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The Heavy Plow as an Agent of Social Change

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Introduction

This case study examines the heavy plow as a technological innovation within the context of social and economic inequality. As will be shown, during the Middle Ages, this innovation transformed and relaxed feudal inequality, but without alleviating it entirely. While the legal and economic forces leading to this change are relatively clear, one possible *additional* factor—not previously made clear—is the effect of the new communal relations which formed among peasants with the use of the heavy plow. Specifically, new forms of cooperation were both the condition for its use and the means of its spread, and this cooperation likely led to a social solidarity that eventually eroded feudal bonds. If this factor is correct, it raises some interesting questions about how a technological innovation can re-shape social relations, even as those relations shape the ways in which a new technology is used.

This case study offers a way to raise and explore these questions, using medieval Britain as an example. The argument, in brief, is as follows.

At the dawn of the Middle Ages, shortly after Roman rule ended in Britain, social relations there were structured by the manor and the villein. The manor was all the land owned by the lord, and the villein were the peasants who worked the lord's land. In this relationship, the peasants owed the lord their labor to work part of his land for his benefit, and in exchange the lord allowed the peasants to work part of his land for their own subsistence. As part of this agreement, peasants also paid rent for the land they worked, along with other fees and service obligations, with the total usually amounting to half the value of what they produced for themselves. In order to

subsist, then, peasants paid the lord with both their labor and the money they earned from working for themselves.

The introduction of the heavy plow both solidified and transformed this relationship. From about the sixth to the twelfth century, increased use of the heavy plow led to an expansion of the manorial system, making peasant serfdom the law of the land. However, even as it did this, the conditions were created for the transformation and relaxation of that law. What was originally a labor-plus-rent for land obligation from peasant to lord became a much more flexible rent-for-land transaction, one which freed peasants to labor more for themselves.

One of these conditions was clearly economic: at the same time as agricultural productivity increased because of the heavy plow, the peasant population expanded as well, so some peasant labor could be reallocated to non-agricultural tasks. Lords were thus incentivized to pay for that labor, even as peasants were incentivized to sell it. This new wage-for-labor relationship put pressure on the labor-for-land exchange that characterized medieval serfdom.

Another of these conditions was legal: manorial rule was relaxed early in the thirteenth century, which loosened the labor obligations peasants owed the manor, even as they continued to pay rents. As these obligations were loosened, peasants again increasingly offered their services for wages, and again, lords were increasingly willing to pay for it. This too put pressure on the labor-for-land obligation between peasants and lords.

The combined effect of these legal and economic changes was to increase the rate at which peasants bought and owned land, and the rate at which lords paid for labor to have their remaining lands worked. As a result, a trend was established where relaxed manorial obligations and an increased labor force among peasants led them to paying *only* rent for use of the lord's land, as opposed working their indentured share in exchange for labor obligations to the lord as well.

In effect, by the middle of the thirteenth century, the labor-plus-rent for land relationship of lordship and villein was being transformed into a rent-for-land relationship of lessor and lessee. By the end of the sixteenth century, this change had become universal in Britain. The conjunction of these legal and economic factors eventually released the peasants from the

bondage of serfdom and freed them—to some extent—for market-oriented labor. In conjunction with many other mechanisms, this expanded labor pool eventually made the Industrial Revolution possible.

Aside from the economic and legal factors behind this change, however, I posit that an additional social factor *may have* played a role as well—one that accounts for how peasants, each of whom had an individual interest, banded together as a group to demand terms that required them to pay only for land use, as opposed to owing additional labor to the lord. As an indicator of this added social factor, note how these individualistic legal/economic factors necessarily inter-relate with any collective, group interests that might emerge.

On the one hand, *individual* peasant households had a compelling economic interest in offering their labor to the lord in exchange for wages. On the other hand, for the peasants to attain this goal as a group, it is not a wild speculation to consider that some new form of social cohesion must have arisen to offset the limited impact their individually pursued incentives might have. In other words, without this social cohesion, the occasional exchanges of labor for wages between peasants and the lords would be more or less incidental, one-off affairs, not the transformation in their relationship that occurred.

