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## THE CRISIS OF FEUDALISM

An Environmental History

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*Environmental history may help explain feudalism's demise and capitalism's ascent in the 16th century. Medieval Europe was riven by profound socio-ecological contradictions. Feudalism's environmental degradation pivoted on the lord-peasant relationship, which limited the possibilities for reinvestment in the land. Consequently, feudalism exhausted the soil and the labor power from which it derived revenues, rendering the population vulnerable to disease. The Black Death decisively altered labor-land ratios in favor of western Europe's peasantry. This new balance of class forces eliminated the possibility of feudal restoration and led the states, landlords, and merchants to favor geographical expansion—an external rather than internal spatial fix to feudal crisis. This external fix, beginning in the Atlantic world, had capitalist commodity production and exchange inscribed within it. Capitalism differed radically from feudalism in that where earlier ecological crises had been local, capitalism globalized them. From this standpoint, the origins of capitalism may shed light on today's ecological crises.*

In the long-running debate over the transition from feudalism to capitalism, only rarely have we glimpsed medieval Europe's socio-ecological contradictions. Probably Immanuel Wallerstein (1974) went furthest, crafting his account of the 14th-century crisis around the notion of a "socio-physical conjuncture" (p. 35).<sup>1</sup> In Wallerstein's hands, modern relations of capital and class shaped, and in turn were shaped by, transformations of the earth. More commonly, environmental history has been subsumed under various environmental determinist approaches (Diamond, 1997; Jones, 1987; Landes, 1998), with some combination of climate and topography offered as major factors in the "rise of the West."

An alternative approach, one that develops and extends the implications of Wallerstein's notion of feudalism as a socio-physical conjuncture, might shed some light on why feudalism gave way to capitalism. It bears repeating that a successful transition to capitalism was not inscribed in feudalism's socio-ecological contradictions. Although medieval Europe contained its share of "proto-capitalist" elements, this was not unusual. Indeed, "proto-capitalism" was so widespread one

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might consider it to be a constitutive element of all the redistributive/tributary [systems] the world has known" (Wallerstein, 1992, p. 613). As the subsequent history of capitalism bears out, agrarian ruling classes in such "tributary" systems had good reason to fear the revolutionary changes promised by a regime of ceaseless capital accumulation. In such a system, the "ceaseless accumulation of capital inevitably permits new persons to challenge existing power, to become part of it, and does so ceaselessly" (Wallerstein, 1992, p. 613). Nevertheless, toward the end of the "long" 14th century (ca. 1300-1450) and the beginning of the "long" 16th century (ca. 1450-1640), Europe's ruling strata pursued policies and adopted strategies that favored a capitalist rather than tributary solution to the crisis of feudalism. This article offers an explanation, first, of the socio-ecological contradictions that gave rise to this crisis. And second, I offer a historical-geographical explanation for the convergence of interests among Europe's leading strata—above all the states, the seigneurs, and the city-state capitalists—in favor of geographical expansion and the creation of a capitalist world-economy.

### FEUDALISM, WHAT'S IN A NAME?<sup>2</sup>

Feudalism means many things to many people. One camp limits the concept to "the hierarchical relationship between a lord and his vassals" (Lefebvre, 1976, p. 122). In this tradition, "history was not just written *from* the perspective of the top but was also limited to studies of the top" (Kaye, 1984, p. 73; e.g., Ganshoff, 1964). The critique of this narrow conception of feudalism was spearheaded by, among others, Rodney Hilton (1949, 1973, 1985) and Marc Bloch (1961). Although recognizing that "feudal Europe was not all feudalized in the same degree or according to the same rhythm and, above all, that it was nowhere feudalized completely" (Bloch, 1961, Vol. 2, p. 445), these historians deployed a broader conception that sought "to describe a whole social order whose principal feature was the domination of the rest of society, mainly peasants, by a military landowning aristocracy" (Hilton, 1976c, p. 30).<sup>3</sup>

This broader conception of feudalism has strongly influenced the world-historical perspective since the 1970s (see esp. Wallerstein, 1974). One major exception to this generalization is Giovanni Arrighi (1994, 1998), who in key respects has returned to the earlier, narrower conception of feudalism. In Arrighi's scheme of things, feudalism is limited to rural social relations in medieval Europe. Although feudal relations are

no doubt very relevant to an understanding of English, French, Polish, Swedish and many other "national" histories of the European world[,] they nonetheless are largely if not entirely irrelevant to an understanding of the origins of world capitalism for the simple reason that world capitalism did not originate within the economic activities and social relations [of territorial Europe]. Rather, [capitalism] originated in the interstices [the city-states] that connected those territorial organizations to one another. (Arrighi, 1998, p. 126)

Thus, following Postan's (1972) famous statement that "medieval towns were . . . non-feudal islands in the feudal seas" (p. 239), Arrighi narrowed the conception of feudalism to exclude urban centers in order to designate them prime movers in the transition to capitalism. In so doing, Arrighi ran the risk of tautological reasoning: The origins of capitalism are explained in terms of capitalist city-states.

Tautology aside, this line of argument tends to reproduce a sterile dualism, pitting the capitalist city against the feudal natural economy. But if the broader conception of feudalism is deployed, city and countryside, market and production, are viewed not in isolation but rather dialectically. From this perspective, production and exchange are “points of departure” for the investigation of large-scale “social economies” (Tomich, 1997, p. 299). From this standpoint,

production and exchange are no longer conceived as discrete entities divorced from their broader contexts, separated from and opposed to each other as external objects; nor are they treated as identical. Rather, production and exchange are understood as relations that presuppose, condition, and are formative of one another as distinct parts of a whole. If we conceive of the social economy in this way, the relevant unit of analysis is defined by the extent of the interrelated processes of production, distribution, exchange, and consumption. (Tomich, 1997, p. 300; see also Marx, 1973, pp. 83-100; Merrington, 1976)<sup>4</sup>

Feudalism’s historical geography was shaped decisively by the agrarian class relations that enveloped the mass of the population. As Hilton (1976b) persuasively argued, the “struggle for rent” was the “‘prime mover’ in feudal society” (p. 115). The struggle between landlords and peasants for shares of the agricultural surplus tended to generate modest (but always constrained rather than ceaseless) pressures for increased productivity and market production. Thus, the expansion of

medieval market centres and towns from the 10th or 11th century was based fundamentally on the expansion of simple commodity production. The spectacular developments in international trade, the industrialisation of Flanders . . . , the growth of big commercial centers like Venice . . . are chronologically secondary to the development of the forces of production in agriculture, stimulated in the process of the struggle for feudal rent. (p. 116)

With this basic framework in mind, we may now investigate feudalism’s socio-ecological crisis tendencies in some depth.

