapted than cotton of the usual staple, second, for the manufacture of rayon, and third, in the manufacture of mattresses. Its effects on the surplus will be considered later.

Tobacco.—Tobacco is included in the table of the selected cotton States because most of the acreage shift in tobacco which is attributable to change in horses and mules occurred in the cotton States, particularly in the type of tobacco known as "bright leaf" or "flue-cured" tobacco.

In North Carolina, a very large portion of the increase of 226,000 acres in the State's flue-cured tobacco might be attributable to the release of acreage caused by the decrease in the number of work animals. However, much of it might be explained by a shift from wheat. In respect to tobacco, Georgia and South Carolina again offer similarities. A considerable portion of the increased acreage might be accounted for by the release of feed crop acreages, but some necessarily results in shifts from cotton and in the use of new ground.

TABLE 12.—DECREASE IN HORSES AND MULES ON FARMS, 1920–1930, AND HYPOTHETICAL RELEASE OF ACREAGE OF SELECTED FEED CROPS, WITH RESULTANT INCREASES IN COTTON AND TOBACCO, IN MAIN COTTON BELT, 1919–1929

[Decreases in italics]

	Decrease in horses and mules 1920–1930 (number)	ACTUAL DECREASE IN ACREAGE OF OATS, CORN,[2] AND HAY			COTTON			TOBACCO			Changes in total crop acreages 1919–1929 [1]
		Total [3]	Acreage traceable to decrease in horses and mules	Balance	Change in acreage 1919–1929	Acreage traceable to decrease in horses and mules	Additional acreage probably due to decrease in horses and mules	Change in acreage 1919–1929	Acreage traceable to decrease in horses and mules	Additional acreage probably due to decreases in horses and mules	
Total	*920,804*	*8,902,011*	*3,510,215*	*5,391,796*	8,744,813	2,431,733	3,340,297	292,616	120,470	186,063	2,945,489
North Carolina	*46,981*	*495,100*	*196,564*	*298,536*	266,697	146,564	120,133	226,063	50,000	176,063	45,404
South Carolina	*78,289*	*642,196*	*329,114*	*313,082*	*658,491*			9,356	9,356		*1,183,790*
Georgia	*115,896*	*1,212,582*	*470,639*	*741,943*	*1,314,055*			65,103	55,103	10,000	*2,054,316*
Florida	*18,400*	*219,956*	*81,620*	*138,336*	12,899	12,899		6,011	6,011		269,663
Tennessee	*176,489*	*793,905*	*397,289*	*396,616*	237,281	237,281		*8,588*			*696,121*
Alabama	*29,627*	*901,611*	*180,733*	*720,878*	938,344	180,733	718,204	*2,888*			*112,421*
Mississippi	*51,046*	*838,969*	*218,990*	*619,979*	1,061,147	218,990	594,142	*1,637*			222,087
Arkansas	*75,348*	*798,343*	*326,848*	*471,495*	892,674	326,848	471,495	*390*			91,698
Louisiana	*39,477*	*396,367*	*125,685*	*270,682*	602,020	125,685	270,682	*327*			186,718
Oklahoma	*254,105*	*1,072,491*	*1,024,576*	*47,915*	1,415,266	1,024,576	47,915	*45*			438,251
Texas	*35,146*	*1,530,491*	*158,157*	*1,372,334*	5,291,031	158,157	1,117,726	*42*			5,738,316

[1] Acreage in 1929 includes all crops except gardens, nurseries, flowers grown in the open, and duplicated acreage of legumes saved for hay or planted with other crops. Acreage in 1919 does not include acreage of land in orchards, nurseries, etc., clover, timothy, and other grass seeds, corn for fodder, etc. See text for complete discussion.

[2] Corn for grain.

[3] Sum of decreases only.

TABLE 13.—DECREASE IN HORSES AND MULES ON FARMS, 1925–1930, AND HYPOTHETICAL RELEASE OF ACREAGE OF SELECTED FEED CROPS, WITH RESULTANT INCREASE IN WHEAT, IN THE WHEAT STATES (EXCLUDING COTTON BELT) 1924–1929

[Decreases in italics]

	Decrease horses and mules 1925–1930 (number)	ACTUAL DECREASE 1924–1929 IN ACRES OF OATS, CORN,[1] AND HAY			WHEAT			Changes in acreage of crop land harvested (1924–1929)
		Total[2]	Acreage traceable to decrease in horses and mules	Balance	Changes in acreage 1924–1929	Acreage traceable to decrease in horses and mules	Additional acreage probably due to decreases in horses and mules	
Total	*2,674,702*	*11,286,688*	*4,898,201*	*6,388,487*	8,461,487	1,802,529	1,886,575	8,349,515
New York	*120,956*	*1,285,629*	*471,729*	*813,900*	*74,918*			*1,331,399*
Pennsylvania	*100,440*	*671,123*	*318,233*	*352,890*	*126,718*			*695,804*
Ohio	*136,540*	*702,585*	*273,080*	*429,505*	*254,782*			*587,390*
Indiana	*131,475*	*433,054*	*262,950*	*170,104*	*72,086*			*401,931*
Illinois	*243,362*	*907,736*	*709,976*	*197,760*	*156,986*			*797,110*
Michigan	*100,232*	*678,295*	*400,928*	*277,367*	*2,820*			*763,682*
Wisconsin	*57,396*	*315,691*	*103,313*	*212,378*	*21,051*			80,308
Minnesota	*26,970*	*848,393*	*51,243*	*797,150*	*328,925*			515,602
Iowa	*144,343*	*305,577*	*129,909*	*175,668*	*24,939*			809,518
Missouri	*186,822*	*800,144*	*326,477*	*473,667*	94,083	94,083		*544,627*
North Dakota	*120,744*	*930,403*	*352,112*	*578,291*	1,646,312	352,112	578,291	1,377,428
South Dakota	*90,898*	*1,078,441*	*286,328*	*792,113*	1,174,873	286,328	792,113	2,063,191
Nebraska	*129,061*	*644,219*	*83,890*	*560,329*	692,750	83,890		1,588,978
Kansas	*325,116*	*827,427*	*421,067*	*406,360*	2,364,099	421,067	406,360	1,926,743
Maryland	*24,294*	*63,846*	*40,972*	*22,874*	21,840	21,840		*35,898*
Virginia	*64,917*	*2,935*	*2,935*		57,817	2,935		6,737
West Virginia	*32,779*	*51,099*	*32,779*	*18,320*	*7,037*			*21,190*
Kentucky	*101,027*	*109,969*	*109,969*		19,963	19,963		147,119
Montana	*146,208*	*280,988*	*280,988*		1,315,709	280,988		355,004
Idaho	*27,069*	*36,643*	*36,643*		485,371	36,643		1,424,644
Wyoming	*27,443*	*6,735*	*6,735*		204,070	6,735		571,298
Colorado	*45,030*	*36,124*	*36,124*		232,706	36,124		435,126
New Mexico	*53,352*	*45,499*	*43,550*	*1,949*	112,166	43,550	1,949	801,961
Utah	*19,741*	*3,940*	*3,940*		71,159	3,940		148,293
Washington	*63,839*	*174,005*	*66,143*	*107,862*	548,389	66,143	107,862	135,324
Oregon	*50,580*	*46,188*	*46,188*		215,700	46,188		314,105
California	*104,068*				274,242			827,167

[1] Corn for grain.
[2] Sum of decreases only.