What might this new form of social cohesion have been? What might have created a new sense of social solidarity among peasants, such that they were willing to sublimate their individual economic interests into a *collective* action that benefited them all, *as a whole*? Some form of solidarity was required to assert and enforce this group interest, over and against the gains to be had from acting on individual interest alone. What social and/or material conditions might have fostered it?

Enter the heavy plow. Regardless of how the plow was introduced—either by the lord or by the peasants themselves—its use required new forms of cooperation among peasants, ones that could either be enforced top-down by the manor, or ones that needed to be agreed upon and carried out consistently by the village. Either way, use of the heavy plow required these new social relations, and these new social relations likely created the conditions for the group solidarity that simultaneously led to peasants as a group demanding rent-payment-only for use of the lord's land, minus additional labor obligations—and the lord's willingness to grant it.

In other words, the heavy plow *might* have set some of the social conditions that transformed the legal and customary sense of bondage in peasant serfdom into the marginally relaxed kind of freedom entailed in a relationship between a landlord and a tenant. So, while the social inequality of manor and villein was not fully alleviated by the new relations fostered by the heavy plow, in important respects it was transformed into a new kind of inequality, one that was nevertheless a crucial step toward the social and legal equalities that eventually emerged, specifically the ones we enjoy and still seek to improve now—though, of course, this emergence took centuries to achieve.

In any case, the details of this transformation are fascinating, and knowing them enables questions to be formed about technological innovation within a social context, both in this case with the heavy plow, and in other cases, where other technological innovations also occurred under a regime of social and economic inequality.

This case study is laid out in three steps. First, the nature, origin, and dissemination of the heavy plow is considered; then some social and economic factors prior to its introduction are examined; then finally, the impact the plow had on these factors—and the way these factors needed to change—is explained. Only then does it become clearer how the relations of lordship and bondage in medieval serfdom were transformed to a lessor and lessee relationship—in short, the trajectory of Britain from the mid-thirteenth century to the end of the sixteenth, with the heavy plow as one of its proximate, material causes.

Nature, origin, and dissemination of the heavy plow

The plow was the first application of non-human power to agriculture, and its changes over time have had a profound impact on the limits and course of civilizations.

Before the Middle Ages, the plow was a comparatively simple technology: it was composed of a stick, sometimes tipped with iron, supported by large handles, which the farmer held as it was pulled by a team of two oxen. This “scratch plow”, as it is usually called, effectively tilled the light, drier soils in the relatively arid lands common in most ancient civilizations, but it could not turn over the heavier, moist, soddy soils in Europe and Britain—at the time, the northernmost limits of the Roman Empire. As a result, under Roman rule cultivation in Britain was limited to the well-drained, light-soiled uplands, which were often less productive than the moist,

heavier-soiled lowlands. This technological limit on arable land limited population growth, which meant the manor-villein relations established at the end of the Roman Empire maintained themselves in a steady state. As there was no population pressure to push expansion, there was no expansion; the technological means to do so were not yet present.

After the end of Roman rule, this all changed. After the Anglo-Saxon invasion in the 5th century, a new kind of plow gradually replaced the light, wooden scratch plow—a furrowing, heavy, iron plow capable of turning over the richer, moister, soddy soils in lands which had gone largely uncultivated. As use of this plow spread, these lands became farmable—and cultivated more productively. This boost to agriculture led to population growth, which in turn required colonization onto even more newly-cultivated lands, which in turn expanded the existing manor-villein relation from its steady state at the end of Roman rule to encompass almost all of Britain. By the middle of the 11th century, just before the Norman Conquest, this expansion was complete. Virtually everyone in Britain lived within the manor-villein relationship.

The heavy plow that made this transformation possible had three technical innovations over the scratch plow—and sometimes a fourth.

First, instead of a stick tipped with iron that tilled only the uppermost layer of soil, the heavy plow—or *carruca*—was primarily an iron coulter, or a “heavy knife”, which made a vertical cut deep into the ground. This meant that previously non-arable “rough” lands could be used, and a greater supply of nutrient-rich soil could be reached, both of which increased agricultural productivity.

Second, this coulter was accompanied by a flat plowshare attached at right angles, protruding from both sides, which also cut the soil horizontally, even as the coulter cut it vertically. This too insured that a greater supply of nutrients could be reached, since now the vertical depth was accompanied by a slicing that “released” the soil lower down. This slicing also cut the sod at its roots, releasing the grasses and the soil held by them.