### **MEDIEVAL EXPANSION: FEUDALISM’S LONG MARCH TOWARD ECOLOGICAL CRISIS**

Our story begins with the golden age of European feudalism. Between the 11th and 14th centuries, medieval Europe experienced rapid population growth, leading to new settlement throughout central and eastern Europe. Successful military campaigns (Crusades) were waged against non-Christians in the Baltic, Iberia, and Palestine. Cities grew. There was significant growth of manufacturing output and cash-crop agriculture, part and parcel of a generalized wave of commercial expansion throughout Afro-Eurasia. The states consolidated their power against feudal lords.<sup>5</sup> Social and technological innovations—especially in sea transport, financial mechanisms, and business organization—encouraged new divisions of labor between previously distant regions.

But sometime around 1300, things started to go wrong. Terribly wrong. Seigneurial revenues began to contract. Peasants started to revolt. Famine proliferated. And famines paved way for even more deadly epidemics. The inroads made by the states against the landlords were reversed. Merchants and financiers in the city-states began to lose money. And the states went to war. Feudalism, as a social system no less than a system of production, was in crisis.

The origins of this crisis are found in relation of the feudal system of production to the land. Organized on the political extraction of surplus, yet (in most cases) recognizing the peasantry's customary rights to the land,<sup>6</sup> feudalism provided neither the coercion nor the incentive necessary to ensure rising productivity. On one hand, the peasant proprietor could only rarely be displaced from the land—even more rarely could market forces displace him. He was therefore compelled to produce to survive, rather than sell to survive. It is in this narrow sense that “the crucial feature of feudalism . . . [is] production for use” (Sweezy, 1976, p. 35). On the other hand, productivity gains, such as they were, tended to be undermined by feudal exactions (Dobb, 1963, pp. 42-44). Rising peasant surpluses were subject to appropriation by the seigneurs and the states—indeed, the appropriation of surplus through rent, levies, and taxes was the primary means of increasing ruling-class revenues. (This of course dampened the seigneurs' incentive to increase productivity because rent and levies were not directly tied to agricultural improvement.) Within certain limits, then, feudal income could increase even if the surplus stagnated or contracted. And this is what seems to have occurred by the early 14th century (Hilton, 1985, pp. 129-130).

Feudalism consequently limited the surplus available for investment in agricultural improvement, which tended to undermine soil fertility (Anderson, 1974b, pp. 197-199; Duby, 1972; Postan, 1972). Simply put, the lord-peasant relation was fundamentally antagonistic to long-run ecological sustainability. Feudalism's ecological cycle was a vicious circle indeed:

Few animals had provided little manure; little manure had meant low [grain] yields; with low corn yields per acre, every possible scrap of land had to be ploughed for corn; so there was little winter feed for animals, and few animals. (Davis, 1973, p. 113)

Even as the feudal system limited the possibilities for reinvesting surpluses in the agricultural improvement, it favored population growth as a means of generating surpluses.<sup>7</sup> For the mass of the population, population growth under feudal class relations tended to fragment smallholdings through partible inheritance. Peasant households therefore faced contracting living standards—although, of course, a few did well—and tended to compensate, much like peasant families today, by opting for larger families, which over time fragmented holdings still further (Brenner, 1985b, p. 230; Dobb, 1963, p. 47). Over time, the fragmentation of holdings itself began to fetter productivity (Milonakis, 1993-1994). Consequently, the peasantry's position tended to deteriorate over the course of the Middle Ages, even in the absence of rising seigneurial demands.

But the seigneurs' demands did tend to rise. The development of feudalism favored not only a rising population for the masses but also an enlarged ruling class:

There was a tendency . . . for the number of vassals to be multiplied, by a process known as sub-infeudation, in order to strengthen the military resources of the greater lords. This, combined with the natural growth of noble families and an increase in the number of retainers, swelled the size of the parasitic class that had to be supported from the surplus labour of the serf population. (Dobb, 1963, p. 45)

So it was that the feudal system of production exhausted the soil, which led to malnutrition, which prepared the ground for epidemic disease and, in short order, a terminal systemic crisis.

There were three main solutions to this contradiction within the feudal mode of production. One solution was to increase agricultural productivity. Following the ninth century, western European peasants began to shift from a two-field to a three-field rotation. In principle, this allowed cultivated acreage to grow by 50%. But the three-field rotation did not work in Mediterranean and northern European climes. Even in western Europe, its diffusion was highly uneven. And it demanded relatively more fertilizer than its predecessor. At the same time, the three-field system reduced the land available for pasture by as much as a third, thereby reducing the livestock necessary to replenish the soil's nutrients at the very moment when the soil's needs were rising (Bowlus, 1980, p. 89; Braudel, 1981, p. 109; Dobb, 1963, pp. 43-44; Duby, 1972, p. 196; Miskimmin, 1975, pp. 18-19, 24-25; Postan, 1972, pp. 63-67). (Even if these problems could be overcome, feudal class relations, as we have seen, discouraged sustained productivity gains.) New pasture could be reclaimed from the forest, but under feudal conditions of steady population growth, these tended to be quickly converted to arable, and thence to renewed exhaustion of arable. As George Duby (1972) observed,

Everything leads us to suppose that the food needs of the ever-increasing population had necessitated an abusive exploitation of the land, and that the land was nearing exhaustion. The continual exhausting of undermanured, overworked, and under-rested arable land seems to have been an *inherent feature of the agrarian system of medieval Europe* [italics added]. (p. 198)

Such internal colonization might be complemented by territorial expansion. Because feudalism generally restrained productivity, economic expansion was ultimately contingent on geographical expansion. Although the balance of class forces might favor peasants or landlords at different times and places, the general rule was that seigniorial revenues increased as long as the population continued to grow. This meant that cultivated acreage tended to expand, all other things being equal. And this was precisely the case between the 11th and 13th centuries.

A third solution was urbanization. The countryside's surplus population could be absorbed by the cities, even out of all proportion to urban growth, given their notoriously high death rates.<sup>8</sup> The cities grew as long as rising revenues—made possible by modestly rising agrarian productivity and rapid territorial expansion—fueled demand for urban manufactures. At the same time, the growth of the nonagricultural workforce increased demand for agricultural produce, bringing further pressure to bear on the land and therefore greater pressure for expansion.

By 1300, these solutions were no longer working. "Two centuries of uncontrolled expansion had been purchased on credit using as collateral Europe's natural resources, which were being rapidly depleted" (Bowlus, 1980, p. 94). Agricultural innovation (such as it was) and geographical expansion were unable to keep pace with population growth or the rising demands of the states and seigneurs. At root, the problem was the very soil exhaustion engendered by feudalism's class contradictions, which at once encouraged population growth and discouraged investment. By the early 14th century, feudal agriculture had significantly degraded the land within the fertile core areas of western and central Europe. In England, yields per acre may have declined by as much as one third between the 13th and 15th centuries (Dobb, 1963, p. 44, n. 1). In this settlement core, new land was reclaimed from the forests, whose soils were quickly exhausted. And on the frontiers, especially but not only in eastern Europe,<sup>9</sup> colonization brought more and more people onto less and



less productive land at the geographical margins of the system. In both areas, yields—and revenues with them—stagnated or declined (Bowlus, 1980, p. 96).

