

# Environmental Degradation in Heilongjiang: Policy Reform and Agrarian Dynamics in China's New Hybrid Economy

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This paper analyzes environmental degradation in rural China as structurally embedded in China's rapid economic growth in the post-Mao era. The theoretical discussion focuses on changes in the organization of production, resource use, and regional development. A critical assessment of the Chinese hybrid economy challenges standard views of the reforms. The overall environmental problems of state socialist agriculture in China have been aggravated following the agrarian reforms of the current regime. Rather than mitigating negative trends, marketization and privatization have brought new, qualitatively different, environmental problems. Resource decline and its attendant social problems are not limited to aspects of transitional economy but are a fundamental part of the new hybrid system. I offer an alternative explanation for interpreting increases in rural productivity as an appropriation and use of collective assets, suggesting that the mining of communal capital is hidden behind the economic growth of the rural economy. Case studies in Heilongjiang Province based on long-term field data provide a profile of three aspects: intensification of land use, agroindustrial pollution, and declining social/communal capital. Further, the political legitimacy of the state is gradually eroded by mutually exclusive fiscal constraints on expenditure and political commitments to peasant producers. Recent repression of political dissent by peasants in hinterland regions forces indirect forms of resistance to state policy. Opportunities for sustainable development are nonetheless present within China, providing that policy makers attempt to address the structural conditions of the rural sector. *Key Words:* China, Heilongjiang, environment, agriculture, peasants, rural reforms, political ecology, market socialism.

**T**he struggle to control resources is central to the relationship between local societies and larger entities. In this articulation, the extraction of economic surplus from rural areas by the state and private capital is contingent upon entering, dismantling, and transforming local institutions directly involved in natural resource use. Based on fieldwork over a fourteen-year period, this paper uses village-based case studies to show how privatization and deregulation in China have brought major change to capital, labor, and natural resource relationships. Agrarian reforms of the current regime have aggravated rather than mitigated specific environmental problems associated with state socialist agriculture in China. Marketization and privatization have added new environmental problems to those of the collective period, representing a major obstacle to both medium and long-term efforts to introduce sustainable development policies in

China. In agriculture, these qualitative differences will become increasingly apparent as more critical assessments are made of China's rapid growth over the last seventeen years.

Economic observers tend to herald the reforms of 1978 as the proper pathway for China to follow, given the failures of the communal period and the pronounced success of market reforms throughout the world (Byrd 1990; Friedman 1990; Dorn and Wang 1990; Lin 1993; McMillan and Naughton 1992; Nolan 1993; Nolan and Sender 1992; Wang 1994; Chen et al. 1995). The World Bank trumpets China as its number one success story for postsocialist transition, in contrast to the difficulties experienced by Russia. More tempered views welcome the reforms as a move in the right direction, but see difficulties (political, economic, or cultural) in the transition to a market economy (Deng et al. 1992; Croll 1988, 1994; Feuchtwang et al. 1988; Fan 1995; Rozelle 1996; Wang 1996;

Bowring 1997). Social and environmental concerns are emphasized by a third group who see fundamental problems with certain aspects of the reforms that undermine their supposed success in solving weaknesses of the communal period (Meisner 1996; Bowles and Dong 1994; Delman 1989; Hinton 1990; Chossudovsky 1986; Muldavin 1986, 1992; Chai and Leung 1987; Davin 1988; Smith 1993; He 1991; Odegard 1992). The contradictions of decollectivization coupled with market reforms and increased privatization suggest that there might be a political ecological “crisis” in the making (Muldavin 1992). This crisis stems from environmental problems resulting from the very success of the reforms as well as the political character of the portentous deepening of social polarization, as the gulf widens between the haves and have-nots in China (Knight and Song 1993; Bramall and Jones 1993). To argue this viewpoint, I rely on an atypical but nevertheless useful case, the relatively undeveloped region of rural Heilongjiang Province. Unlike the boom regions, the grass and cropland areas of this border province are simultaneously exposed to economic growth dynamics and to the limitations of a hinterland region (Lyons 1991). As a hinterland, the region produces primary commodities which are exported to boom regions—precluding a shift to more sophisticated and sustainable forms of resource use and management. Thus, this hinterland case study of the Chinese economy will demonstrate how the overlooked but nonetheless problematic use of natural resources in one area prefigures a political-ecological crisis in the making for the rest of the country.