The third innovation, the moldboard, completed the combined work of the coulter and the plowshare; it turned this vertical-horizontal cut onto its side, creating a furrow that buried grass

and weeds under the newly released topsoil, which added nutrients back into the soil as they decayed. This too enhanced agricultural productivity.

Lastly, this tripartite plow was sometimes wheeled, which enabled the farmer to control the depth of the furrows.

The ultimate origins of this society-changing innovation are largely unknown. There is some evidence the Romans knew of it, though there is little evidence they ever used it. At the time of Caesar's conquest of Gaul, there is some evidence German tribes were already using it, sporadically, and this evidence suggests they adopted it from the Slavs, who occupied what is now eastern Europe. This evidence in turn suggests some parts of the heavy plow were invented at different times, in different places, than others.

However, what is more important than who invented what when is this: under what conditions did this wider use become possible? And, what was it about the heavy plow that changed these conditions, and how and why did these changes occur?

In the case of post-Roman Britain, the answer to this question requires a closer look at the social relations that prevailed during and at the end of Roman rule, but before that, a key fact about the heavy plow needs to be considered, to which this account now turns.

First and foremost, the heavy plow was expensive, far too expensive for any one peasant household to own. It was so expensive for two reasons—the materials and workmanship required to make it, and the team of oxen required to pull it.

Unlike the lighter scratch plow, which might only contain a tip of iron, the heavy plow required that the coulter be molded in iron, or even be made of iron, otherwise it could not cut the soil. The same applied to the plowshare; it too needed to be made of or molded in iron. This dramatically increased the cost of the heavy plow far beyond the means of an ordinary peasant because iron was expensive in and of itself, and because working iron required skill labor that added to its cost. So, in materials alone, using the heavy plow was out of the reach of individual peasant households.

On top of this material expense, the operation of the plow added another one; it required a team of at least six oxen to pull it—and usually eight. It required an additional peasant to guide the team, since the one manning the plow had no means to steer a team of six or eight oxen. Even if most peasant households had a worker to spare to do this, few owned more than one or two oxen, and virtually none had the means to buy four to six more—again, putting the heavy plow even further out of reach.

In essence, the heavy plow was just too expensive for an individual peasant household to own—but its use became widespread anyway. How this happened is intimately tied into the specific social relations that existed prior to its use—relations that had to change in order for it to be used.

Social and economic conditions *before* the use of the heavy plow

As already indicated, the relation between peasants and lords was one of "the manor" and "the villein," where in exchange for the right to work land for themselves peasants paid the lord both a money rent and a labor obligation, usually to work the part of the land the lord reserved for himself. In either case, the land the peasants worked remained owned by the lord, and the peasants were bound by custom and law to work the land the lord allotted—and none else. They were, as serfs, essentially tied to the land, and this created two kinds of relations among the peasants themselves.

First, there was the "rights of use" for specific pieces of land between individual peasant households. At the start of the Middle Ages, these were almost exclusively individual parcels of the lord's land that each peasant family worked for itself, from which it contributed its own portion of the monetary rent. Sometimes these parcels were connected directly to the household, but often they were scattered throughout the indentured lands the peasants as a whole worked. In any case, each household was responsible for cultivating its parcel(s) of land, and only those allotted to them. Nor could they move from manor to manor, unless they paid a manumission fine. Under these conditions, for all the community relations established in the village—and there were many, since the lords required *some* degree of self-governance—peasant households were largely individualistic. Each one worked, ultimately, for itself.

Second, with this emphasis on the individual households, rules of inheritance had to be established for the transfer of “ownership rights" from the deceased to the survivors. Sometimes the manor prescribed these; other times local customs dictated them, but either way these rules usually resulted in further fragmentation of the parcels individual households might cultivate. Strictly speaking, of course, these “ownership rights” did not apply to the land itself, only the right to work it, but either way, these inheritable rights were also the basis of the individualistic nature of peasant households. Peasants who could afford it paid the lord for more rights to work more land, which they then passed on to their heirs.