Wheat.—Wheat offers a very much more difficult and intricate problem due to the very great increase in wheat during the war and the various readjustments of acreage which have occurred since. As previously mentioned, the war time wheat acreage encroached on practically all other crops, including the acreage released in the previous decade which was formerly required to feed city horses and mules. From 1919 to 1924 the acreage in wheat decreased from 73,099,421 acres to 50,862,230 acres. From 1924 to 1929 the acreage again increased, largely at the expense of the acreage of corn, hay, and oats, or those crops which were no longer necessary to feed the decreased number of horses and mules. If the same method which was followed with cotton be followed with wheat, for the period *1924 to 1929*, it will be found that about 1,800,000 acres could be explained on the hypothesis which we are following. This acreage figure would be derived principally from North and South Dakota, Kansas, and Montana. Most of the important wheat States followed the same trend, with the exception of the Middle Atlantic and East North Central States. The decrease in Wisconsin, Minnesota, and Iowa can probably be accounted for by shifts from wheat to corn for grain.

Of course different results in the allocation and disposition of the various crops might be arrived at by each independent observer, and the hypothetical acreages

shown in the table appended are intended to be merely indicative of probabilities. Due allowances, of course, must be made for increases and decreases in idle land, plowable pasture, and wild hay, as well as for new farms which have come into operation and old farms which have gone out of cultivation and which are not now recorded by the Census.

Rye.—Rye, a surplus crop during the war, has declined with the ceasing of the pressing foreign demand for breadstuffs. It is no longer a surplus crop, but it represents an added part of the wheat problem. Fortunately a large part of the readjustment in rye was taken care of by barley, especially in the West North Central States.

Sorghums.—Very heavy decreases in the acreages of sorghum have released acreages for cotton and wheat in Oklahoma and Kansas, respectively. A part of this release may be attributed to the decreases in horses and mules. In Oklahoma probably the entire amount was absorbed by the increased acreage of wheat or cotton, but the proportion to be allocated to each of those crops is somewhat in doubt. A similar situation is found in Kansas where there was a decrease of 362,649 acres, a large part of which doubtless went into wheat, and approximately these amounts should be added to the acreage of feed crops diverted to cash or surplus crops in endeavoring to determine the net effect the decreases of horses and mules had upon those surpluses.

Hay.—Some differences of opinion, particularly as regards local differences, are encountered in the case of hay. Wild hay especially introduces serious complications, as a large proportion of this hay is fed to range animals. Formerly an appreciable portion of it was shipped to stockyards so that changes in wild hay acreage are not as closely related to changes in work animals as in the case of tame hay. Among the tame grasses, timothy is the principal source of hay for the use of horses and mules. Timothy has shown a very material decrease which can logically be attributed to the decrease in horses and mules. On the other hand, there has been a very heavy increase in alfalfa, which has tended to somewhat obscure the hay situation. This can probably be accounted for because of the fact that in many States alfalfa is fed principally to cattle and sheep. Hogs also may account for considerable acreage, particularly where the practice is to graze hogs on alfalfa.

Cattle.—Decreases in the total number of cattle since 1920 are due principally to the decrease in beef cattle. The difference in the date of enumeration makes it difficult to draw any very exact comparison of numbers, due to the necessary inclusion of calves, and to the fact that no satisfactory statistics are available showing the number of animals which were marketed between January 1 and April 1, or the number that died during that period. Cows and heifers kept mainly for milk production have increased during the decade partially offsetting the decreases in other cattle. The increases in the number of milk cows and the increased consumption per animal, which is generally believed to accompany the increasing production of milk per animal, materially affected the hay acreages. Dairy cows consume very large quantities of alfalfa hay, the production of which has increased. They also probably consume enough timothy to affect conclusions drawn from changes in timothy acreage.

Sheep.—The total consumption of grain and hay by sheep is very difficult to determine because a very large proportion of sheep are raised on the range and the feeding of grain or hay varies from practically nothing in some range areas to material quantities in the farming or feeding areas. Changes of feed crops utilized by sheep in such areas tend to obscure the feed situation in regard to horses and mules. The computation of total animal units must necessarily include sheep, but the exactness of the computations for sheep is open to some question for the reasons mentioned. The effect upon the hay crop, so far as

can be determined from census figures was much more serious than in regard to grain. Very thorough knowledge of local conditions would be necessary to allocate the hay acreage accurately in the territory where sheep are important.

RELATION OF DECREASE IN PLOWABLE PASTURE AND DECREASE IN NUMBER OF HORSES AND MULES

The decrease in the acreage of plowable pasture between 1925 and 1930 was 4,407,584 or about 3.9 per cent. The decrease in animal units as we have computed it was slightly under 6 per cent for the period 1920 to 1930. If the rate of decrease be assumed to have been fairly uniform the decrease in the 5-year period would be about 3 per cent. This would seem to indicate a very close relationship between the decrease in animal units and the required pasture, particularly plowable pasture. As the change in total animal units is largely due to the decline in horses and mules (other changes being offsetting ones) it might be assumed that the decrease in horses and mules was responsible for the decrease in plowable pasture.

Such an assumption, however, is quickly found to be untenable upon examination of state details. In the farm section plowable pastures are generally utilized by all farm animals. In most cases they are fenced and not subject to much change in boundaries. Where pastures are used in rotation with crops, areas of course might change materially. Any actual physical change in pasture boundaries, however, would be more likely to accompany changes in other animals, particularly cattle and sheep, rather than horses and mules (unless horses and mules were being entirely replaced by machinery). In the range section the cattle and sheep are usually the paramount consideration, although occasional ranches might have horse pastures which have been shifted to grain or devoted to cattle and sheep. In the West North Central, the West South Central, and Mountain divisions there was a decrease of more than 6,000,000 acres offset by very minor and erratic increases in most States in other sections. While some considerable part might be attributed to decrease in pasture required for horses and mules, relationship can not by shown conclusively from the figures. A study of the local detail indicates rather that a very large portion of it went into the cash crops, cotton and wheat, without any close relationship to the horse situation and that this tended to obscure rather than clarify the matter. For example in Texas and Oklahoma there was a decrease in the 5-year period of over 3,000,000 acres of plowable pasture and an increase of 490,498 acres of cotton (6,600,000 acres for period 1919–1929). Checking and adding the decreases in other crops it would still require much new ground to make room for the cotton. Moreover in Texas there was an increase in work animals and an increase of over 1,500,000 acres of wheat. In the Mountain States wide and erratic differences occur, for example, increases in plowable pasture in Montana accompanying great increases in wheat and heavy decreases in horses. This suggests increased farm operations and the use of the combine harvester thresher. Range horses also complicate the Montana situation. Similar factors seem to affect Wyoming.