Because virtually the entire surplus product of medieval Europe flowed from the countryside, declining seigneurial revenues were a serious problem indeed. The agrarian recession that spread throughout early 14th-century Europe, then, threatened not only the landlords but the states, who faced a contraction of their tax base, and the city-state capitalists, who faced a contraction of their markets. But agrarian recession is one thing. Crisis is another.

What turned this contraction from a recession to a full-fledged crisis has everything to do with environmental history. In the first instance, the weather got colder. The margin of survival for the European peasant had always been razor thin, and overpopulation and overexploitation in the heartland and overextension at the margins rendered 14th-century agriculture highly “dependent upon favorable weather” (Utterstrom, 1955, p. 5). Crop failures became more common and, with them, general famines, which had been quite rare in the 12th and 13th centuries (Bowlus, 1980, pp. 95-96). Above all, the great famine of 1315 to 1317 cut a swathe through rural and urban populations from France to Russia. Far from an isolated occurrence, this was simply the worst of a series of devastating famines throughout the 14th and 15th centuries (North & Thomas, 1973, pp. 72-73). So severe was the agrarian crisis that by 1300 “almost every child born in western Europe faced the probability of extreme hunger at least once or twice during his 30 to 35 years of life” (Miskimmin, 1975, pp. 26-27). Famine “recurred so insistently for centuries on end that it became incorporated into man’s biological regime and built into his daily life” (Braudel, 1981, pp. 73-74; see also Montanari, 1994, pp. 68-70).

The conjuncture of unfavorable weather and agrarian recession that produced increasingly severe and widespread famine also undermined the population’s capacity to resist disease. Thus, feudalism’s ecological contradictions gave rise not only to soil degradation but equally to a dietary regime that virtually guaranteed epidemic disease (Braudel, 1981, p. 78; Dobb, 1963, pp. 48-49; Montanari, 1994, pp. 70-71; Slicher van Bath, 1963, pp. 84, 88-90).<sup>10</sup> It is almost certainly no coincidence that those regional populations—such as the Low Countries—marked by the greatest agricultural productivity, and the greatest freedom from seigneurial oppression, were among those most resistant to the new disease vectors (de Vries, 1973; DuPlessis, 1997, pp. 25-27; Slicher van Bath, 1963).

To make matters worse, the great trade expansion of the 11th and 12th centuries knitted together not only Europe but much of Eurasia, much more tightly than ever before. A new “disease pool”—to borrow a phrase from William McNeill (1976)—unprecedented in its geographical scope had come into existence. Chinese peasants, central Asian pastoralists, and European artisans were increasingly breathing the same air, epidemiologically speaking.

Agrarian recession, bad weather, and a new disease pool proved a fertile conjuncture for the bacillus that carried the plague from Southeast Asia to Europe in 1348. Within 3 years, one third of Europe’s population, some 25 million people, perished. Other epidemics followed. The enormity of the loss boggles the mind.

Feudalism’s fate may already have been sealed prior to 1348. Less certain, however, was the nature of the social system that would succeed it. More than any other event, the Black Death at once signed feudalism’s death warrant and favored a capitalist rather than “tributary” solution to Europe’s crisis. This had a lot to do with feudalism’s class contradictions. On one hand, the feudal class structure rested on rising population densities, whose agro-ecological contradictions were attenuated through geographical expansion. A relatively high labor-land ratio reinforced seig-

neural power by tending to reduce labor costs, increase aggregate value appropriated in the form of feudal rent, and, as a result, augment revenues. Conversely, a relatively low-labor to high-land ratio tended to reduce the value derived from the land, raise real wages, and depress feudal revenues (Dobb, 1963, p. 49; Duby, 1972, p. 213).<sup>11</sup> By the mid-15th century, rents in England, Germany, and Italy were 40% lower than a century earlier; wages for laborers were often 300% higher (DuPlessis, 1997, pp. 21-22; Hodgett, 1972, pp. 208-209). Thus, by dramatically shifting labor-land ratios in favor of the direct producers, the Black Death at once empowered the peasantry and weakened the seigneurs.<sup>12</sup>

On the other hand, the very processes most reflective of feudalism's success—commercial expansion, urbanization, and state formation—also enhanced the peasantry's potential class power, even after (especially after) the states, the seigneurs, and the capitalists fell into crisis. As Perry Anderson (1974b) observed,

The penetration of the countryside by commodity exchange had weakened customary relationships, and the advent of royal taxation now often overlaid traditional noble exactions in the villages; both tended to centralize population reactions to seigneurial extortion or repression, into major collective movements. (p. 202)

Beginning in the early 14th century, once local peasant revolts began to operate on a regional, even national, scale (Hilton, 1973). The class power of the western European peasantry had developed to such an extent that the reestablishment of serfdom became exceedingly unlikely, all the more so if less costly alternatives were available. Before considering those alternatives, however, we will turn our attention to the somewhat different situation in eastern Europe.

In eastern Europe, the peasantry was weaker, and feudal relations were maintained or reimposed in what has become known as the "second serfdom." This is an important part of the story, and one also that has quite a bit to do with feudalism's agro-ecological contradictions, as well as the transition to capitalism. Eastern European feudalism took shape out of the great demographic expansion of the 11th and 12th centuries, a movement driven by rising population densities and environmental pressure in west-central Europe, as we have seen. Relative to western Europe, three decisive features stand out. In the first place, peasant village solidarity was weaker in the east, reflecting the region's development as a "colonial society" (Brenner, 1985a, p. 42). Colonization in the east was led by landlords. As a result, village self-government was limited. This seems to have been the political expression of the underlying agricultural geography. In contrast to the west, common lands were typically absent. Settler colonization produced consolidated rather than fragmented holdings that reinforced tendencies toward "individualistic farming" (Brenner, 1985a, p. 42). Second, the towns were weaker in the east, and they suffered more from the agrarian recession.<sup>13</sup> Although towns may not have uniformly supported peasant revolts, there does seem to be a strong correlation between urbanization and the possibilities for effective peasant resistance to serfdom. In both the east and west, peasant revolts clustered around the towns—the main difference being that there were many more powerful, relatively autonomous towns in the west (Anderson, 1974b, p. 253; Brenner, 1985b)! And third, the weakness of the east's towns meant that there was a minimal woollens industry, which had come to the rescue of "hard-pressed lords in England and Castile" (Anderson, 1974b, p. 252). Consequently, eastern landlords could not shift so easily from arable to pasturage as a means of responding to rising labor costs and a stagnating cereals market. The first two contrasts minimized the possibilities for effective



resistance by the peasantry; the third contrast maximized the likelihood that the seigneurs would opt for a reimposition of serfdom.

