Horses

HORSES ON FARMS TODAY

by

D. H. EVANS, M.Sc.

University of Nottingham School of Agriculture
Department of Agricultural Economics
Sutton Bonington
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Price - 1s. 6d.

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INTRODUCTION.

As a result of the increasing application of mechanical power to farming processes the number of horses on farms continues to decline. Although this decline has been the occasion of a great deal of regret the substitution of mechanical power for horses has generally been recognised as an essential and inevitable part of progress in agricultural methods.

There is today, however, growing disagreement as to how much further the displacement of horses should proceed. Some people argue that the rapid increase in tractor numbers, especially since 1939, has not resulted in a commensurate reduction in the number of horses on farms, and imply that further reductions in horse numbers should take place. There are other people who are seriously alarmed at what they believe to be the gradual extinction of the horse, and argue that our increasing dependence on mechanical power in farming may seriously jeopardise our food supply in time of war if fuel supplies are cut off or restricted. Others again, express concern at the high "capital" cost incurred in the use of tractors on small farms, and suggest that any further extension of tractors on to the large number of very small farming units in this country would, at least under present circumstances, be uneconomical, and that the everyday tractive power on such farms can best be provided by horses. There is thus some divergence of views as to what part horses should play in our agricultural economy. There are many farmers who no longer find use for horses on their farms at all. Others who, in spite of having an adequate range of tractors, maintain that the tractor and the horse are in many ways complementary, and that were they to eliminate all horses from their farms, their farming efficiency would be adversely affected. The object of this report is to consider some of these divergent viewpoints, and to attempt some assessment of the place of horses on farms today and the part they are likely to play in our farming economy of the future.

THE HORSE IN BRITISH AGRICULTURE.

Horses, although used in agriculture for a long time before, first began to supplant oxen as the main source of farm draught power from about the middle of the eighteenth century. In 1760, according to Arthur Young, oxen were still about as commonly used as horses. At this time, however, the use of horses was fairly rapidly superseding the slower moving ox-team, although discussion as to the relative merits of the horse and the ox persisted until well into the nineteenth century. Loudon writing on this subject in 1825 in his Encyclopaedia of Agriculture stated that "much difference of opinion formerly prevailed as to which of these two animals should be preferred, and the preference has generally been given by speculative writers to the ox, and by practical farmers to the horse".

With the increasing use of new and improved implements of cultivation, far greater attention was given to the breeding and improvement of heavy draught horses, for both farm and urban uses. No statistics of the number of horses on farms are available before 1870 but it is fairly certain that a steady increase in their number occurred throughout the nineteenth century.

From 1881 to 1910 the total number of horses on farms in England and Wales rose by approximately 110,000 despite a fall in the tillage acreage of about 2½ million acres. During the period the use of horses on farms had been extended by the more widespread adoption of harvesting equipment such as "self binders", mowers and haymaking machinery, and there was, moreover, a steady demand for heavy horses for industrial use and for export, a fact indeed which assisted a number of farmers through the acute depression of the latter years of the nineteenth century.

In the first decade of the present century evidence of a decline in horse-breeding on farms is provided by the published statistics. In 1912 there were 19,000 fewer horses under one year than seven years earlier, but it was not until about 1910 that the number of agricultural horses began the decline which, with one temporary reversal between 1915 and 1921, has proceeded down to the present day. (See

Fig. 1). Whereas in 1910 there were nearly one million working horses on farms in England and Wales, in 1939 their number had been reduced to only 549,000.

Up to the late 1930's the progressive reduction in the number of horses on farms had been chiefly due to the decline in the tillage area and to the rapid development of motor transport for road haulage. Although an increasing number of tractors had been introduced on to farms it is not until the late 1930's that the farm tractor can be regarded as having seriously affected the position of the horse as the predominant source of draught power on farms in this country. In 1930 there were fewer than 20,000 tractors in England and Wales, and even at the outbreak of war there were only about 50,000 tractors or approximately one tractor to every 500 acres of crops and grass. Farm tractors were still regarded quite largely as a supplement rather than a main source of farm draught power. J. Wyllie writing in 1937[1] has stated that "taking a broad view of the country as a whole, it may be said that farmers are still depending on the horse as the primary source of power on farms, the tractor being regarded mainly as a supplement rather than a substitute". But although horses were still an important source of power on farms, this was no longer true of the towns where comparatively few horses were now used for road transport. Horses were still used by many roundsmen, breweries and the railways but the market for horses outside the farm had considerably diminished. In 1911 77 per cent of the vehicles entering the City of London were horse-drawn whereas today the proportion is less than 1 per cent.[2]