Colorado and New Mexico show tremendous decreases in plowable pasture but increases in wheat. The increases of course far exceed the pasture requirements of horses.

Considerable differences of judgment as to what constitutes plowable pasture also render interpretation of results somwhat questionable in the great range sections.

It is probable that somewhat over a million acres of plowable pasture have been released for crops, although it is very difficult to prove it from data and the conclusion must rest on a judgment basis.

Of course with 6,313,696 less horses and mules, pasturage is available for roughly that additional number of cattle or a similar number of other animal units. As at present, however, we are attempting to show the importance of farm surpluses, and as hog products (at present) are the only important surplus which would be so produced with additional pasturage, the remarks would apply to swine only.

As to pasture other than plowable, and its relation to decreases in horses and mules, it is not possible with data available to do other than repeat the observation that decreases in horses and mules render available an amount of pasture for other animals which doubtless affect plowable pasture requirements and the acreage in crops, but not in such a way that it can be readily measured.

CHAPTER VI.—SURPLUSES

The surpluses of crops or commodities are so universally accepted as the principal causes of low prices that it is unnecessary to go further into that phase of the subject. Cotton, however, offers such an interesting example and is such an essential part of American agriculture that brief illustrations of the relation of surplus and price will be helpful.

The following table and graph will indicate clearly that when surpluses are large prices are low and that when the supply is reduced the prices rise. For this rough illustration the carry-over is used as the surplus, although probably in a closer analysis deductions should be made of the cotton in transit and of the amount of mill and warehouse stocks necessary for the normal transaction of business. It is to be further noted that half or more of the cotton is exported and that American cotton is somewhat over half of the world production. Therefore a heavy American surplus of this commodity ordinarily results in world surpluses and low world prices.

The cumulative effect of several years' production of American cotton in excess of needs is aptly illustrated by the rising surplus and the declining price. And this is more noteworthy in view of the great efforts that have been made to stabilize the price, and the fact that a large portion of the surplus was held off the market in an effort to accomplish that purpose.

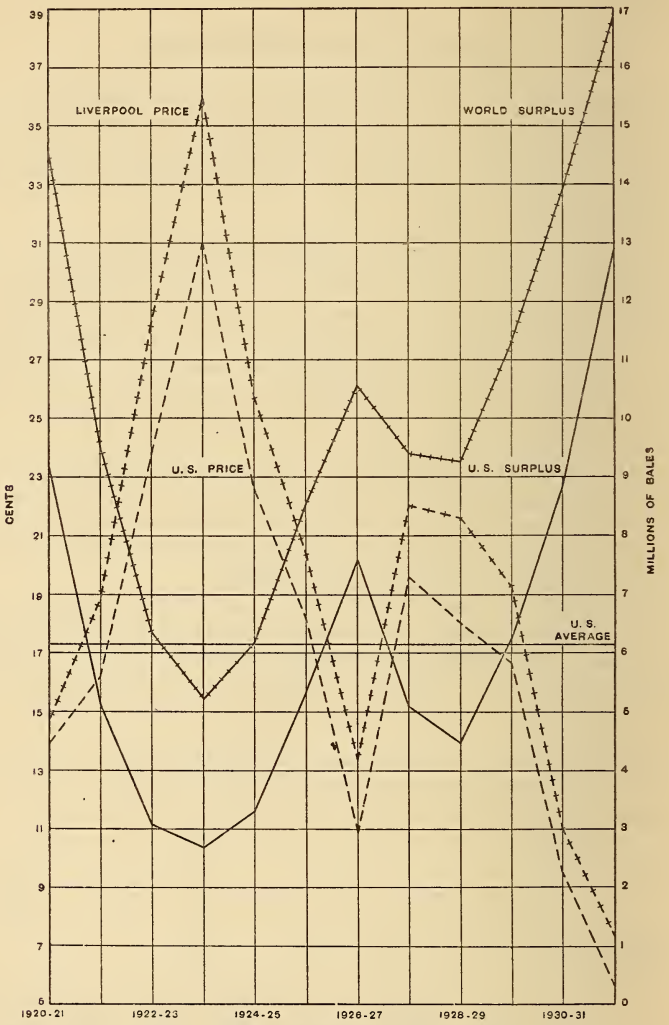
The prices used in this graph are, for the United States, the price received by producers, and for the world, the Liverpool spot price for American middling cotton (in cents). The carry-over, August 1, for the purpose of this study, has been considered as the surplus. The prices used and the carry-over were selected as being most representative and reliable for those two items.

TABLE 14.—PRODUCTION, CONSUMPTION, CARRY-OVER, AND AVERAGE PRICE PER POUND OF COTTON, 1920 TO 1932

SEASON	PRODUCTION		CONSUMPTION [1]		CARRY-OVER (SURPLUS)		AVERAGE SPOT PRICE PER POUND	PRICE PER POUND RECEIVED BY PRODUCERS DEC. 1
	World (1,000 bales)	United States (1,000 bales)	World (1,000 bales)	United States (1,000 bales)	World [2] (1,000 bales)	United States (1,000 bales)	At Liverpool (cents)	In United States (cents)
1920–21	19,217	13,440	16,905	4,893	14,540	9,172	14.7	13.9
1921–22	13,886	7,954	19,990	5,910	9,536	5,123	18.8	16.2
1922–23	16,982	9,755	21,325	6,666	6,341	3,065	28.3	23.8
1923–24	17,707	10,140	19,982	5,681	5,212	2,664	36.0	31.0
1924–25	22,622	13,628	22,642	6,193	6,114	3,306	25.7	22.6
1925–26	25,798	16,104	23,930	6,456	8,532	5,357	20.5	18.2
1926–27	26,658	17,977	25,869	7,190	10,562	7,599	13.3	10.9
1927–28	22,125	12,955	25,285	6,834	9,391	5,079	21.9	19.6
1928–29	24,434	14,478	25,782	7,091	9,253	4,459	21.6	18.0
1929–30	24,384	14,828	24,878	6,106	11,316	6,242	19.2	16.4
1930–31	24,250	13,932	22,402	5,263	13,930	8,838	11.0	9.5
1931–32	25,500	16,918	22,896	4,866	16,868	12,927	7.4	5.7

[1] American in running bales and other growths in bales of 478 pounds net.
[2] Excludes China.