If the seigneurs succeeded in reimposing serfdom in the east, they failed in the west—but not for lack of trying. Throughout western Europe, the nobility's “immediate reaction was to try to recuperate its surplus by riveting the peasantry to the manor or battering down wages in both towns and countryside” (Anderson, 1974b, p. 201). The seigneurs, in concert with the states, went all out to intensify feudal control of the peasantry—England in 1349 to 1351, France and Castile in 1351, Germany in 1352, Portugal in 1375. Only now, as never before, such measures provoked explosive peasant revolts on a much larger scale (Anderson, 1974b, pp. 201-202; Hilton, 1973). Indeed, by turning to the state, the very measures the seigneurs hoped would increase feudal exactions tended to unify discontent “because the target of the discontent was no longer the individual lord alone, but also the local officials of the government” (Hilton, 1949, p. 132; see also Duby, 1972, p. 214).

If the producing classes were rarely successful in political terms—only in Switzerland did the peasantry bring the seigneurs to their knees—they made it crystal clear that a feudal solution to western Europe's agrarian crisis was impossible. This clarity was reinforced by developments in the cities—those autonomous urban enclaves that were perhaps feudalism's crowning achievement. In western Europe's most heavily urbanized areas, Flanders and Italy, artisans and even wage workers staged revolts that toppled the urban patriciate—most notably in Ghent (1309) and Florence (1378). The strength of the cities had three major effects on the peasantry's class power. First, the urban semiproletariat lent support to peasant revolts, as occurred in London during the 1381 uprising or in Paris during the 1357 *Jacquerie* (Anderson, 1974b, pp. 202-204). Second, the cities provided a means of escape from feudal bonds themselves. And finally, the commercialization of the countryside, in addition to its role in centralizing resistance as we noted above, also profoundly threatened subsistence-oriented peasant society. It appears that in the 14th century, no less than in the 20th, those areas most prone to revolt were neither fully commercialized (prior to capitalism no area could be) nor entirely subsistence oriented but rather those areas that lay somewhere in between.

### **“FIXING” THE CRISIS OF FEUDALISM: TOWARD EUROPE'S GLOBAL EXPANSION**

This all meant that an “internal fix” to feudalism's problems was infinitely more costly than an “external fix,” provided one could be found. In terms of the class struggle, then, trans-Atlantic expansion was the path of least resistance, given the reality of overlapping crises, which pushed together interests that had hitherto been at odds. Feudal crisis pushed together the interests of the states, the seigneurs, and the city-state capitalists in favor of overseas expansion. “The only solution,” argued Wallerstein (1974),

that would extract western Europe from decimation and stagnation would be one that would expand the economic pie to be shared, a solution which required, given the technology of the time, an expansion of the land area and population base to exploit. (p. 24)

It is this process of geographical expansion—made possible by the converging interests of the states, the seigneurs, and the city-state capitalists—that made possi-

ble the transition to capitalism. The outline of this convergence in favor of geographical expansion runs as follows.

First, the states, which had made great strides between the 11th and 14th centuries—owing to increased revenues from internal expansion and the politico-military unification that resulted from the Crusades—now suffered greatly from the economic contraction, which began even before the Black Death (Strayer, 1970; Wallerstein, 1992). Beginning in the 14th century, the states faced a deepening “liquidity crisis” (Wallerstein, 1974, p. 21), as they struggled to exact higher taxes from the peasants in the interests of waging war. The big states tried to conquer smaller states, but given the rather widespread diffusion of advanced military technology and techniques, alongside the equally widespread access to the money capital needed to wage war,<sup>14</sup> the possibilities for conquest were continually frustrated from the mid-14th century. England could not conquer France, France could not conquer Italy, Castile could conquer neither Portugal (indeed, it could barely hold together its own rickety “nation” within Iberia) nor England, and perhaps most significant, the Austro-Iberian Hapsburgs could not conquer Europe. Moreover, the rising costs of war meant increased borrowing, which strengthened the city-state capitalists against the states and at the same time sapped the latter’s strength relative to the seigneurs, whose support they also needed to wage war.

Second, the seigneurs faced a deepening crisis in the wake of the Black Death. As we have seen, the downward readjustment of labor-land ratios affected several crucial changes in the balance of class forces, particularly in western Europe. Internal efforts to restore seigneurial revenues were ultimately self-defeating. Political measures to reimpose serfdom sparked peasant revolts. Efforts to convert arable land to pasturage allowed some landlords to shift from labor-intensive cereals production—whose profitability declined precipitously in the wake of the Black Death—to the more stable, land-extensive stock raising.<sup>15</sup> Sheep (and cattle) not only required fewer hands relative to agriculture, they yoked the seigneurs to the world market, who were as a consequence inclined to support measures that favored the further expansion of that market.<sup>16</sup>

The resulting widespread displacement of cereal agriculture by animal husbandry not only entailed a more specialized world-scale division of labor (Helleiner, 1967, pp. 68-69), it also biased the European world-economy in favor of further expansion because of the geographically expansive character of the European livestock economy. (It was no coincidence that Europe’s greatest overseas empires were forged by those very states most engaged in sheep raising.) Moreover, the shift from arable to pasturage militated against a rapid population recovery by reducing grain acreages and, therefore, limited the very demographic expansion that might have shifted the balance of class power back in favor of the seigneurs. Thus, the seigneurs were triply motivated to expand geographically, by virtue of the peasantry’s continued class power, diminishing returns on livestock and cereal production, and the ecology of ranching, which, especially in Castile, caused widespread land degradation (Clough, 1959, p. 146; Klein, 1919).

At the same time, the peasantry’s newfound power led the seigneurs to turn their attention to the states,<sup>17</sup> which were forced to recognize the former’s voice in policy making.<sup>18</sup> The seigneurs’ “political turn” meant they could expand their revenues only so far as “their” states prospered. But the very nature of feudal crisis limited such prosperity to the extent that intra-European warfare was privileged over geographical expansion. Thus, an uneasy compromise prevailed between the states and seigneurs in favor of statism and overseas expansion.

Finally, the city-states were equally beset by contradictions that favored geographical expansion. Socially, the city-states faced increasingly serious threats to internal order from the producing classes (Wallerstein, 1974, p. 52). In Florence, where one out of three people depended on the city's woolen industry, the economic crisis curtailed the latter's output by more than two thirds in the four decades after 1338. The social unrest that followed "culminated in the so-called revolt of the Ciompi [1378] . . . when impoverished clothworkers seized state power and put a woolcomber . . . at the head of the republic's government" (Arrighi, 1994, p. 101; see also Miskimmin, 1975, pp. 98-99). Economically, the city-state capitalists were doubly squeezed (North & Thomas, 1973, p. 76). On the demand side, they faced the contraction of the domestic European market owing to declining seigniorial revenues. On the supply side, they suffered from the contraction of Eurasia's great commercial networks.