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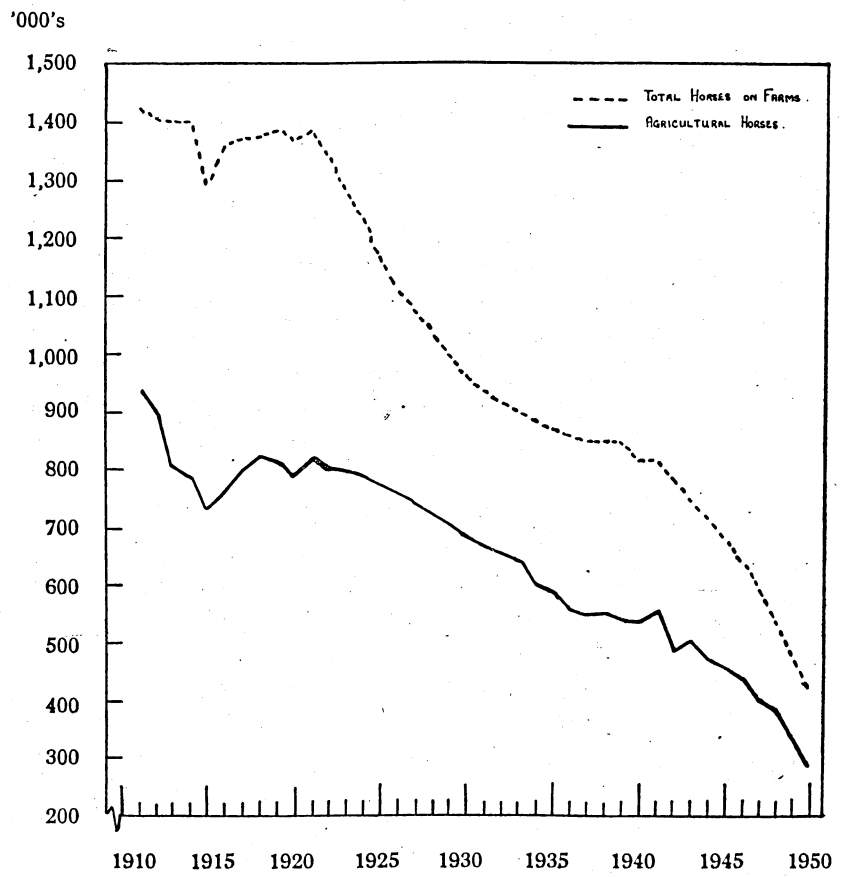
1 J. WYLLIE, *Horse v Tractor*, South Eastern Agricultural College, Wye, 1937.

2 See *The Economist*, Dec. 24th, 1949, p.1398.

CHANGES IN THE NUMBER OF HORSES RETURNED ON FARMS IN ENGLAND AND WALES, 1911 TO 1950.

FIGURE 1.



CHANGES IN THE NUMBER OF HORSES ON FARMS SINCE 1939.

Within three years of the outbreak of war the arable acreage of England and Wales had expanded by nearly four million acres, and by 1944 it exceeded by over two million acres the peak arable area during the First World War, although farmers had over 300,000 fewer horses than in 1918.

The decline in the number of horses on farms since 1939 is shown below.

CHANGES IN THE NUMBER OF HORSES ON FARMS IN ENGLAND AND WALES 1939 TO 1950.

TABLE 1.

	June 1939	June 1950	Decrease
	Number in '000's		%
Horses used for agricultural purposes :			
Mares [1]	346.7	170.2	51
Geldings	202.2	118.8	41
Total	548.9	289.0	48
Unbroken horses over one year old	110.4	29.8	73
Horses under one year :			
Light	14.6	6.3	57
Heavy	35.4	4.0	89
Total	50.0	10.3	80
Stallions for service	4.6	1.6	65
All other horses	131.9	86.7	34
Total Horses	845.8	417.4	51

[1] Including those kept for breeding.

It will be seen that young unbroken horses on farms show a much greater proportional decrease than working horses, this decline in breeding being proportionately greater for "heavy" horses than "light". In 1939 there were for every 1,000 horses being used for agricultural purposes, 91 horses under a year old on farms, 55 being classified as heavy. In 1950 there were only 35 horses under a year old per 1,000 horses in work, and only 14 of these were classified as heavy. Similarly between 1948 and 1950 the number of unbroken horses of one year and older declined by 17,500, but almost the whole of this decline was accounted for by a reduction of horses classified in the returns as "heavy".

It is apparent, therefore, that the continued decline in breeding, and especially of heavy horses, is such that the number of horses on farms is likely to fall considerably further. There are today proportionately fewer young horses and more older horses on farms than there were before the war. This fact is illustrated in Table 2 where the percentage of horses in the different classes enumerated in the returns is shown averaged for the years 1935 to 1940 and the years 1945 to 1950. In the period 1935 to 1940 unbroken horses and stallions comprised 18 per cent of all horses compared with only 13 per cent in 1945 to 1950. It is significant that even the 18 per cent proportion of unbroken horses of the earlier period was insufficient to maintain the number of horses on farms, and that today losses of horses are almost certainly greater than pre-war due to slaughter for meat etc., with a smaller proportion of young horses being reared to replace them.

CHANGE IN THE STRUCTURE OF THE HORSE POPULATION 1935-40 TO 1945-50 ENGLAND AND WALES.

TABLE 2.