COTTON SURPLUSES AND PRICES, UNITED STATES AND WORLD, 1920 TO 1932



Abandonment and seasonal variation in yield, and surpluses.—The effects of seasonal factors in producing crop surpluses may also be noted in the result of the good crop year 1931. The seasonal factors, abandonment of acreage planted and variation in yield, play a critical part in the production of surpluses, particularly in connection with the tremendous acreage available because of the reduced area required to produce horse feed.

Unfortunately the two surplus crops, great export and cash crops, wheat and cotton, are the principal ones affected, wheat in abandonment and cotton in seasonal variation in yield. The 10-year average abandonment of winter wheat (or acreage planted and not harvested) 1919–1928 was estimated by the Department of Agriculture at 11.7 per cent. Abandonment in 1928 was estimated at 23.5 per cent or about 11,000,000 acres. This acreage is sufficient to produce 165,000,000 bushels in an average year, or a greater amount than was exported

in 1928, 1929 or 1930. There is also a very great variation in the yield of winter wheat running from 12.8 bushels (in 1925) to 19.2 bushels (in 1931).

To cover losses from this cause farmers must plant from 10 to 25 per cent more acreage of wheat than would be the case if there were no abandonment or low yields to be considered. If a series of good years occur this invariably results in a surplus, other things being equal.

Cotton.—The case of cotton is very similar and in some ways even more serious as surpluses can be stored for years. While the abandonment of cotton seldom reaches the high percentage of wheat, it is material. The variation in yield is very great in different seasons. For example, in 1931 the yield per acre was 200.1 pounds of lint cotton, approximately one-third greater than the 10-year average of 154.4, and still greater where compared with 147.7 pounds per acre of 1930. Although the acreage harvested was 5,000,000 acres less, the production was 16,-918,000 bales (of 478 pounds net) an amount about 3,000,000 bales over 1930 and a surplus above recent yearly consumption of about 5,000,000 bales.

The great variations in yield are principally due to the boll weevil. In bad years like 1921 the United States average yield fell to 124.5 pounds per acre. When climatic and other conditions were favorable to weevil control, as in 1931, the yield rose to 200.1 pounds per acre. The farmer can not tell in advance what the weevil damage or what the price will be. Weevil damage sometimes occurs in spots depending on local conditions.

Hence the farmer is forced to plant as much acreage as he can to be sure of producing enough cotton to make a living. For although general weevil damage might result in a short crop and high price, spotted damage in any locality may result in a short local crop although there is a large United States crop.

The ravages of the boll weevil and the utilization of acreage released by decrease in horses and mules are factors of greatest moment in their influence on surpluses. To take care of the great fall in the average yield of cotton because of weevil damage the cotton acreage was expanded between 1909 and 1929 in about the same ratio as the yield per acre declined. For example, the average yield fell, from a 10-year average of 187.9 pounds of lint cotton per acre for the period 1899–1908 (or 176.8 pounds for the period 1911–1920) to 124.5 in 1921, 141.2 in 1922 and 130.6 in 1923, and the acreage was expanded from 33,740,106 (census) harvested in 1919 to 39,204,319 in 1924 and 43,227,488 in 1929. In the States where the most severe weevil damage occurred, Georgia and South Carolina, and where about 2,000,000 acres of cotton went out of cultivation during the decade 1919–1929, the decrease in horses and mules on this account far outweighed that caused by the automobile, tractor and truck, but in the remaining States the increases in cotton took up the acreage released from feed crops by decrease in numbers of horses and mules. Except in the West the tractor played little part in this release. In Texas and Oklahoma the tractor did figure, but principally in territory where cotton acreage expanded at the expense of pasture. In the cotton belt outside of Georgia and South Carolina, where weevil menace and damage was the greatest factor, all States increased their cotton acreage at the expense of corn, oats, and hay (with minor exceptions) and the increase for these States was approximately 10,700,000 acres (offset by approximately 2,000,000 acres decrease in Georgia and South Carolina). The yield on the expanded acreage of 43,227,488 was about 14,574,000 bales in 1930, compared with about 15,693,000 in 1911, 13,703,000 in 1912, 14,156,000 in 1913, and 16,135,000 in 1914, on an acreage 8,000,000 to 10,000,000 smaller.

To summarize the cotton situation the surpluses have been built up by two major factors, the release for cotton growing of acreages previously devoted to feed crops for horses and mules, and the heavy yearly surplus produced in years

of little weevil damage, on the cotton acreage which has expanded to meet usual weevil loss.

The manufacturing of cotton linters, a by-product of cotton, into rayon also indirectly contributed to formation of surpluses. Moreover when used in mattresses it competes with cheaper grades of cotton, felt, etc.

In some statistical computations of foreign countries linters are included with cotton, which to that extent causes further difficulties. This is true because the statistics of surpluses, although they may be faulty, have almost as much influence upon prices as the true amount of the crop or commodity. Since 1925 the yearly production of linters in the United States has been in excess of 800,000 running bales a year, in many instances exceeding 1,000,000 bales, whereas in 1909 there were only 313,000 bales and in 1900 only 114,544 bales.[1] Any computation of cotton surpluses should take this product into consideration even though not including it in the calculations in the surplus bales of cotton. The study of rayon, silk, wool, and competing fabrics is not within the scope of this bulletin except insofar as wool may conceivably become a surplus crop. At present the United States exports only a very small quantity and still imports a considerable amount of wool.

Further, the plan of producing cotton in a system of advances or credit tends to force maximum possible acreages. The low annual income of the individual cotton farmer also tends to force him to produce as much cotton as possible. In 1929 the number of cotton farms reported by the census in groups showing value of products sold, traded, or used by operator's family was as follows:

Number of cotton farms[2]	Value group
95,098	Under $250.
164,514	$250–$399.
298,440	$400–$599.
508,173	$600–$999.
307,552	$1,000–$1,499.
183,825	$1,500–$2,499.
55,562	$2,500–$3,999.
16,350	$4,000–$5,999.
6,982	$6,000–$9,999.
2,626	$10,000–$19,999.
903	$20,000 and over.

It will be seen that over a million out of 1,640,025 farms produced under $1,000 gross. The price of cotton in 1929 was between 16 and 17 cents. For the 1932–33 season it was between 5 and 6 cents so that the *gross* receipts per cotton farm on the *same* basis, would probably be less than $350, which would have to cover interest, taxes, labor of farmers and family, fertilizer, tools, etc.