By the later 14th century, Venice proved militarily strong enough to pursue an internal fix to this contraction, driving Genoese capital from the eastern Mediterranean and monopolizing what remained of the profitable trade opportunities with the east (Arrighi, 1994, pp. 114-115).<sup>19</sup> Genoa's apparent position of weakness, however, became a position of strength by the middle of the next century. As Genoese capitalists turned west, looking to replace the investment outlets they had lost in the economic contraction, they became the bankers to the Portuguese and Castilian crowns. In so doing, they hitched their collective wagon to the very powers that would expand the geographical arena necessary not only for renewed commercial expansion but for the possible emergence of a world-system predicated on the endless accumulation of capital. What Genoa had lost in the east could be won back (and then some) in the newly "discovered" west of the emergent Atlantic economy.

### **GEOGRAPHICAL BIASES TO EUROPEAN EXPANSION**

If there were strong social forces pushing medieval Europe toward an external rather than internal fix to feudal crisis, there were also powerful geographical factors favoring such an outcome. But rather than succumb to environmental determinism, which has experienced something of a renaissance in recent years (Diamond, 1997; Jones, 1987; Landes, 1998), we should remember that geographies are as much made as they are given.

The first of these factors was Europe's political geography. In contrast to China, Europe contained not one but many states. As the 14th-century crisis deepened, these states went to war, seeking to recoup through battle what they had lost in the agrarian recession.<sup>20</sup> As competition between the states intensified, so did the search for sources of power that would give one state a competitive edge. This was true no less for city-state capitalists than for states—it was the great Venetian-Genoese rivalry that pushed the latter into an alliance with the Iberian states and encouraged the search for an alternative route to the Indies. In a social system where revolutionary increases in productivity were not (yet) feasible, this search for power necessarily entailed geographical expansion—at first to the Atlantic islands and subsequently to the Indian Ocean and the New World. Not only did this political geography provide incentive for expansion, it removed a significant barrier to it. China's great overseas voyages began in the early 1400s but were called to a halt by the empire by the 1430s. But Europe was a region of multiple states, and no central

authority could restrain the expansionary impulses of, first and foremost, the Iberian powers.

Although much of this is widely recognized, less obvious is the relationship between this unusual political geography and Europe's physical geography. Europe's geographical position was in sharp contrast to that of China, whose civilization took shape around the two major river valleys (the Yellow and Yangzi), and was consequently vulnerable to recurrent waves of central Asian invaders. In western Europe, there were multiple fertile "core" areas separated from each other by mountains or other natural barriers (Pounds & Ball, 1964)—Portugal from Spain, Spain from France, England from everyone, Italy from Germany, Sweden from Norway (both protected by sea), the northern Netherlands by riverine marshes, and so forth. (Eastern Europe is another story, and this partly explains, among other things, Poland's sorry history.) The effect of this physical geography was to raise the costs of continental empire building and, in corresponding degree, to reduce the costs of overseas empire building. So the matter of Europe's physical geography in providing a certain bias to geographical expansion should not be discounted.

I do not think we should make too much of this, as does Eric Jones (1987) and other environmental determinists. At the same time, I do not think we should make too little of this, as does the great critic of Eurocentric historiography, James Blaut. Although the environment determined nothing—the outcome of Europe's 14th-century crisis was not discernible until well into the 16th century—neither was Europe part of a Eurasian-wide "landscape of even development," as Blaut (1992, p. 22) would have it. Environment matters, but where many look for deterministic answers, we would do better to look for how classes make history (and geography) but not in eco-geographical situations of their own choosing.

A second major bias to overseas expansion is found in Europe's agronomy. Medieval Europe was a society of wheat and other grains.<sup>21</sup> Medieval China was a society based on wet rice farming. Partly as a consequence, China's agronomy leant itself much more easily to internal fixes. (I think this is the very small but important kernel of truth in the otherwise very problematic theory of hydraulic societies; see Wittfogel, 1957).<sup>22</sup> Wet rice yields were vastly higher, typically 5 times greater than European cereals (Braudel, 1981, p. 151). Moreover, the revolution in wet rice farming, based on early-maturing rice varieties and allowing multiple cropping (Braudel, 1981, pp. 154-155; Ho, 1956), seems to have occurred right around the same time as the introduction of the three-field rotation, iron mouldboard, and horse-drawn ploughs in Europe. Given the relatively smaller and more tightly knit wet rice zone in the south, agricultural innovations likely diffused much faster in China (Elvin, 1973, chap. 9). Wet rice farming does not face wheat's problems of soil exhaustion; as long as river ecologies are regulated adequately and not unduly disrupted, the nutrients are replenished. Climate permitting, multiple cropping is possible on the same land for centuries on end. There also seems to have been a much more sustainable metabolic relation between town and country in China, whereby urban wastes were returned to the soil (Braudel, 1981, pp. 155, 486). During periods of crisis, the state could focus on maintaining or restoring the hydraulic infrastructure—above all, the canal system linking the two great river valleys—as an internal fix. In Europe, no such internal fix was possible, given the necessarily fragmented character of its wheat-livestock agronomic complex. Given this agronomic variation, it comes as little surprise that China recovered from the Black Death so much faster than Europe.

Rice's great advantage was its tremendous productivity on minimal land. Its great disadvantage was its high labor requirements.<sup>23</sup> Wheat's advantage, such as it

was, ran in the opposite direction—it was highly consumptive of land but not labor. “Wheat’s unpardonable fault was its low yield,” observed Braudel (1981, p. 120). It “devours the soil and forces it to rest regularly” (Braudel, 1977, p. 11).<sup>24</sup> Although China’s wet rice cultivation maintained high yields without animals, which were used primarily for draught purposes (Grigg, 1974, pp. 75-83), the ecology of wheat required livestock to maintain its fertility. Wheat’s stimulus to livestock raising provided Europe with animal power considerably greater than Afro-Eurasia’s other civilizations, not to mention the Americas. As Europe commenced renewed economic expansion in the mid-15th century, it relied heavily on horses for haulage and transport. More

horses meant a greater demand for fodder . . . [and land] used to grow fodder is obviously no longer available for crops to feed men; therefore, if the cultivated areas remains the same, an increase in the number of horses reduces the quantity of cereals for human consumption. (Slicher van Bath, 1963, p. 195)

At the same time, western European landlords were responding to the agrarian crisis by enclosing common lands and shifting from arable to animal husbandry, especially sheep raising.