Category	Average of years 1935 to 1940	Average of years 1945 to 1950
	Per cent of total	
Horses used for agricultural purposes including mares kept for breeding	65.5	69.0
Unbroken horses one year and over	11.5)	9.5)
Unbroken horses under one year	6.0)18.0	3.1)13.0
Stallions kept for service	0.5)	0.4)
"Other" horses	16.5	18.0
Total	100.0	100.0

INCREASE IN THE NUMBER OF FARM TRACTORS.

The substitution of mechanical power for horses has proceeded at a very rapid rate since the outbreak of war in 1939. In January, 1950 the total number of tractors returned by occupiers of agricultural land, County Agricultural Committees and Contractors was just over 295,000 of which approximately 36,000 were small horticultural tractors. Thus an increase of 209,000 "agricultural" tractors between 1939 and 1950 has been associated with a decrease of 260,000 in the number of work horses on farms. Owing, however, to the

increase in the tillage acreage since 1939, the displacement of horses by tractors can be more conveniently expressed in terms of the number of agricultural tractors and working horses per 1,000 acres of tillage, as follows :—

	1939	1950
Agricultural tractors	7	25
Working horses	80	28

It will be seen that per 1,000 acres of tillage an increase of 18 tractors has been associated with a decrease of 52 work horses, or about three horses for each additional tractor introduced.[1]

Only about one twentieth or less of the greatly increased draught horsepower now available on farms in the form of tractors and horses is supplied by horses, as shown in the following Table.

PROPORTION OF TOTAL AVAILABLE HORSEPOWER ON FARMS SUPPLIED BY HORSES (ENGLAND AND WALES).

TABLE 3.

Year	Estimate of total draught power available on farms[2] (England and Wales)	Proportion available as work horses.
	million h.p.	%
1925	1.1	69
1939	1.5	39
1950	5.8	5

[2] Excluding lorries, vans and cars.

ADVANTAGES OF THE TRACTOR IN AGRICULTURE.

The chief stimulus to this rapid substitution of mechanical power for horses in agriculture is the greater amount of work that a man can perform in a given time. With the increased power available an implement of greater effective width may be drawn for longer continuous periods at greater speed than with a horse team. Often, too, the greater power of the tractor enables two or more operations to be combined as one. In this way the direct labour cost of an

[1] For a discussion of the rate of replacement of horses by tractors see R. A. DUDMAN *Of Horses and Tractors*, Farm Economist Vol.VI No. 7. 1950.

hour's ploughing or some other cultivating or harvesting operation is reduced to a fraction of that necessary when horses are used.

Another highly important consequence of the greater speed of getting work done is the greater timeliness with which successive operations can be performed. Full advantage can be taken of short spells of suitable weather, and crops can be sown and harvested more nearly at the optimum times. Allied to the better cultivations which are made possible by the use of tractors, this factor of timeliness has undoubtedly played some part in the higher yields per acre which have been obtained in recent years.

Tractors owe their important position in agriculture, too, to the adaptability of their power, in that it can be delivered at the drawbar, belt or power take-off. In this sense horses and tractors are by no means interchangeable on farms. The greater part of modern developments in farm machines and implements are firmly based on the tractor as the power unit, and horses are clearly unsuited either for pulling large machines such as combine harvesters and Gyro-tillers or for machines which require additional drive. The tractor is no longer a supplementary source of power as it frequently was on farms in the 1930's but has now considerably transformed the whole range of farm equipment and farm practices.

From the national point of view there is another consequence of great importance in the change over from animal to mechanical power in agriculture, and that is the release for food production of land formerly used for the feeding and grazing of horses. In a highly populated country such as Britain with so many competing demands for the available land resources, this is a question which must be borne in mind when considering the place of horses on farms today. The amount of land necessary to maintain a horse will naturally vary according to the size of the horse and the amount of work it performs, but before the war it was estimated that the average working horse consumed annually the produce of about two acres of corn (chiefly oats), about $1\frac{1}{4}$ acres of fodder and hay and about one acre of grazing. Allowing for the fact that the average working horse performs less work today we may assume a figure of three acres to maintain a working horse. On this assumption, the reduction in the number of working horses alone between 1939 and 1950 has released for other uses approximately $\frac{3}{4}$ million acres of land in England and Wales, a figure which corresponds approximately to the estimated losses of agricultural land to non-agricultural uses during the same period.

ADVANTAGES OF HORSES.

Having emphasised the fact that modern farming is firmly rooted on the tractor, and that no longer can horses be considered a substitute for the tractor in the greater part of farm work, it is nevertheless not necessarily true that all horse work could with advantage be taken over by tractor power. There are, in fact, strong arguments to support the retention of the horse as a source of farm draught power, if only as a supplement to the tractor.