This has been explained in such detail to show that the cotton farmer is forced by circumstances to plant all the cotton land available (where there is no other cash crop) and why he has used any land available through release land formerly devoted to horse feed or pasture.

Or if there is no direct release of acreage or decrease in work stock, he puts his land in cotton and buys corn and oats from the North, where land previously used to produce horse feed for local consumption produces it now for the Southern farmer. Very often oats and corn can be much more cheaply purchased than raised in most of the cotton States.

Wheat.—The wheat surplus involves several other factors and is more difficult to trace. The heavy acreage increase which occurred prior to 1919 was due principally to war activities and war prices for wheat. The release of acreage because of the horse situation prior to that time was probably considerable

[1] This is taken from p. 72, Cotton Production and Distribution, U. S. Department of Agriculture, Bulletin 169. Season of 1931–32.

[2] Type of farm, vol. III, Census of Agriculture, 1930.

although the decrease which had occurred in city horses had not yet reached any great proportions of the total horse and mule population. The decrease of city horses and mules between 1910 and 1920 was about 1,500,000 which would release roughly 6,500,000 to 9,000,000 acres theoretically required to produce grain and hay.

The wheat acreage increased from 44,262,592 in 1909 to 73,099,421 in 1919 or approximately 29,000,000 acres.

The drop which has occurred since that time to 62,000,000 acres still leaves us far above the prewar years. If the 1913 acreage estimated at 50,184,000 acres be taken as an approximately normal prewar production year, the addition of 6,500,000 to 9,000,000 acres, formerly devoted to grain for sale to cities, released from feed crops and added to the previous wheat acreage would explain a considerable part of the still existing *surplus* acreage. Increased yields per acre during the last decade, particularly in 1931, offer further explanation of surpluses. The Department of Agriculture estimated yields for 1924 and following years were 16.5, 12.9, 14.8, 14.9, 15.7, 13.0, 14.0, 16.2, an average of about 14.8 against an average of about 13.3 for 1919 to 1923, inclusive. This average increase in yield per acre of 11 per cent yearly would account for a large part of the surplus. (The net export in 1930 was only about 13 per cent of the crop.)

Another factor which now must be considered in the study of wheat surpluses is the feeding of wheat to livestock. In 1930 the Department of Agriculture estimated 156,972,000 bushels fed to livestock, or about 18.4 per cent of the total crop. The proportion fed to horses and mules is problematical. Ordinarily wheat is fed to chickens and hogs, only about 5 per cent of that wheat which is fed being used for horses and cattle. Present conditions however, may entirely upset ordinary wheat feeding practices. If the percentage utilized by horses and mules is material it will constitute one of the few offsetting factors to the release of acreage caused by horses and mules and resulting in surpluses.

Tobacco.—Tobacco is one of the principal crops in which surpluses develop and of which a considerable proportion is exported. There are over 65 types and each of these types is almost like a separate crop. The heavy exports are now of the "flue cured" or "bright leaf" tobacco, the type used for cigarettes.

Considerable surpluses of this type have been produced and could have been caused by acreage release from horse and mule feed in Georgia and South Carolina, where there were tremendous decreases of horses and mules from 1920 to 1930. However, while this is not sufficient to explain the entire increase, it will explain it except in so far as tobacco was used as a cash crop to replace cotton which was rendered unprofitable by the boll weevil in Georgia, South Carolina, and the Coastal Plain area.

In North Carolina, acreage released by decreases in horses and mules probably contributed in a marked degree to surpluses of bright leaf tobacco and cotton.

The decline in cigarette consumption very recently would tend to increase surpluses of tobacco of cigarette types, but this decline had not occurred at the time of the 1930 census.

Seasonal variations in yields of tobacco appear to be insignificant for the United States as a whole although wide yield fluctuations and surpluses of certain types of tobacco occur in the limited territory in which such types are grown.

Minor crops.—While there have been as yet no surpluses of vegetable oils, cottonseed, peanut, soybean and linseed oil, in a way the increased crop acreages from which these products are derived do affect other agricultural surpluses. At present the only ones apparently materially affected are swine products. But the released acreage of other feed crops apparently continues to be put into these oil producing crops and into minor crops, such as the legumes, so that it is within the range of probability that surpluses of vegetable oils may occur within

the next decade. To bear out this supposition attention is called to the increase in soybean acreage in Indiana and Illinois. In these two States there are approximately 700,000 acres now devoted to this crop, where formerly there were only a few thousand acres.

The United States exports considerable quantities of butter, which up to the present time have been practically offset by imports. With a constant increase in numbers and per capita production of dairy cows, it is very possible that a surplus of butter may be produced in the United States in the near future, particularly if there should come any diminution in the consumption of milk and butter. Butter is directly affected by competing butter substitutes such as peanut butter. Therefore, in tracing the effect of surpluses due to decreases in horses and mules, it is reasonable to suppose that some of the acreage of feed crops and pasture formerly devoted to horses and mules is now being utilized by dairy cattle, and that another surplus may be in the course of development for that reason, either directly as we have shown by the acreage available for increasing dairy products, or indirectly through the production of butter substitutes on acreage formerly devoted to horses and mules.

Indeed it may be shown by logic, and apparently by statistics of vegetables, fruits, and most minor crops, that tendencies toward surplus now exist which may become of very decided moment in the years to come, provided, of course, that there is a further continuance of the trend in horses and mules which has been apparent for the last 15 years, and that there is no greater increase in population than is indicated by the present population statistics, or no change in immigration. To put it more succinctly, the decrease in horses and mules is releasing more acreage at a greater rate than can be fully utilized by the population of the United States at the present rate of growth. This applies not only to major crops with national surpluses but also apparently to many minor crops. Among those not yet mentioned there appears to be a prospect of surpluses in grapefruit, oranges, pecans and vegetables within the next 10 years.

The acreages of grapefruit, oranges, and pecans are not available, but the number of trees gives a fair basis of comparison for 1920–1930. The pecan situation is so closely bound up with that of other nuts that they must be considered together. Grapefruit and oranges present a similar situation, as can be seen from the folfowing tabulation:

	1930 (trees of all ages)	1920 (trees of all ages)
Pecans	9,147,075	4,929,479
Almonds	4,410,240	3,852,098
English or Persian walnuts	3,520,841	1,973,303
Total	17,078,156	10,754,880
Oranges	31,958,314	19,667,058
Grapefruit	9,236,653	3,073,477
Total	41,194,967	22,740,535

While most of the acreage in these crops can not be traced directly to changes in horses and mules, it is one of the factors to be considered, particularly as regards pecans.

Local surpluses may occur in any crop from asparagus to watermelons and as more and more land is released because of the horse situation, and as the effort to find paying crops becomes more intense, these tend toward national overproduction.

