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The Horse Versus the Ox during Medieval Times……and Horse Power versus Horsepower Today

by
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In watching television or other films regarding agriculture in various nations, one can occasionally still see where horses, mules, donkeys, or oxen are used to plow/plough fields or haul produce from farm to market. These practices seem antiquated by today's farming techniques which mostly employ large combustion engine combines or tractors, trucks, etc. Much has been written about the agricultural revolution that occurred throughout most developed nations between the world wars and especially after the second one in which the use of more and more machinery has been used to grow agricultural produce such as wheat, corn, barley, etc. Even in the developing countries, more and more machinery is being used in agricultural production.

The use of animals in agriculture and animal husbandry is as old as civilization itself. For medieval enthusiasts, the economic historian John Langdon probably has done the greatest amount of work and scholarship on the uses of draft/draught animals in medieval Europe, especially in England (1982, 1986). Up until late medieval times, the ox is preferred to the horse on farms mostly because the animal is cheaper to own and maintain even though the horse is capable of performing and helping with a greater variety of tasks beyond helping to plow fields, and these other functions of the horse include hauling things such as produce and tools and possibly being used for traveling, herding, and hunting if necessary. As an ox ages and becomes less useful, it can be slaughtered and sold for meat if necessary, and beef is preferred to horse meat in medieval times. Horse meat is considered an inferior good and not as enjoyable as beef.

Even an older horse has more value with continued use versus selling it for meat. The ox has greater resale value, and so even though usually there are not dramatic differences between its price and plow horse prices, the ox is a more valuable asset.

Despite the versatility of the horse, the ox has a competitive cost advantage over it in medieval England. The table below comes from Langdon's (1982) extensive work at estimating the operating costs of each animal and shows how much cheaper it is to own and maintain an ox versus a horse, whether a plow horse or cart horse. The depreciation expense shown below reflects the difference between the average initial price of each animal and its resale value which is in turn divided by the average life expectancy of each animal to obtain the estimated annual depreciation amount. Langdon calculates that during medieval times that plow horses and oxen typically have roughly the same life expectancy (a little over 5 years), but the cart horse lives an average of around 7 years. The high resale value of the ox lowers its depreciation expense despite that its average lifespan is only around 5 years.

	Cart-horses (cost/animal/year)	**Plow-horses (cost/animal/year)**	**Oxen (cost/animal/year)**
Feeding			
Oats	15s, 9.5d	4s,9.5d	9.75d
Hay and Straw	3s,11.5d	2s,0.75d	4s,7.25d
Pasture	1s	1s	1s
Total	**20s,9d**	**7s,10.25d**	**6s,5d**
Maintenance			
Shoeing	1s,2d	9d	0
Other Costs	6d	6d	6d
Total	**1s,8d**	**1s,3d**	**6d**
Depreciation	**1s,3.5d**	**1s,0.75d**	**3.75d**
Grand Total	**23s,8.5d**	**10s,2d**	**7s,2.75d**
Grand Total w/o Hay & Straw	**19s,9d**	**8s,1.25d**	**2s,7.5d**

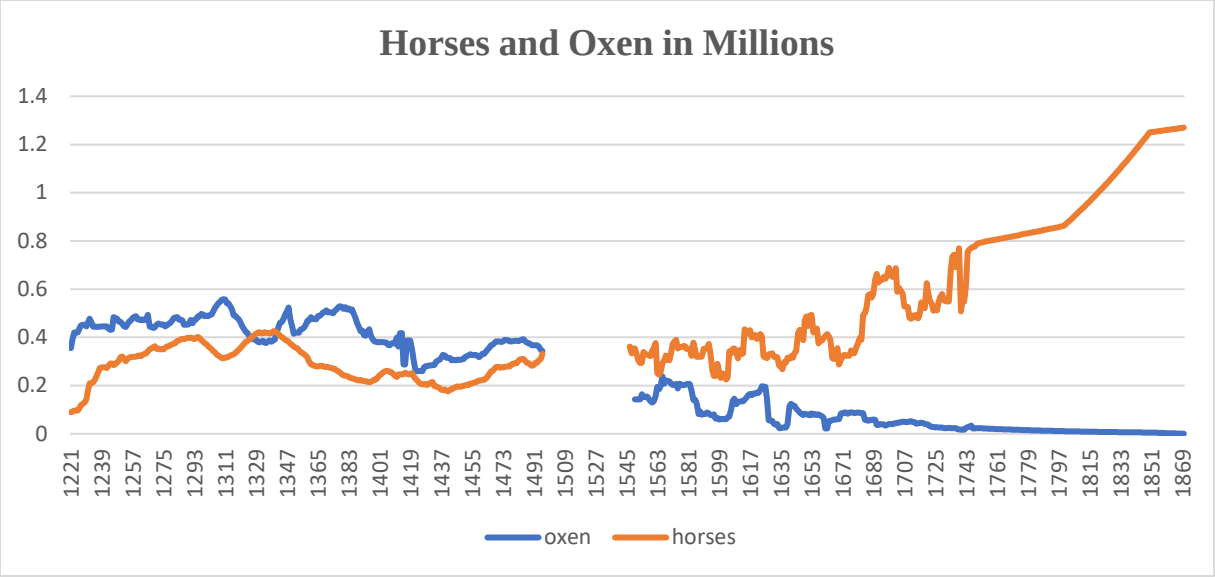
s=shilling, d=pence/penny

Source: reproduced from Langdon
(1982, page 37)