What develops over the course of the feudal crisis is a wheat-livestock complex in which cereal agriculture and stock raising become geographically specialized activities. These were economically interdependent but not ecologically articulated. There was a widening and increasingly “irreparable rift” in the metabolism of nature and society (Marx, 1981, p. 949). As pastoral husbandry was ecologically hived off from arable, local nutrient cycling was significantly disrupted. Cereal and sugar monocultures would take root in Poland and Brazil, whereas sheep raising would predominate in Castile, England, and Mexico. By the 16th and 17th centuries, there were widespread soil erosion, soil exhaustion, and deforestation in all these regions (Klein, 1919; Melville, 1990; Moore, 2000b; Wallerstein, 1980, pp. 132-133; Westoby, 1989). Thus were the conditions for ecological sustainability undermined by new divisions of labor within the countryside, even as population pressure on the land was greatly reduced.

The landlords’ widespread shift from arable to pasturage reduced the land available for grain cultivation in western Europe. The Black Death reduced labor-land ratios and thereby allowed more land per capita, which should have allowed for a fairly rapid demographic recovery. “Although fewer men should have meant more food since the landmass remained the same,” the shift to pasturage led to “a reduction of caloric output” (Wallerstein, 1974, pp. 35-36). Fifteenth-century Europe was partially “decerealized,” as stock raising occupied a landmass 5 to 6 times greater than did cereal agriculture for the same caloric output (Helleiner, 1967, p. 69). Western European wool production may have increased between threefold and fivefold (Anderson, 1974b, p. 208). By the 16th century, then, pasturage not only became “regionally specialized,” but this regional specialization was linked to deepening land degradation on one hand and deteriorating peasant diets on the other (Wallerstein, 1974, pp. 44, 109).<sup>25</sup>

In sum, wheat’s low yields and soil-exhausting properties conditioned Europe’s reliance on cattle, sheep, and horses—which “ate” men nearly as often as men ate them.<sup>26</sup> The upshot was that Europe’s agronomic complex encouraged extensive development (Wallerstein, 1974, pp. 56-63). It was this bias that “condemn[ed] the great Mediterranean area to the conquest of the Earth” (Chaunu, 1969, pp. 338-339, as cited in Wallerstein, 1974, p. 57). Between 1535 and 1680, the European world-



economy more than doubled in size, expanding from 3 to 7 million square kilometers (Wallerstein, 1974, p. 68). The labor-land ratio declined even more sharply, falling some 80% between 1500 and 1650 (Webb, 1964, pp. 17-18).

A final decisive geographical bias concerns what we might call "locational" advantages. It is certainly not the case that European seafaring technology was superior (Abu-Lughod, 1989, pp. 326-327, 353-354; Chaudhuri, 1985, pp. 138-159). Europe's crucial seafaring advantage was locational. In the first place, Europe was closer to the New World than any other maritime civilization. Once Portugal and Spain had colonized the Atlantic islands, whose sugar plantations worked by African slaves prefigured later developments, the Americas were even closer. But that would not have mattered much if the Atlantic Ocean's currents carried European vessels in the wrong direction. Fortunately for Columbus and those who followed, these ocean currents would not only carry European vessels to the Caribbean, Brazil, and North America but carry them back home as well. From the experience of sailing to the Atlantic islands, and fishing voyages probably as distant as Newfoundland, Columbus and others

knew that the trade winds (or easterlies) would assist him outbound and had good reason to believe that the westerlies would assist the return voyage. The point here is a matter of strong probabilities. Overall, it is vastly more probable that an Iberian ship would effect a . . . round trip to America than would an African or Asia ship in the late 15th century. (Blaut, 1993, pp. 181-182; see also the maps in Landes, 1998, pp. 80-85)

Making matters even more favorable, Europe's only possible seafaring rival was west Africa. But west Africa's political and economic geography was unfavorable to overseas expansion. Like China, west Africa was a zone of wet rice cultivation (Carney, 2001). Its leading urban centers were oriented to land, not sea. Where Africa's coastal trade was an extension of inland trade, Europe's inland trade was an extension of seaborne trade. West and central Africa's great empires were located inland, and the primary trade routes lay northward to the Maghreb and Mediterranean and eastward to the Nile and the Middle East. The Maghreb's great trading cities possessed a strong maritime tradition but faced serious military threats from the Ottomans and Iberians (Blaut, 1993, p. 183; 1994, p. 373, n. 16; Thornton, 1992, pp. 13-21).

## CONCLUSION

Feudalism degraded the environment in significant ways. Although primarily a system of production for use, which would seem to favor sustainable development, the medieval lord-peasant relation limited the possibilities for reinvestment in the land. As a consequence, European feudalism tended to exhaust the soil and the labor power from which it derived revenues. The feudal system's best response to this socio-ecological contradiction was an anemic spatial fix, which took the form of internal and external colonization, such as land reclamation in the Low Countries or colonial expansion in the East. The global external fix that this eventually led to, beginning with the colonization of the Americas, had capitalist commodity production and exchange inscribed within it. Capitalism, however, was an entirely different animal from the feudal society that had preceded it. Where earlier ecological crises had been local, capitalism globalized them. And it did so at a pace that outstripped all previously existing historical systems.

At the root of this ecohistorical difference between capitalism and feudalism is the role of commodity production in the two systems. To be sure, there was commodity production under feudalism. There were, for example, important antecedents of the modern plantation system in the medieval Mediterranean. But however widespread this commodity production may have been, there was no ineluctable tendency toward its generalization. Why? Because a society organized around the progressive generalization of commodity production undermines relations of domination based on tribute. Social strata who benefit from this system are likely to oppose any change that might favor generalized commodity production. In the end, however, they had no choice. The crisis of feudalism led to a convergence of interests among Europe's ruling strata in favor of a significant expansion of commodity production, most dramatically in the New World.

Geographical expansion was so important because it incorporated vast new agrarian zones into the emergent pan-European world-economy. Creating new agrarian spaces for commodity production, outside the peasantry's western European stronghold, encouraged Europe's beleaguered ruling strata to reshape the town-country division of labor in ways that favored capitalist development. Above all through the agency of the sugar plantation and the massive silver mining enterprises of Potosi and Zacatecas, early capitalism spearheaded the generalization of commodity production through overseas expansion, the fruits of which fueled capital accumulation in Europe's leading cities (Blaut, 1993; Moore, 2000b, *in press*). In turn, this accumulation made possible the extension of capitalist town-country relations and the deepening of commodity relations in the European countryside. Control over American silver during the era of the Price Revolution, for instance, allowed Dutch merchants to subordinate Poland's grain-producing landlords to the world market, essentially creating a system of international "debt peonage" (Wallerstein, 1974, pp. 121-122).