Swine products.—A very great increase in swine and all derived products might be brought about by the utilization of acreage and production formerly

devoted to feed for horses and mules. The actual amount of acreage released because of the decrease in the number of horses and mules and which may have affected the production of hogs is very hard to trace and is problematical. The theory upon which most of the attempt to trace acreage releases is based is that the decrease in horses and mules will show parallel decreases in feed-crop acreages. While this is true in the majority of cases, in many of the major hog-producing States the swine have utilized the surplus of corn and other grain formerly fed to horses and mules, and more besides, so that no decreases appear in the acreages. This makes difficult the tracing of the changes attributable to changes in numbers of work animals.

Of the major crops, corn and barley are the principal ones affected, relatively few oats and little hay being consumed by swine. For this reason difficulty has been encountered in accounting for changes in the corn acreage in most of the corn belt, but with computations based upon corn required per hog, particularly where increases occur, reasonable explanations of the acreage shifts are possible. Such computations are necessary, for example, in Kansas. In the case of barley which is prime horse feed, additional difficulties occur. In the West North Central States there have been heavy increases in the number of swine, accompanied by a corresponding increase in barley, which is used rather as a swine feed than as a feed for horses and mules in that area. Increases in barley which have been rather general throughout the United States, render more difficult the allocation of acreage but at present there are no satisfactory statistics showing the proportion fed to horses and mules and swine. It is this and other unknown factors that render advisable the use of the minimum figure, based on maintenance ration, in allocating or tracing acreages released because of decreasing numbers of work animals. It is self evident that acreages of corn and barley previously needed for horses and mules could be readily diverted to the production of swine.

No attempt has been made to show in detail the additional number of hogs which have been or could be raised in the United States because of the additional acreage available for feed stuffs. Based on all feeding tables, it would theoretically make possible the raising of several times as many hogs as the number representing the decrease in horses and mules. The estimated amount of grain required per hog was about 800 pounds against 4,000 pounds of grain per horse on a light working ration. Using the regular animal feeding ration therefore as a minimum, 15,000,000 hogs could easily be added to the existing number yearly if the entire equivalent grain feed consumed by 6,000,000 horses were devoted to the production of swine. The total number of swine on hand April 1, 1930 was 56,287,920. In face of these figures no further statement is necessary as to the potentialities introduced by decreases in horses and mules. Practically the only States reporting important increases in swine were the West North Central and Mountain States and such increases were accompanied by material gains in barley and corn, in addition to the acreage of the crops released by decreases in horses and mules.

CHAPTER VII.—EFFECTS OF SURPLUSES AND CONSEQUENT LOW PRICES UPON FARM PURCHASING POWER

In the foregoing pages the relationship of surpluses to prices has been described. The brief statement which follows is intended to complete the picture and to trace through the decrease in horses and mules to its final results.

The net effect of the low price of the great cash crops, cotton, wheat, and tobacco, resulting from surpluses, upon the purchasing power of the farmer can be realized by comparison of 1919 and 1929. In 1919 cotton, wheat, and tobacco accounted for about $4,870,000,000, in 1929, about $2,560,000,000. By 1932 they had fallen to roughly $857,000,000 and each of these three most important cash crops were surpassed in money value by dairy products and vegetables. This illustration will bring out strikingly the unfavorable price situation of the export or surplus crops in comparison with those almost entirely consumed by the domestic market. Of the other major surpluses, pork products occupies a relatively unfavorable price position when compared with crops of which there is little or no exportable surplus.

The index numbers of farm prices computed by the Department of Agriculture in the table appended shows how unfavorable the grain and cotton situation is in respect to other commodities, being at 34 for grain and 44 for cotton and cottonseed as compared with 49 for all groups. It also shows the ratio of prices received by farmers to prices paid for commodities, of 47. These figures are on the base of 1909 to 1914. Comparison with 1920 shows the present price index at less than one-fourth the price at that time.

TABLE 15.—GENERAL TREND OF PRICES AND PURCHASING POWER

[On 5-year base, August, 1909-July, 1914=100]

YEAR AND MONTH	INDEX NUMBERS OF FARM PRICES							Prices paid by farmers for commodities bought [1]	Ratio of prices received to prices paid
	Grains	Fruits and vegetables	Cotton and cottonseed	Meat animals	Dairy products	Poultry products	All groups		
1910	104	91	113	103	100	104	103	98	106
1911	96	106	101	87	97	91	95	101	93
1912	106	110	87	95	103	101	99	100	99
1913	92	92	97	108	100	101	100	100	99
1914	103	100	85	112	100	105	102	101	101
1915	120	83	78	104	98	103	100	106	95
1916	126	123	119	120	102	116	117	123	95
1917	217	202	187	173	125	157	176	150	118
1918	226	162	245	202	152	185	200	178	112
1919	231	189	247	206	173	206	209	205	102
1920	231	249	248	173	188	222	205	206	99
1921	112	148	101	108	148	161	116	156	75
1922	105	152	156	113	134	139	124	152	81
1923	114	136	216	106	148	145	135	153	88
1924	129	124	211	109	134	147	134	154	87
1925	156	160	177	139	137	161	147	159	92
1926	129	189	122	146	136	156	136	156	87
1927	128	155	128	139	138	141	131	154	85
1928	130	146	152	150	140	150	139	156	90
1929	121	136	145	156	140	159	138	155	89
1930	100	158	102	134	123	126	117	146	80
1931	63	98	63	93	94	96	80	126	63
1932	44	71	46	63	70	80	57		
Jan., 1933	34	59	45	51	68	96	51	[2] 105	[2] 49
Feb., 1933	34	57	44	53	62	57	49	[2] 104	[2] 47

[1] These index numbers are based on retail prices paid by farmers for commodities used in living and production, reported quarterly for March, June, September, and December. The indexes for other months are straight interpolations between the successive quarterly indexes.

[2] Preliminary.

These figures are quoted to show first that the surplus crops have suffered far more severely than other farm produce and commodities, and second to show the tremendous drop in farm income principally from that cause. It may be further stated that surpluses of corn fed to meat animals naturally resulted in lower prices for such animals, particularly when pork constitutes one of the major surpluses. This index should also be used in comparing relative price index of horses and mules.

Farm purchasing power and the depression.—The price index just quoted shows the general ratio of prices paid to prices received of 47 per cent in relation to 1909 to 1914, or converted to the base of 1920, of less than 25 per cent. For practical purposes this puts the farm purchasing power at 25 per cent of 1920. It is true that accumulated capital and the volume of production are involved in purchasing power. These, however, do not affect the statement much as most of the farm capital is in land, building, or equipment, including automobiles, averaging several years old, all of which are now worth very much less than in 1920.

The production for the year 1932 was not above that of the average season.