In the first place there is the question of national security. Shortage of fuel in time of war could seriously threaten our home food supplies through the immobilisation of the national tractor fleet. The total fuel bill of agriculture in the U.K. has increased rapidly in recent years, and domestic food production is now irrevocably tied up with strategic and political considerations in the Middle East and elsewhere. It has been estimated that the value of machinery fuel consumed in agriculture in the U.K. in 1943-44 was £13½ million,[1] and it is probable that annual consumption at the present time is running at something like double this amount. There are no major oil wells in this country, and no important fields either in the Dominions (with the exception of Alberta) or the Colonial Empire, so that our fuel oils have almost wholly to be obtained from foreign sources. In the present unsettled state of the world it is obviously a matter of immediate concern how much further we should allow our horse population to fall and our dependance on imported fuel supplies to increase. Alternative sources of tractor fuel may possibly be exploited. It is said, for example, that five acres of potatoes could yield sufficient alcohol to keep a tractor working for about a thousand hours, and experiments conducted in Germany show that methane gas produced from dung can be successfully utilised for powering farm tractors.[2] But such methods are likely to be costly, and it may be more reasonable to economise on fuel consumption, should it become necessary, by concentrating the use of tractors on heavy or rush jobs in which tractors have the greatest advantage, relying on horses for light cultivations and even for some of the heavier cultivations when speed is not an important consideration, and for a great deal more of the ordinary carting on the farm. But with a continuation of the present decline

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1 J. H. KIRK *The Output of British Agriculture during the War*, Proceedings of the Agricultural Economics Society Vol.VIII. No. 1.

2 See *Power Farmer*, April 1951 and June 1951.

in horse numbers, any return to the use of horses in a possible emergency would require such a lengthy period of breeding, rearing and breaking-in of young horses for farm work, that the value of horses as an emergency or reserve source of power is rapidly being lost. Thus from the standpoint of our national security a strong case can be made out for trying to arrest as far as possible the decline in horse-breeding, even though the supply of tractors in recent years may seem to have resulted in a disproportionately small reduction in the number of horses on farms.

Another advantage of horses as a source of farm power lies in the divisibility of the power unit, always an important consideration in farming. With horse teams the farm draught power can be added to or reduced in units of 1 h.p., enabling the amount of power used to be varied at least within limits, according to the requirements of the job in hand. The ordinary farm tractor consists of one indivisible unit of approximately 20 h.p., and only for a comparatively small proportion of its working time is it ordinarily engaged in work which requires anything like its full power.[1] A second and more significant advantage associated with a highly divisible power unit in agriculture is that when the occasion demands, several jobs may be performed concurrently. In this country a great many farm businesses are too small to justify the ownership of more than one tractor, so that all the farm draught power is locked up in one machine, and unless one or two horses are kept in addition, only one operation requiring draught power can be performed at any one time. This may set a serious strain on the organisation of the farm, particularly during the busy periods of the year, such as harvest time. In many carting operations such, for example, as the carting of corn sheaves from field to rickyard, smooth and continuous working for all persons engaged in the harvesting team will depend on the steady passage of carts or trailers to and from the field. Unless there are sufficient transport units it is difficult to organise the work so as to prevent idle time spent in waiting for an empty cart or trailer to return from the rickyard or a full one to come out from the field. For this reason, one tractor alone is rarely an adequate supply of power on a farm, and on the many small and medium sized farms in this country careful consideration

1 According to Wright, "for only about 30 per cent of its working time will the average tractor, capable of a rated drawbar output of 16 h.p., develop its full power. It would seldom develop as much as two thirds of its power in other basic cultivations and would be still worse off in row-crop work and carting, and would spend a proportion of its time running idle". S. J. WRIGHT, *The Mechanisation of the* 200 *acre Farm*. 'Modern Farming' edited by Sir George Stapledon, June, 1946.

should be given to whether the retention of one or two horses would not be preferable to an additional tractor, on grounds both of economy and of convenience of working.

Although in general the tractor enables work to be carried out more expeditiously than with horses, there are some circumstances when work on the land can proceed with horses in conditions unsuitable for the use of the tractor. On many soil types in a wet spring cultivated land may be too wet to carry tractors without harming the tilth, though dry enough to carry horses. Similarly, many highly mechanised farmers on the Lincolnshire fens have to keep a team of horses primarily to get the roots off the land in the autumn, when conditions are too wet for tractors or "dumpers". It cannot be doubted that horses are particularly suited for much of the carting on the farm, especially for work which involves a great deal of stopping and starting. The farm horse has a great reserve of power for emergencies and temporary overloads. It has been shown that for a period of a few seconds and over a limited distance of perhaps 10 yards or less a horse can exert a maximum pull of up to 10 h.p., or more depending upon its size and pulling ability.[1] Horses, however, are rapidly being displaced even in carting, generally speaking the last remaining sphere in which they have tended to retain their importance. This is reflected in the fact that between 1946 and 1950 the number of tractor trailers on farms in England and Wales increased from 79,000 to 221,000 whereas wagons and carts declined from 596,000 to 404,000.

HORSE LABOUR AND ITS COST ON FARMS TODAY.

In order to obtain some information on the cost of keeping horses and the use made of them on farms today, a survey of a small sample of farms in the East Midlands was commenced in the autumn of 1948. A record of all expenses relating to the horses, and time-sheets showing the work which they performed, were obtained in respect of 26 farms for the year 1948-49, and 22 farms for a second year ending in the autumn of 1950.

The 26 farms included in the survey were mixed farms ranging in size from 28 acres to 370 acres and averaging 127 acres. In addition to the 41 working horses on these farms there were also 36 tractors. Three of the farms did not possess tractors.