Mining enterprises and sugar plantations funneled both ecological as well as monetary wealth from the increasingly distant rural areas into the cities. Thus did the "development of underdevelopment" and capitalism's metabolic rift form a dialectical unity. Perhaps nowhere was this more evident than in the emergent sugar plantation complex. First in the Atlantic islands and later in Brazil, the capitalist sugar plantation in the 15th and 16th centuries ravaged both the island landscapes it occupied and the laborers who worked it. With sugar, we have a classic instance of capitalism's metabolic rift—whereby the products of the countryside (especially but not only in the periphery) flow into the cities, which are under no obligation to return the "waste" products to the point of production (Foster, 1999, 2000; Foster & Magdoff, 1998). Nutrient cycling is consequently ruptured, as nutrients are pumped out of rural areas and transferred to urban centers. Capitalist agriculture is sustained and expanded only "by increasing overdraft on the fertility of our soils" (Sauer, 1981, p. 360). As a consequence, the wave of European expansion inaugurated by the crisis of feudalism set in motion new ecological crisis tendencies on a world scale. With the creation of a world market and a trans-Atlantic division of labor in the 16th century, feudalism's localized ecological problems gave way to capitalism's globalization of environmental problems. With the transition to capitalism, the nutrient cycling of local ecosystems was radically disrupted as these were incorporated into a new division of labor, and localized relations gave way to progressively globalized relations between the country and the city (Moore, 2000a, *in press*).

With all frontiers now closed, we might ask if the capitalist world-economy today confronts a situation at all similar to that faced by feudalism some seven cen-

turies earlier. Like feudalism, capitalism appears to be approaching the limits to growth inscribed in its production system. Also like feudalism, capitalism has created fertile new breeding grounds for epidemic disease. The crucial difference is that capitalism's ruling classes lack the option of the spatial fix enjoyed by medieval Europe's ruling strata.

Ecohistorically, the best we can say about the present conjuncture is that the future relation of the global economy and the biosphere is deeply uncertain. "It is impossible to know whether humankind has entered a genuine ecological crisis," J. R. McNeill (2000) concluded in his environmental history of the 20th century (p. 358). But there seems little question that the world-system is headed in this direction:

Many of the ecological buffers—open land, unused water, unpolluted spaces—that helped societies weather difficult times in the past are now gone. The most difficult passages will probably . . . involve shortage of clean fresh water, the myriad effects of warmer climate, and of reduced biodiversity. (p. 359)

Although McNeill did not say it, the disappearance and deepening erosion of these "ecological buffers" removes one of the chief means that capitalists have employed to avoid paying their bills over the past five centuries or so. In this way, capitalism's transformation of the earth undermines its own social reproduction at the same time as it endangers the planet's capacity to support human life. From this perspective, the contradiction between capitalism's relentless expansion and biospheric sustainability suggests, as Immanuel Wallerstein (2002) has been arguing for some time now, that we are living not in an age of globalization but rather in an "age of transition"—from one historical system (capitalism) to another.

## NOTES

1. According to Wallerstein (1974),

Factors of the physical environment . . . should be assessed and given their due weight. . . . Intruding the variables of the physical environment does not undo our previous [social] analysis. It enriches it by adding a further element to help explain a historical conjuncture so consequential in the future history of the world. (pp. 33, 36)

See also the discussion in Moore (2000a).

2. With apologies to Hilton (1976a).

3. We can certainly identify a number of regions, such as the Low Countries, where the peasantry enjoyed relative freedom from seigneurial power (de Vries, 1973; de Vries & van der Woude, 1997). Nevertheless, even these peasantries were embedded in a broader system of power in which political-tributary relations predominated over either a protocapitalist political economy or a peasant moral economy.

4. This approach seems consonant with the spirit (and often the letter) of Marx and Engels's (1970, 1979; Marx, 1973) broad conception of feudalism. Marx and Engels's emphasized the system's historically and geographically specific class relations and its town-country division of labor, which determined specific forms of wealth production and accumulation. Some degree of confusion typically arises over the term *mode of production*, which Marx used in at least three different ways: (a) to refer to "the actual methods and techniques used in the production of a particular kind of use value"; (b) to refer to "the characteristic form of the labor process under the class relations of capitalism," whereby the capital-

labor relation constitutes “an abstract representation of a reasonably narrowly defined set of relationships”; and (c) to refer

holistically and for comparative purposes . . . to the whole gamut of production, exchange, distribution and consumption relations as well as to the institutional, juridical and administrative arrangements, political organization and state apparatus, ideology and characteristic forms of social (class) reproduction. This all-embracing but highly abstract concept is in some ways the most interesting, but it also creates the greatest difficulties. (Harvey, 1982/1999, pp. 25-26)

It is this third meaning of the concept mode of production that I deploy in comparing capitalism and feudalism.

5. The language of “states” must be used very carefully here. In this article, I follow Strayer (1970) in dating the origins of the modern state to 1100. Prior to this date, “parcellized sovereignty” (Anderson, 1974a, p. 15) held sway. “It went so far by the year 1000 [that] it would have been difficult to find anything like a state anywhere on the continent of Europe” (Strayer, 1970, p. 15). Even after 1100,

the states were never strong in Europe. . . . But they were stronger at some times than at others. The expansion of the economy in Europe between 1000-1250 which created new revenue bases for the states and new needs for internal order, on the one hand, and the outward expansion of “Europe” (the Crusades, colonization in the east and far north) which called for some military unification, on the other, combined to create a new life for nascent state-machineries. (Wallerstein, 1992, pp. 603-604)

6. Although the seigneurs legally “owned” the land, the peasants “possessed” it (Milonakis, 1993-1994). On one hand, peasant customary possession placed limits on the degree to which the direct producer could be compelled to pay higher rents, whether labor, in kind, or monetary. On the other, the relative (if still very limited) autonomy of the direct producers under feudalism constituted a real productive advance over slave systems of production. Feudalism limited but did not remove incentives for increased productivity.

7. “The long-term tendency, therefore, appears to have been towards over-population, leading to increasing demand for land, creating the possibility of extracting growing rents, without direct resort to extra-economic pressures or controls” (Brenner, 1985b, p. 230).

8. As Russell wrote (1972),

The cities had a lower marriage rate and birth rate than the country villages. Since all together produced at best only a very gradual increase, it is obvious that the cities did not replace their population and thus were dependent on the countryside. (p. 64)

9. Medieval settler expansion was particularly vigorous along the southeastern Baltic, whose sandy soils were especially prone to exhaustion (Anderson, 1974b, p. 247).