The next step in the chain of reasoning is to show how the purchasing power of the farm or rural population affects that of the entire country. Approximately 30,000,000 people were classed as farm population. The wider classification, rural population, which included the farm population plus those residing in unincorporated places with less than 2,500, totals about 54,000,000 compared with about 69,000,000 urban population.

Most of the rural population were partly or entirely dependent upon the farm or farm population so that they were immediately affected by the farm buying power.

Of the city population a very large proportion is dependent upon industries based upon agriculture such as packing, manufacturing, and selling farm machinery; selling farm products such as groceries; manufacturing, such as boots and shoes; spinning and weaving, as cotton mills; merchants selling to rural sections; and so on indefinitely. For this reason, by far the greater portion of the people are affected directly or indirectly by the farm purchasing power.

With a tremendous drop in farm purchasing power all dependent industries were immediately affected, ranging from merchant to manufacturer.

Although it is true that the prices of certain farm crops grown for local consumption closely follow the income of the consumers, the prices of the great cash export crops of cotton and wheat dropped before the prices of other commodities and in a greater measure. The drop started October 15, 1929, in cotton and preceded the debacle in the stock market, popularly considered the principal cause of the depression, and the drop occurred although a large portion of the surplus crops were withheld from the market in an effort to sustain prices, although the world surplus of wheat was not cumbersome until 1929, and although the world consumption of cotton held at a high level until 1930.

The relatively high cost of items purchased by farmers and the rising taxes acted to further cut the net farm income and add to the lowering of farm purchasing power brought about by the drop in prices of the great cash crops.

This concludes the chain of reasoning and whether the conclusions be accepted or not, there remains the inescapable fact that either logically or upon a statistical basis, it is necessary to show what disposition was made of the acreages in crops formerly devoted to producing horse feed. There has been no decrease in acreage of crop land harvested. Furthermore, if our premise be incorrect then it will be necessary to show what affect the production of the substitute crops had on prices of those crops and what disposition was made of those crops.

CHAPTER VIII.—RÉSUMÉ OF TREND IN NUMBER AND VALUE OF HORSES AND MULES AND THE OUTLOOK FOR THE FUTURE

The data derived from the census showed the essential status of the horse situation April 1, 1930. Since then the trend downward, in numbers of horses has continued, and the trend in mules is also now downward, according to indications of the Department of Agriculture and according to what might be expected from the extremely small birth rate of mules indicated in the census (ratio of colts to mature animals). The relatively high proportion of mules and the fact that they live on an average to a somewhat greater age than horses, has tended to modify the rapid decrease in the total work animals when compared to the much more rapid decrease in the number of horses. The excess of the mortality rate 7.50 over the birth rate 3.02 for all horses and mules, and the constantly rising mortality rate, pointed to an acute shortage in horses and mules as soon as the surplus power represented by tractors and the unnecessary reserves of horses and mules formerly carried on farms, are exhausted. That point now appears to have been reached. Breeding operations in 1932, judging from the number of registered stallions in the various States, do not appear to have been appreciably above preceding seasons. The January 1 price of horses on farms in 1933, after reaching the lowest point in 30 years last season, January 1, 1932, has again started upward. The inventory of mules on farms January 1 had not yet begun to rise. The price received by farmers for animals and the selling price in the major markets, however, have experienced very material increases at the time of this writing showing definite indications of very strong upward movement.

The receipts (and sales) of horses and mules in major markets also indicate strongly that the low point has been passed and that the price trend is decidedly upward. From three to five times as many horses and mules have been received and sold in these markets in the past six months as in the corresponding period of the year previous.

TABLE 16.—RECEIPTS OF HORSES AND MULES AT SELECTED MARKETS, SIX MONTHS' PERIOD, AUGUST TO JANUARY, 1931–32 AND 1932–33

	Selected markets, 1932–33	Selected markets, 1931–32	ATLANTA		MEMPHIS	
			August, 1932, to January, 1933	Preceding year same period	August, 1932, to January, 1933	Preceding year same period
Total	32,381	11,574	6,233	2,426	11,227	2,094
January	14,825	5,456	3,624	1,254	6,655	1,805
December	4,336	1,461	677	192	1,557	173
November	3,356	1,344	1,102	316	938	64
October	4,536	1,604	461	493	1,594	----
September	3,804	939	316	62	386	28
August	1,524	770	53	109	97	24

	MONTGOMERY		SAN ANTONIO		FORT WORTH	
	August, 1932, to January, 1933	Preceding year same period	August, 1932, to January, 1933	Preceding year same period	August, 1932, to January, 1933	Preceding year same period
Total	1,339	806	3,795	642	9,787	5,606
January	673	248	885	203	2,988	1,946
December	135	133	497	80	1,470	883
November	60	92	482	81	774	791
October	222	198	944	67	1,315	846
September	235	105	846	85	2,021	659
August	14	30	141	126	1,219	481

Another indication of change in the horse situation is the very material decline in the number of horses slaughtered at inspected plants. The peak was reached in 1930, when the number slaughtered was 138,827—an average of 11,000 a

month. The number has declined sharply during the recent months and in February, 1933, was only 2,688. For the eight months ending February, 1933, the number had fallen to 41,624 as compared to 81,125 for the eight months ending February, 1932.[1] This decrease in slaughter probably means two things: First, that the price of animals that are nearly worn out has increased on account of the emergency demand so that they are worth more than the price that can be paid by slaughterers. Second, the supply of older horses available and suitable for slaughter is sharply decreasing.

With the price of grain as low as at present and with the farmers purchasing power at 49 per cent of the 5-year average, August, 1909, to July, 1914, it is difficult if not impossible for farmers to buy gas and oil and pay for repairs to tractors, not to mention purchasing new tractors. With oats at 13 cents a bushel and corn at 19 cents most farmers probably figure it is chepaer to operate with horsepower than with tractors.[2]

The steady movement of city population back to farms creates additional demand for work stock and doubtless has something to do with the rising prices. With the prospect of a shortage of animals in the future, cheap grain and rising prices of horses and mules, the raising of colts promises to become more profitable, and this offers an additional argument for increasing the use of horses and mules under the present conditions.

While an acute shortage of mules has not yet occurred, due to rather heavy breeding operations up to 1924 or 1925, the relatively low mortality rate of mules and the sufficiency for current needs, the trend promises to follow that of horses. The extremely low birth rate (ratio of colts to grown animals) indicated by the last census, however, shows that there will be a definite shortage of fresh animals in the near future. The number of breeding jacks has declined seriously and by far the large proportion of work animals being sold in the Southern markets are mules. Indeed the sales of mules in major markets exceed those of horses. For example, the January average for the period 1928–1932 shows that 38,190 mules were received as against 17,972 horses. A perusal of the little table previously presented will give a fair idea of the Southern markets where mules are the principal item.