The result of these two kinds of relations—inheritable rights to work specific parcels of land—was a peasant community as fragmented and individualistic as it was in other ways communal and-group oriented. Although they had to set up many rules and institutions through which to govern themselves—always within the ultimate purview of the lord, to be sure—they were nevertheless independent and self-sufficient households that produced both their own substance and the surplus required to pay the lord. As a result, it was to a very real extent “every peasant household for itself.”

The impact of the heavy plow on social and economic conditions

The heavy plow changed social and economic conditions for peasants. Since its benefits as a labor saving and productivity enhancing device were obvious, many peasant households wanted one. However, since it was astronomically too expensive for any individual peasant household to buy, none could afford it. In some cases, the lord himself provided one, with the hopes that his peasants would be more productive, and therefore he himself would get richer. But in cases where the rule of the manor was laxer—and this applied to the majority—the peasants were left to fend for themselves on how they went about paying their rents and meeting their labor obligations, while still subsisting.

So, what happened? What change led to the widespread use of the heavy plow, despite the fact that acquiring one was beyond the means of virtually all peasant households, all of whom were in it for themselves?

In a move that almost defies economic explanation, peasants all over Britain *decided to work together in order to acquire and use the heavy plow*, and they *shared* the proceeds accordingly. This decision required a profound transformation of the two social relations just

described—individual rights of exclusive use, and transfer of those rights to heirs. And change they did.

Although documentary evidence of these changes is *almost* non-existent, we can infer from some material facts that they *had* to happen.

First, there was the change in the shape and layout of the cultivated fields. It went from the closed-field array of small, scattered parcels to a unified, open-field system. This change occurred all over Britain, and it was the result of the technological constraints of the respective type of plows.

Using the scratch plow, each peasant cultivated a relatively small square parcel of land, or several, sometimes separated from one another by another peasant's lands. Additionally, some of these lands were better than others; therefore, some peasants had rights to more productive acreage. Under this system, each peasant worked independently of the other, such that when one worked his land, the other worked his own as well. This effect was as much the result of the nature of the light plow as it was of existing social relations. Since cross-plowing prior to planting was needed, and since turning the team that pulled the light plow was simple, the square was the most efficient form for fields. In the early manorial system, this fragmented layout of small, square fields was the norm.

The field layouts for the heavy plow, however, *had* to be different, and over time, these differences became more common, until, eventually, they were the norm across the entire manorial system. And the reasons for transformation were astonishingly mundane—since it was prohibitively difficult to turn the team required to pull the heavy plow on the small, individuated, square parcels, it was necessary to plow *furlongs*, or fields as long and as wide as could be plowed in one day—always far, far longer than wide. This meant several small, fragmented fields would *need* to be folded into one large field, and with different parcels of differing quality folded into several long, open strips. As a result, to use the heavy plow as they did, peasants *must* have agreed to relinquish, to some extent, their individual rights to specific parcels of land and fold those rights into partial "ownership" of a collective field or fields.

In effect, while specific field layouts varied from village to village, with some using the two-field system and some the three, the technical requirements of the heavy plow required that for its effective use, social relations of “ownership” and inheritance *had* to change. Instead of each peasant household cultivating small, disparate parcels scattered across the indentured land, which could be passed on to heirs, they *had* to collectively “own" the large, longer fields that “crossed them,” only those parts of which could be passed on. In order to do this, they had to work together in new ways and create legal and social institutions to enforce this cooperative agreement.

That they did so is evident not just in the rise of the open-field system across Britain, which in fact occurred. It is also evident in the standardized units of land that became used across all manorial systems during this time. Specifically, parcel-strips (the twelve-acre furlongs typical of this era) were assigned according to who contributed what to the heavy plow and its team, and their names reflected this. The plowman, the driver, the owner of the plow irons, and the owner of each of the eight oxen all got a portion of this strip, designated as bovates or half-virgate for those who contributed an ox and a full virgate to those who contributed the plow. Not only were land portions allotted this way; the proceeds from each allotment were as well. While this system did not create economic equality among peasants (in fact, in some respects it increased it), it did require a kind of *social* equality that was unheard of before the advent of the heavy plow.