Horses are used on some farms, but its overall use in England for agriculture is not as great as that of oxen. In fact, as in ancient times, the horse is valued more for military rather than farming purposes. It is probably not until the late medieval period with the gradual breakdown of the demesne system of feudalism and the rise of independent farmers that the horse begins to close the gap with the ox. This is mostly because independent farmers begin to gain property rights; have an incentive to produce more for their own gain/profit by being able to sell some/most of their produce in markets rather than giving some or most of it to some lord or baron as a serf would; buy out rival farms that are not performing that well or have failed; and begin to attain a level of affluence that makes investing in the horse more practical since horses can plow faster than oxen and therefore can plow a greater amount of land in a shorter period of time. These gains in efficiency are due to the economies of scale found in larger farms, and in the late medieval period and especially through the 1600s and 1700s average farm size begins to increase due to consolidation in the farming industry and due to many peasants moving, whether voluntarily or involuntarily, from rural areas to towns and cities. Technological innovation also begins to occur thanks to better and more investment opportunities that are facilitated by greater average farm size. The greater expense of the horse can now be spread out over a greater area of land, and this gives the horse a productivity advantage over the ox which makes up for the horse's greater average operating expense. Lambert (2023) notes that property rights are not sufficient for investment because farm earnings and profits have to reach a certain level before investment and subsequent higher levels of production will take place. Large enough earnings and profits are attained with larger and larger farms, which in turn yield even greater profits.

By the farmer knowing that the horse can perform a greater variety of functions than the ox, the horse becomes a worthwhile investment once average farm size reaches a critical threshold. The multi-faceted aspect and use of the horse for plowing, hauling, herding, traveling, etc. is something that economists refer to as economies of scope such as when a modern delivery company can use a large truck for both inter-city and intra-city deliveries. The owner of the asset gains cost savings and greater efficiencies due to the asset being capable of being used in more than one way. The ox has more limited capabilities because it is slower at hauling, cannot help with herding, and is definitely not good for traveling or hunting.

The table below illustrates how the horse overtakes the ox in sheer numbers in England according to estimates by Broadberry, et al (2015). Unfortunately these economic historians cannot fill a data gap from 1497 to 1547 due to a lack of records, yet the patterns for each animal show early dominance of the ox over the horse which begins to narrow in the first half of the 14th Century, then widens again before narrowing again in the 15th Century. This era corresponds to the period of the ascent of the independent farmer and unraveling of the demesne system. And then during the 1600s, which corresponds to the time that many argue is the main period of the English Agricultural Revolution and increasing average farm size, the horse begins to greatly overtake the ox, and by the 18th Century, the ox is left way behind in total numbers. During the 1600s and later, English agricultural production takes off dramatically. The horse plays a key role in overall production and productivity per farm worker



Source: reproduced from Broadberry, et al (2015), Figure 2.01, page 54.

Back to the Future? Horse Power versus Horsepower

With concerns over climate change, some are now arguing that horses should be re-deployed in greater numbers back to farmlands across the globe. Combines, tractors, and other farm machines have greater productivity levels than a team of horses or other draft animals, yet these machines also generate carbon emissions. In fact, agriculture has been cited as one of the most, if not the most, energy intensive industry that exists. More so than regular electric vehicles, electric powered combines and tractors face challenges in finding recharging stations or sources and use up electric power quickly due to their large and heavy sizes. Like their motor vehicle counterparts, the fueling source frequently and ironically is from a fossil fuel burning power plant. So much for carbon neutral electric vehicles. For these reasons and because some argue for a greater presence for more locally grown produce which cuts down on the transportation costs of food; and because some argue for an organic form of farming which

eliminates the use of petroleum based pesticides, the idea of using horse power (and perhaps ox power) once again is being considered and/or implemented in many parts of the world. Such efforts have been taking place in Cuba since the early 1990s because of petroleum shortages. It can be argued that savings on transportation costs and the reduction in the manufacturing of petroleum based pesticides would help to reduce carbon emissions and thereby help the climate. Horse and/or other forms of draft animal farm work cannot replace completely combines and tractors, but could be used to work areas that are difficult or problematic for large farm equipment and machines to navigate especially on smaller farms close to or in the more rural (or ex-urban) parts of metropolitan areas. They could also be used as complements to farm equipment on larger farms, thereby helping to curtail emissions from farm equipment. The slaughter of unwanted and surplus horses could be dramatically curtailed by finding other uses of an animal that once was a chief ally and friend in humankind's fight against mass hunger and famine. The use of greater levels "horse power" and the need to reduce carbon emitting horsepower definitely needs to be considered and discussed.

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