1 Bulletin 240. Iowa Experimental Station, U.S.A.

The average cost of keeping 41 horses in 1948-49 was found to be just over £24 per horse, and for the 34 horses in 1949-50 just over £26. These figures exclude any allowance for depreciation. Generally speaking the horses were not provided with a great deal of work, so that they required comparatively little attention and many of them were out on grass for the greater part of the year with very little additional feed except when working.

The hours worked in the year averaged 619 per horse in 1948-49 and 533 in 1949-50, representing an average cost per hour of 9½d. and 1s. 0d. in the respective years. These average costs per hour cover wide variations in costs on the individual farms, as is shown in Tables 1 and 2 in the Appendix. In 1948-49 the range in cost per hour was from 4½d. to 5s. 10d. and in 1949-50 from 5½d. to 6s. 9¼d. per hour. Although the total cost of maintaining a horse that is used very little during the year can be extremely low, and on some of the farms in the sample amounted to only £13, the cost per hour of work tends to be high. It would appear that on some of the farms covered by the survey there is little or no work for the horses to do, and that the farmers' main object is to keep them as cheaply as possible as a reserve source of power in case of emergency. Generally speaking low costs per hour were obtained only for horses which were worked a minimum of about 600 hours during the year.

The cost of food (including grazing) accounted for 67 per cent of the cost of keeping horses in 1948-49 and 69 per cent in 1949-50. With the exception of a small quantity of purchased foodstuffs fed to one horse, all the foods fed were home grown. Charges for labour time spent in looking after the horses accounted for 27 per cent of the total cost in 1948-49 and 24 per cent in 1949-50. The remaining cost, amounting to six per cent in the first year and seven per cent in the second, consisted of miscellaneous expenses, chiefly shoeing and veterinary expenses.

The average age of the 41 horses included in the survey at the commencement of the enquiry was 9½ years, the youngest being a three year old and the oldest a veteran of 26 years. The average farm valuation of these horses was £43. In calculating the costs of working these horses no allowance has been made for depreciation or appreciation. The usual method adopted is merely to take the difference between the estimated values of the horses at the beginning and end of the period under investigation. There are, however, some objections to such a method. In the first place major losses in value

through death or injury may often be excluded so that the recorded changes in value may not give sufficient emphasis to the normal risks attending the use of horses, and secondly, there is today so little trading in horses that farmers have no precise market values upon which they can base their estimates of value. It was found, for example, that farmers' valuations of their horses at the beginning and end of the two year period covered by the survey showed upward or downward changes which bore little relation to the age of the horses, the seeming irrationality of these changes being probably due to the difficulties of precise valuation. For a satisfactory basis for allowing for the changes in value accompanying increasing age of horses, one would require to know a good deal more about the average working life of horses on farms and the normal incidence of injuries and disease. But for the purpose of illustration, it can be pointed out that the average age of the horses in the sample being 9½ years and their average value £43 a reduction in value of £5 per annum would imply a further life of 8½ years making a total life of about 18 years. Assuming, therefore, that £5 is a reasonable figure to adopt to cover depreciation of the "average" horse in the sample, this implies an addition to hourly cost of 2d. an hour based on a year's work of 600 hours. Thus, the average cost per hour of work for 34 horses in 1949-50 would be raised from 1s. 0d. to a little over 1s. 2d. per hour.

During the two years for which records were obtained a total of 43,491 horse hours were worked, distributed as follows:—

	%
Carting	62.2
Ploughing	7.6
Harrowing and Rolling	12.3
Drilling	3.6
Hoeing and other inter-row cultivations	6.0
Ridging	3.7
Cutting hay and corn	1.1
Other miscellaneous operations	3.5

It will be seen that the horses were predominantly used for carting and indeed on some of the farms this was almost the only kind of work which the horses performed. Ploughing accounted for 7.6 per cent of the total hours worked, but a great deal of this was ploughing of headlands and awkward corners of fields.

As might perhaps be expected, with so much of their time spent in carting, the work done by the horses was fairly evenly spread throughout the year although on most farms the busiest time was in

the autumn. In 1948-49 31 per cent of all horse labour fell in the three months September to November, the proportion for the same period in 1949-50 being 35 per cent.

A significant feature of the records obtained was the very small amount of work which some of the horses performed. For example, there were three farms, totalling 502 acres in size, on each of which two horses were kept. Altogether these six horses worked only 900 hours in 1948-49, an average of 150 hours per horse. In the succeeding year, the position was even worse, the total amount of work performed by the six horses being only 460 hours, or an average of 77 hours per horse. It is difficult to justify the retention of these horses for so little work, in spite of the fact that the cost of maintaining them amounted to only £14 3s. 7d. per horse in 1948-49 and £15 9s. 2d. in 1949-50, small sums viewed in relation to the total expenses of the farms. The cost per hour of work done was, however, extremely high, amounting in 1949-50 to as much as 4s. 0d. per hour. It is probable that conditions such as these may be found on many farms throughout the country, and that more horses are retained than is justified by the use that is made of them. But where it is considered necsessary to keep one or more horses for the occasional periods of the year when they may be of great value to the farmer, further consideration should be given to whether their use could not be extended so as to obtain lower unit costs. Efficiency in the use of power will often depend on the provision of sufficient work for both tractors and horses.