Because of the fact that the cotton States produce relatively few of their own mule colts and offer a constant market, the outlook for mules is of particular interest. It may be further noted in regard to mules that most of them are sold in territory which has small farms with a small acreage per animal and which has few tractors. The limiting factor in that territory is the amount of cotton which can be picked by one family and this makes large scale farming difficult and prevents the use of much heavy machinery, unless and until a satisfactory mechanical cotton picker is devised which will change the situation. The mechanical cotton picker, at the present time, has not been sufficiently successful to warrant anticipation of conditions in the cotton belt similar to those produced in the wheat belt upon the coming of the combine harvester-thresher and the header. Mules, therefore, so far as can be seen at present, do not face the probability of being replaced by machinery, while it may be advantageous in much of the rest of the United States to replace horses in the future by tractors and improved machinery when present price conditions are readjusted.

Farmers interested in raising horses and mules, however, are invited to consider the effects of a possible cotton holiday or restriction of acreage such as has been proposed. It might be further pointed out that the time required to raise horses and mules to marketable age, about 4 years, will prevent any immediate or great surplus production. This very greatly lessens the danger of overproduction such as confronts producers of all crops and livestock which can be marketed

[1] March, 1933, Crops and Markets, U. S. Department of Agriculture.
[2] United States Department of Agriculture Price Index.

within a year. To summarize the outlook, the conditions appear favorable for the increased use of both horses and mules for the immediate future, while the outlook for mules appears to be excellent for an indefinite period of time.

SUMMARY OF CONCLUSIONS

A summary of the conclusions reached follows:

1. The automobile, truck, tractor, and improved farm machinery replaced about 10,000,000 horses and mules between 1910 and 1930, including city horses and mules.

2. This replacement by machinery made available for other uses the land previously required to produce horse feed and this acreage was used for growing other crops.

3. The total acreage so released can not be exactly measured, but the upper and lower limits are reasonably well defined as:

For 1910 to 1930, 30,000,000 to 45,000,000 (released by all horses and mules).
For 1920 to 1930, 26,000,000 to 35,000,000 (released by all horses and mules).
For 1920 to 1930, 18,000,000 to 24,000,000 (released by farm horses and mules).

4. A considerable percentage of plowable pasture has also been released but it is not closely measurable.

5. The decrease in city horses and mules began to release acreage in feed crops prior to 1909 but the effects were not noticed until the next decade.

6. The decrease in city horses and mules appeared to be offset by increases in farm horses and considerable increases in mules between 1909 and 1919.

7. The decrease in horses preceded the decrease in mules.

8. The decrease in mules has commenced and the number born is so small that the shortage will soon be more serious than that of horses.

9. The present birth rate of horses and mules is only about three-sevenths of that necessary for replacement.

10. With the present advanced average age of horses and mules, mortality rates will rise.

11. The decreases in crop acreages are partly traceable to decrease in horses and mules, State by State and crop by crop.

12. Theoretical feed requirements of horses and mules which have disappeared check closely with decrease in feed-crop acreage for the United States as a whole.

13. Increases in surplus crop acreages check closely with acreage released by decreases in horses and mules.

14. Increases in tractors and trucks check closely with decreases in farm horses and mules. Allowance for automobiles can not well be made, as they represent a new addition to American life.

15. The acreage released from crops previously required for horse feed has resulted in increases of nearly all other crops.

16. The acreage released from feed crops for horses and mules 1909–19 went into wheat and rye acreages and those crops helped to tide over the readjustment temporarily, but as they now sink back to normal levels the decrease in wheat and rye constitute merely an additional problem. Or, in other words, although the wheat acreage decreased markedly during the past decade, the surpluses created arose from abnormal acreages which were released from horse feed in the previous decade and which have not yet returned to normal.

17. The increase in major crops, wheat, cotton and tobacco, and hogs, together with some contributing factors of consumption, has resulted in national and even world surpluses of those items.

18. The previous acreages of those crops were sufficient for the population of the United States, with small allowances for new ground and increasing population and with a large per cent for export.

19. The additional acreage derived from horse feed made possible larger crops every year and such additional acreage produced cotton, grain, etc., in excess of national needs.

20. An increase of *8,408,000* acres is traceable on a very conservative and reasonable basis directly to the decrease in *farm* horses and mules, and of this acreage *4,355,000* acres are traceable directly to surplus crops—cotton, wheat, and tobacco.

21. Such traceable acreage in each of the crops mentioned is sufficient to have produced current surpluses.

22. Approximately twice the acreage indicated could be explained if standard feeding ration be used rather than the maintenance (or minimum probable amount).

23. Such surpluses are cumulative and become worse each year, and will continue to do so until population overtakes the production or some measures are adopted to reduce the surpluses.

24. These cumulative surpluses are principally responsible for the low world price of cotton and wheat.

25. Low prices of these export cash crops (as well as minor crops) are responsible for low purchasing power of the farmer.

26. Low purchasing power of the farmer directly affects the entire population, as it restricts markets and reduces manufactures and throws city population out of work.

27. In this way it is one of the principal causes of the present depression.

28. Large numbers of farm hands have been released by the use of improved farm machinery to add to industrial workers already in excess of needs, adding to unemployment and contributing to hard times.

29. The reaction of hard times has driven large numbers back to the farm, increasing the demand for work animals.

30. The situation has started to correct itself because of the necessity of replacing the work animals that are dying at an increased rate on account of old age and the tractors which are wearing out.

31. The surplus of farm power indicated in 1930 is now apparently exhausted.

32. A temporary halt has been called to increase of farm automobiles, tractors, and combines by the financial situation and the fact that horses and mules are cheaper under present circumstances and require no cash outlay for feed, while gas and upkeep of machinery require cash. Farm incomes justify few automobiles.

33. Large numbers of automobiles, tractors, and trucks have been worn out or become obsolete.

34. The upward reaction in the price of horses has already started.

35. Probable higher prices of farm-work animals will offer some help to grain markets and help to renew need for acreage of feed crops.

36. The increased use of horses and mules would help to utilize surpluses of wheat directly and indirectly.

37. Increased demand for grain will reduce pressure on the other crops.

38. No great future decrease in horses or mules is indicated unless a cotton picker be perfected which will work on a large scale.

39. Increases in horses and mules can not occur quickly because it requires four years to produce mature work animals, and because of shortage of breeding stallions and jacks.

40. The shortage of horses and mules will grow more acute for at least four years, other conditions remaining about as at present.

41. The critical status of the horse situation is just beginning to be realized.

42. If the situation becomes serious it may be helped by importation of Mexican and Argentine horses and foreign breeding stock, and use of wild and range stock to breed light and inferior animals.

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