10. As Montanari (1994) noted,

The repeated incidents of nutritional stress suffered by the European population in the first half of the fourteenth century engendered a state of widespread malnutrition and physiological weakness which prepared the way for the plague epidemic. . . . Clearly there is not a direct causal link between the two phenomena: each has its own life and history. . . . It is equally clear, however that the standard of living of a population . . . plays an important role in favouring or blocking individual defences to infection. (pp. 70-71)

11. As Hodgett (1972) noted,

The smallholders and landless men profited perhaps more than any other group [from the consequences of the Black Death], for those with under 2.5 hectares . . . were in a position to acquire more and the landless benefited from the high wages and were often able to obtain some land. (pp. 208-209)

12. Duby (1972) wrote,

The troubles of [the 14th century] . . . forced the landlords to be less exacting towards their tenants and bondmen, even though they themselves were affected by the calamities and perhaps more in need of money than ever before. Their problem was to persuade the peasants to stay on their lands, to repopulate them when they were deserted, and to put them back in order. . . . Some landlords attempted to tighten the bonds of servitude and tie the workers [peasants] closer to the soil; they failed: it was too easy to abscond; and this emigration contributed towards the total disappearance of bondage in most of Western Europe. . . . The only way to keep or attract tenants . . . was to give in to their demands and lighten their dues. Peasant families were much less numerous; they handed over an ever decreasing share of their working profits: hence the period saw a considerable fall in seigneurial income. (p. 213)

13. Not only were eastern Europe's towns weaker, but their control over their respective hinterlands was considerably more restricted than their northwestern and southern European counterparts (Anderson, 1974b, p. 252).

14. Indeed, capital was more widely available for warfare because profitable investment opportunities had dried up as a result of the agrarian and demographic crises (see Arrighi, 1994).

15. For instance, the ranks of Castile's wool-producing sheep grew from 1.5 million to 2.7 million between 1350 and 1450 (Mielants, 2000, p. 266, n. 81).

16. "The capitalist mode of production first takes its characteristic form here particularly in sheep farming and stock raising, but this is not the concentration of capital on a relatively small land area but rather in production on a larger scale" (Marx, 1981, p. 814).

17. Hilton (1985) saw a direct link between the economic crisis and rising seigneurial interest in the state:

Demesne profits . . . [were] disappearing very rapidly, especially after the 1370s. No wonder that in the second half of the fourteenth century we see not only the economic aspect of the crisis but its political consequences. These, taking the form of intensified factional struggles among the landed aristocracy, largely over the control of the state and its fund of patronage, connected with declining landed income. (pp. 132-133)

18. The opportunities of the seigneurs within western Europe were at once limited and augmented by the formation of powerful territorial states. State fiscal policies of debasement and increasingly effective taxation systems undermined feudal arrangements in the countryside by devaluing fixed rents and extracting surplus from the peasantry. But by creating various assemblies and selling state offices, new opportunities were opened for the seigneurs to advance their interests through the state.

19. Genoese capital was also deprived of investment opportunities in its *contado*, relative to its rivals, Venice above all. In an era when Italy's urban capitalists aggressively colonized the surrounding countryside (Braudel, 1972), Genoese capital encountered a powerful rural aristocracy, who posed "an insurmountable social barrier to the domestic expansion of [the urban merchant classes'] wealth and power" (Arrighi, 1994, p. 111). In sum, the intersection



of Genoa's town-country division of labor and class structure further biased Genoese capital toward global expansion.

20. As Strayer (1970) noted,

In an age when the economy was stagnant, if not regressive, the easiest way for a ruler to increase his income and power was to try to gain control of new territories, even if those territories lay within the boundaries of an already established state. (pp. 59-60)

21. Braudel (1981) wrote,

As soon as one looks at the question of grain, one realizes what a complicated phenomenon it is. It would be better to put it in the plural—*los panes*, as so many Spanish texts say. . . . Wheat was never grown by itself. Despite its great age, even older cereals grew alongside it. (p. 109)

Rye, a poor man's crop, was especially important. For our purposes, however, the differences are not decisive. The difference in yield ratios between European grains was not significant (pp. 121-122).

22. Chaudhuri (1985) compared wheat- and rice-growing zones in medieval and early modern Asia:

Wheat land, the making of bread, and the caravan trade were connected together by an invisible net, woven by climatic, social, economic, and even political relationships. Centralised governments in the wheat- and millet-growing areas faced a perpetual struggle to bring the lesser chiefs of the independent-minded agricultural communities under a single authority. In the rice-growing lands, the control or destruction of the water channels, the dykes, or even the nursery beds of young seedling rice placed the terrible weapon of mass starvation in the hands of the war lords. The collective effort needed to plant and harvest rice and its favourable land:yield ratio forced centralized Asian government to consider the welfare of cultivating villages much more than was the case with the extensive farming techniques associated with wheat and millet. (p. 29)

23. Palat (1995) took this line of reasoning even further. In a sort of agronomic variation of the Brenner thesis, wet rice not only demanded more labor than rain-fed grain, its labor process impeded capitalist development:

Fundamental differences in agricultural techniques [were] dictated by the dominant crops and the specific conditions of production in [China and Europe]. . . . Whereas the substitution of labor-power by animal and mechanical power represented technological progress in societies with low densities of population [as was the case in Europe], the technical conditions of wet-rice cultivation dictated the substitution of simple tools for more complex instruments. This implies that, rather than moving toward large-scale consolidated farming operations, the dynamics of change in societies based on irrigated rizicultures increasingly privileged small-scale operations. Or, as Thomas Smith [1980, p. 105] puts it so well, "To speak metaphorically, rather than impelling farming forward to a manufacturing stage of production, [operations associated with wet-rice agriculture] served to strengthen its handicraft character."

Once emphasis was placed on the skill of the cultivators rather than on increasingly complex instruments of production, as was the case in early modern Europe, there was a tendential decline in the intervention of landlords in the production process. This implied that though producers may remain formally subordinate, no attempt was made by landowners to revolutionize and transform constantly the

labor process. These conditions imposed severe impediments to a ceaseless accumulation of capital since landlords were unable to realize an increase in relative surplus value by constantly reducing production costs. At the same time, the increasing premium placed on skilled labor even constrained their ability to realize an increase in absolute surplus value. There was hence no tendency toward an increasing real subsumption of labor to capital. (pp. 56-57, 70)

24. "Wheat cannot be cultivated on the same land for two years running without serious harmful effects. It has to be rotated" (Braudel, 1981, p. 114).

25. Wallerstein (1974) noted,

The most important thing to note about pasturage in the 16th century, especially livestock, was that it was becoming increasingly a regionally specialized activity. *More cattle here, an advantage to large landowners, also meant less cattle elsewhere, which often meant a reduction in peasant consumption of meat and dairy products, a deterioration in the diet* [italics added]. (p. 109)

26. Europe's wheat-livestock complex—especially stock raising—proved especially well suited for the conquest of the New World (Crosby, 1972, pp. 98-99; Melville, 1990; Moore, in press; Parry, 1963, pp. 244-247; Wolf, 1959, pp. 197-199).

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