FITTING THE HORSE INTO THE FARM ORGANISATION.

In spite of the fact that mechanical power has replaced the use of horses in a growing number of farm operations, there are still on many farms advantages to be gained from retaining one or more horses as a supplement to the tractor. A great deal depends on how horses are fitted in with tractors in the organisation of the farm as a whole. In the rapid change over to mechanical methods in recent years, perhaps too little attention has been given to the possibilities of successfully combining horses with tractors on the farm.

There are, however, several difficulties confronting the farmer of today wishing to continue using horses for farm work. In the first

place, the gradual disappearance of village blacksmiths causes many farmers to give up horses altogether because of the difficulty of getting them shod. In most country districts the surviving blacksmiths have no younger men to replace them, so that when they retire the farmers in the districts will have to weigh up any advantage to be gained from keeping their horses against the serious disadvantage of having to journey several miles to have their horses shod.

Secondly, many farmers today complain of the difficulty of obtaining skilled horsemen. This, however, is not such a serious problem as might appear. When horses were worked a considerable amount during the year, and performed some of the heavier cultivations, an experienced horseman was indispensable. But when horses are used only for odd jobs of carting and light cultivations, as in most cases they are today, grooming, feeding and skilled horsemanship are much less important than formerly, and unskilled or semi-skilled workers are all that are necessary.

Another difficulty associated with the keeping of horses today is that of deciding how much work they should do and what particular jobs they are to be used for. Once tractors have been introduced on to a farm, it is necessary to make full use of them in order to achieve economical results, and a range of tractor equipment has to be acquired with this end in view. But once this has been done it becomes no longer possible to make anything like full use of the horses unless some horse equipment is kept in addition. Unless there are compensating advantages duplication of horse and tractor implements is clearly undesirable, as this means higher capital costs. As old horse implements wear out they are generally replaced by tractor implements, thereby making it difficult for farmers to provide sufficient work for horses other than in carting. In the wet spring of 1951 there were many farmers who would have been glad to make use of their horses for sowing, for example, had they still possessed horse-drills. On many farms, however, it will not be a question of keeping horse implements for possible rare emergencies, but a question of whether a couple of horses and appropriate implements can adequately replace the need for an additional tractor and its range of attachments. It is on this possibility that the future of the horse probably chiefly rests, that of avoiding the need for further heavy capital investments in tractors and tractor equipment, particularly on small farms carrying a fairly heavy burden in capital equipment.

It has been shown that farm horses today doing only light work can be kept very cheaply. But however cheaply they can be kept there is no point in keeping them unless there are definite advantages in doing so. To the individual farmer the advantages may be of four kinds, as follows :—

(1) As a reserve source of power for emergencies such as a tractor break-down.

(2) For special jobs, such as root carting on land too wet for tractors.

(3) As a supplement to the tractor, especially important on one-tractor farms when an additional power unit may be of great value when the tractor is fully engaged on essential operations.

(4) As a cheaper source of power for some operations. Generally speaking the cost per hour of a man and horse is about three fifths the cost per hour of a man with a tractor, but the man with a tractor will usually get through so much more work in the time that the tractor will usually prove to be far more economical. There are, however, some farm operations where the amount of work done by a man and a horse is not much less than that done by the man on a tractor, so that to use horses rather than tractors may actually be cheaper. For example, in many carting operations such as carrying fodder to livestock, a tractor and trailer will not carry much greater loads or travel a great deal faster than a horse and cart. In fact in all haulage work where there is a great deal of stopping for loading and unloading and where the distances of uninterrupted travel are short, the speed of work may differ very little between horse and tractor. Other jobs in which horse work may be cheaper than tractor work are sugar beet hoeing in which the quality of work is more important than speed, and the spinning out of potatoes where the speed of work is controlled by the size of the picking gang. With a small gang of pickers more than half the time of the tractor will often be spent idle at the end of the rows.

As has been shown, however, unless sufficient work can be provided for the horses the cost per hour of work may be very high, and in some instances may exceed that of the tractor. Careful con-

sideration must therefore be given to the amount of useful employment that can be provided for the horse. At the same time the fullest use should be made of the tractor if it is to make its full contribution to the economy of the farm. Thus the dilemma of the modern farmer on whose farm horses are still necessary is whether to use them when they would otherwise be idle or to use his tractor. The answer will largely depend on the effect on the total labour requirements of the farm. Unless the labour saved by using the tractor can be dispensed with or can be used for other purposes, then it may well be cheaper to do the work by horses. It is important that in attempting to use horses to full advantage that this should not act as a brake on progress. In many respects indeed the individual farmer must consider whether he has gone far enough in making full use of mechanical power and equipment in order to save labour and increase output. But this does not exclude possibilities of usefully combining horses with tractors on the modern farm. On many small farms a tractor and a horse may be a better combination than two tractors.

APPENDIX.

HORSE LABOUR COSTS IN 1948-49 FOR 26 FARMS IN THE EAST MIDLANDS PROVINCE.