In short, instead of each peasant household working individually for self-sufficiency and a surplus to pay the lord, peasant households surrendered time-honored “rights" in order to work together and share in a collective good. This form of sharing probably would not have been possible—and it certainly would not have been *necessary*—if not for the arrival of the heavy plow. That this sharing led to a new sense of community that transformed the lord and peasant relation represents the concluding thoughts to this case study, as stimulus for further discussion.

Concluding Thoughts

As already noted, prior to the introduction of the heavy plow, individual peasant households had all the incentives in the world to work only for themselves, even as the manorial rules about obligatory labor were relaxed. With the advent of the heavy plow and its effect on the peasant population, they still had as many reasons as not to continue working individually, even as the

heavy plow required new forms of cooperation. In effect, the question remains: how did *individual* labor-for-wage relations between the peasants and the lords, which became more common with the heavy plow, become a *collective* rent-for-land relationship that dissolved 'ancient' feudal *labor* obligations, between the lords and peasants as such? It is generally acknowledged that economic and legal factors were not *by themselves* sufficient, so what additional factor(s) added to this change? And, what impact did this change ultimately have on the peasants, as a class?

What is proposed here is that a new sense of peasant solidarity emerged from the cooperation that use of the heavy plow both encouraged and required; that this new solidarity banded peasants together and fostered their collective, as opposed to their individual, interests—even if this 'banding together' was a tacit expression of passive resistance and not explicit action. We can see some of this collective interest emerging in the Peasant Revolts in the late thirteenth and early fourteenth century, but the impact of these revolts aside (in fact they changed very little), eventually this collective interest *did* emerge, it did prevail: peasants got rents in lieu of rents-plus-labor—and the lords agreed to it.

That this was in *their* own economic and social interest is certain. What is less certain, however, is how the peasants' *collective* interest came to be asserted and accommodated.

Whatever the mix of proximate legal, economic, social, and material causes behind this assertion, which was concurrent with the spread of the heavy plow, the simultaneous expansion and weakening of the feudal inequality of lordship and bondage *did in fact occur*. While this weakening and eventual abolition of feudal rule did not make peasants materially better off, as a rule, it did give them a modicum of freedom they could never have enjoyed under traditional feudal obligations. Did this transformation, then, simply change one form of social and economic inequality for another, or did changing notions of social status set the stage for eventually forms of social and economic equality to emerge?

Discussion Questions

1) That new forms of cooperation both emerged with and made possible the use of the heavy plow is an established historical fact. However, assigning social causality to this technological innovation is another matter. What, in general, is required to assert that a material factor

affects—or even *creates*—a new social relation, and does the case of the heavy plow meet these conditions. If so, in what way?

2) It is generally believed that the dissolution of medieval feudal obligations did not, as a rule, make peasants better off, material speaking. Despite a freedom to offer their labor on the open market, these relationships were often just as exploitative—or more so than—traditional lordship and bondage. So, even though releasing peasants from land tenure occurred as their labor obligations to their lord dissolved, were the peasants really freer, or was their “new freedom" bought in exchange for relations that exploited them in new ways, ways that left them no better off, in material terms?

3) The evidence that social relations changed because of the increased use of the heavy plow is both indirect and direct. On the one hand, the material layout of the fields changed; this is verifiable in a number of ways. On the other hand, manorial records, such as they are, indicate new forms of allotment and rent were codified, indicating that something about peasant relations changed. In the absence of other documentary or material evidence, however, what social or economic theories might make this assertion more plausible—the problems of the commons, the logic of collective action, the balance or exchange theory, etc.? Which of these (and others) might apply here, and why, and in the alternative, which ones don’t apply, and why?

4) Whatever the mix of proximate legal, social, economic, and material causes that led to the conjunction of the use of the heavy plow with the initial expansion and eventual decline of the feudal system, this conjunction did occur. Can you think of other technological innovations that emerged under similar conditions of social and economic inequality, that had similar effects—even if the ultimate mix of factors is as unclear as the case here? Do most technological innovations so situated tend to exacerbate, as opposed to alleviate, inequalities, or do they have ambiguous effects similar to those suggested here? Ultimately, what conclusions can be drawn from the case of the heavy plow as an agent for social and economic change, relative to the condition of social and economic inequality within which it emerged, and how might these lessons apply to other cases?

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