APPENDIX TABLE 1.

Farm Code No.	No. of horses	Foodstuffs £ s. d.	Grazing £ s. d.	Labour £ s. d.	Other Expenses £ s. d.	Total Cost £ s. d.	Total hours worked	Cost per working hour s. d.
2	2	7 0 0	5 12 7	3 9 5	1 5 0	17 7 0	498	8¼
		6 19 10	5 12 7	3 9 5	1 5 0	17 6 10	430	10
4	2	9 1 8	5 12 7	9 15 10	18 0	25 8 1	790	8
		8 7 0	5 12 7	9 13 7	1 2 0	24 15 2	717	8¼
5	4	22 19 0	2 15 10	13 0 0	1 6 6	40 1 4	1,119	8½
		23 5 0	2 15 10	13 0 0	1 6 6	40 7 4	1,236	8
		24 7 3	2 15 10	13 0 0	1 6 6	41 9 7	1,524	6½
		23 6 0	2 15 10	13 0 0	1 6 6	40 8 4	1,364	7
6	1	1 14 6	5 12 7	7 19 3	2 10 6	17 16 10	622	7
7	2	15 4 9	5 12 7	6 11 8	5 0	27 14 0	1,056	6¼
		15 4 9	5 12 7	6 11 8	5 0	27 14 0	798	8¼
8	2	6 17 10	5 12 7	2 7 11	—	14 18 4	186	1 7
		6 12 3	5 12 7	2 7 11	—	14 12 9	50	5 10
9	2	5 17 10	5 12 7	1 9 9	—	13 0 2	118	2 3
		5 17 10	5 12 7	1 9 9	—	13 0 2	272	11½
10	2	8 7 1	5 12 7	1 3 1	—	15 2 9	205	1 5½
		7 14 10	5 12 7	19 11	—	14 7 4	70	4 1
11	2	7 1 11	5 12 7	11 16 3	3 10 1	28 0 10	645	10½
		5 16 5	5 12 7	11 16 3	3 10 1	26 15 4	623	10¼
13	2	13 18 3	5 12 7	6 8 3	—	25 19 1	934	6½
		11 15 2	5 12 7	5 2 3	—	22 10 0	609	9
14	2	8 15 5	5 12 7	8 8 10	2 12 6	25 9 4	653	9¼
		8 15 5	5 12 7	8 8 10	12 6	23 9 4	651	8¾
15	1	4 6 3	5 12 7	3 8 10	15 0	14 2 8	109	2 7
16	1	13 14 0	5 12 7	6 7 0	4 1 0	29 14 7	770	9¼
18	2	11 18 0	3 12 2	6 12 6	1 6 0	23 8 8	758	7¼
		13 3 0	3 12 2	6 12 6	2 6 0	25 13 8	835	7¼
20	1	14 11 10	3 14 11	9 1 3	3 17 6	31 5 6	906	8¼
21	1	5 17 1	5 12 7	5 6 9	1 16 0	18 12 5	244	1 6¼
22	2	10 10 11	5 12 7	5 2 1	1 4 0	22 9 7	466	11½
		9 16 0	5 12 7	15 7	1 4 0	17 8 2	431	10
24	1	2 16 0	5 12 7	4 0 5	1 7 0	13 16 0	616	5½
25	1	8 13 4	4 15 11	5 10 1	19 9	19 19 1	403	1 0
26	1	15 7 6	5 12 7	6 16 0	2 19 0	30 15 1	633	11¾
27	2	14 19 3	5 12 7	7 5 10	1 14 0	29 11 8	804	9
		13 2 2	5 12 7	7 5 10	1 14 0	27 14 7	546	1 0
29	1	19 5 2	5 7 4	7 2 3	2 18 11	34 13 8	930	9
30	1	8 8 3	4 4 6	13 0	13 0	13 18 9	751	4½
31	1	6 12 2	5 12 7	6 16 0	1 0 0	20 0 9	481	10
32	1	15 0 8	5 12 7	5 12 2	4 2 0	30 7 5	350	1 8¾
33	1	11 10 8	4 4 6	12 16 9	1 9 6	30 1 5	163	3 8¼
Total	41	454 12 3	209 12 4	268 14 8	58 8 4	991 7 7	25,366	—
Average cost per horse		11 1 9	5 2 3	6 11 1	1 8 6	24 3 7	619	9½
% Composition of costs		45.9	21.1	27.1	5.9	100.0	—	—

NOTES :—(1) No charge has been made for depreciation or appreciation of the value of the horses.
(2) The cost of grazing has been calculated on the basis of 3.7d per grazing day.

HORSE LABOUR COSTS IN 1949-50 FOR 22 FARMS IN THE EAST MIDLANDS PROVINCE

APPENDIX TABLE 2.

Farm Code No.	No. of horses	Foodstuffs £ s. d.	Grazing £ s. d.	Labour £ s. d.	Other Expenses £ s. d.	Total cost £ s. d.	Total hours worked	Cost per working hour s. d.
4	1	10 7 2	5 3 4	6 2 0	4 10 0	26 2 6	699	9
5	4	27 6 7	3 17 5	13 0 0	1 7 6	45 11 6	1,063	10¼
		27 17 10	3 17 5	13 0 0	1 7 6	46 2 9	1,219	9
		27 17 10	3 17 5	13 0 0	1 7 6	46 2 9	975	11½
		27 17 10	3 17 5	13 0 0	1 7 6	46 2 9	1,258	9
6	1	4 12 0	5 12 7	7 19 9	4 0	18 8 4	581	7½
8	2	9 3 2	5 12 7	2 11 2	—	17 6 11	93	3 9
		9 14 11	5 12 7	2 11 2	—	17 18 8	60	5 11½
9	2	10 15 7	2 16 1	1 12 9	—	15 4 5	76	4 0
		10 15 7	2 16 1	1 12 9	—	15 4 5	45	6 9¼
10	2	6 2 9	5 12 7	2 8 4	—	14 3 8	141	2 0
		4 16 0	5 12 7	2 8 5	—	12 17 0	46	5 7
11	2	5 9 3	5 12 7	9 7 3	3 6 6	23 15 7	606	9½
		5 9 3	5 12 7	9 7 3	3 6 6	23 15 7	318	1 6
13	2	20 5 9	5 12 7	5 13 7	—	31 11 11	851	9
		14 8 3	5 12 7	4 3 3	—	24 4 1	395	1 3
14	2	11 14 9	5 12 7	6 3 9	—	23 11 1	307	1 6¼
		11 14 9	5 12 7	6 3 9	—	23 11 1	256	1 10
15	1	4 8 6	5 12 7	3 8 10	—	13 9 11	144	1 10
16	1	18 5 8	5 12 7	6 2 7	5 19 6	36 0 4	705	1 0¼
18	2	16 1 8	3 3 3	7 4 0	1 3 9	27 12 8	1,162	5½
		16 11 0	3 3 3	7 4 0	1 3 9	28 2 0	953	7
20	1	9 3 6	4 4 6	7 14 6	1 0 0	22 2 6	550	10
22	2	7 10 0	5 12 7	1 7 5	3 12 0	18 2 0	386	11¼
		6 16 10	5 12 7	1 4 9	3 12 0	17 6 2	362	11½
25	1	11 3 8	4 4 6	5 2 9	1 6 6	21 17 5	447	11¾
26	1	14 4 1	5 12 7	5 14 2	5 0 0	30 10 10	403	1 6
27	2	15 1 0	4 18 4	5 5 1	3 15 0	28 19 5	799	8¾
		15 4 2	4 18 4	5 5 2	3 15 0	29 2 8	868	8
29	1	21 10 9	5 12 7	8 0 4	5 3 0	40 6 8	566	1 5¼
30	1	7 18 3	4 8 2	8 8 9	6 3 6	26 18 8	697	9¼
31	1	9 0 9	5 12 7	3 7 10	2 0 0	21 2 0	531	9
32	1	15 17 8	5 12 7	5 18 2	3 4 0	30 12 5	340	1 10
33	1	12 17 6	4 4 6	10 3 8	—	27 5 8	223	2 5½
Total	34	448 4 3	166 9 1	211 17 2	63 15 0	890 5 6	18,125	—
Average cost per horse		13 3 9	4 17 11	6 4 8	1 17 6	26 3 8	533	1 0
% Composition of costs		50.3	18.7	23.8	7.2	100.0	—	—

NOTES :—(1) No charge has been made for depreciation or appreciation of the value of the horses.
(2) The cost of grazing has been calculated on the basis of 3.7d. per grazing day.

PROPORTION OF TOTAL ESTIMATED DRAUGHT POWER IN AGRICULTURE SUPPLIED BY ANIMALS IN THE DIFFERENT REGIONS OF THE WORLD 1948-49 [1]

APPENDIX TABLE 3.

Region [2]	Total Draught Power available	Proportion of Total Draught Power supplied by animals.
	Million units [3]	%
United Kingdom	2.2	22.7
North America	29.4	24.5
Oceania	1.6	62.5
U.S.S.R.	14.1	78.7
Europe (excl. U.K.)	20.9	85.6
Africa	17.4	98.0
Near East	9.3	99.0
Latin America	45.6	99.1
Far East	90.1	99.9
World	230.6	86.4

1 Prepared from information published in the Food and Agriculture Organisation report on *Progress and Economic Problems in Farm Mechanisation*. Washington 1950.

2 Regions are defined as follows :—
North America—Canada, United States, Alaska, Hawaian Island.
Europe—Excludes U.S.S.R. and Turkey.
Latin America—Central and South America and the Caribbean area.
Near East—Turkey, Iraq, Iran, Afghanistan, Syria, Lebanon, Israel, Saudi Arabia and neighbouring territories, Egypt, Sudan, Ethiopia and Eritrea.
Oceania—Australia, New Zealand, and islands in the Southwest and Central Pacific.
Africa—Excludes Egypt, Sudan, Ethiopia and Eritrea.
U.S.S.R.—includes European Russia.

3 Units of draught power calculated on the following basis :—

Tractor	6
Horse or Mule	1
Buffalo	0.9
Draught Cattle	0.5