The interaction between changes in production and state policy in China’s reform period can best be seen in agriculture, where the rapid transition from collective to household forms of production organization affects land-use practices. These practices in turn are embedded in social perceptions of risk, security, and stability. Non-state actors and institutions transform the production process despite the state’s attempts to control them (Watson 1992). A political ecology in this context places a special emphasis on organizational forms and capital sources.

One of the major problems overlooked in the more celebratory writings on Chinese economic reform has been the fate of assets built up during the communal period. These social, economic, and environmental forms of capital typified local-level economic development under Mao. Lacking

sophisticated market-based institutions or independent sources of finance, rural producers came to regard these assets as a source of capital. The rapid mining of communal assets (tangible and intangible) forces us to reevaluate the impacts of short-term coping strategies under shifting regimes of accumulation—from plan to market, collective to individual, long-term to short-term. Furthermore, we are obligated to look at political consequences among rural producers of ecological decline—such as claims by peasants on the state for losses incurred as a consequence of “natural” disasters (Blaikie et al. 1994).

Resistance to the new order has emerged among workers and peasants. Whether the underlying social tensions will become openly active politics, or surface through everyday resistance, depends to a large degree on the development of a social (civil) space for dissent and discourse (Solinger 1993). At this time, there is limited potential for organized social movements on a broad scale in China, demonstrating a transfer of authoritarian politics to the emerging hybrid system.<sup>1</sup>

This paper is a product of and contribution to the emerging subdiscipline of political ecology. It situates the Chinese reforms in an analysis crafted on the theoretical concerns and insights of political ecology, exploring the social impacts and ecological consequences of reform, and subsequent state attempts to maintain legitimacy in the face of growing resistance.<sup>2</sup> The implications of socialist-transition economies’ insertion into global production networks can be better understood through a specific political ecology of China’s own articulation. Using this analysis, emergent environmental and social problems in China appear not only as consequences of reform policy, but as linked to global economic restructuring.<sup>3</sup> At the local level, changes in the organization of production, and in marketing and consumption patterns result in an intensification of natural resource use and environmental degradation.<sup>4</sup>

## The Fate of Communal Capital in the New Hybrid System

China is all things to all people: it is “capital’s salvation”—a vast new market, a place to invest East Asia’s surplus capital, a huge labor pool of disciplined workers, a vast resource base, a powerful industrial system, and a diversified agricultural and industrial economy. China is also a

Third World economy, with an enormous peasant population facing the tremendous gap between economic possibility and everyday actuality. Still, as its regions of prosperity rapidly merge into the First World (in much the same way as other East Asian economies), China is increasingly identified as a newly industrialized country (NIC), but also a powerful and potentially destabilizing military force—a regional superpower and a political enigma.

A new political economic system has emerged in China, derived from a synthesis of command socialism and advanced capitalism but seeming to combine the worst of both systems. Politically, the strong one-party state has retained its complete intolerance of dissent, gambling that the party-state system can remain responsive to crises, while retaining its political legitimacy. Socially, an eruption of new poverty has accompanied the creation of concentrated personal wealth. And despite claims of pragmatism, the new economy is speculative in terms of capitalist investment, natural resources, and even social/political institutions.<sup>5</sup>

The exact nature of this hybrid system is difficult to pinpoint. It is simultaneously a cross between a NIC, a Soviet-style industrialization model, an export-led growth model, an import-substitution model, and a sweat shop/subcontractor to the world's manufacturing corporations.<sup>6</sup> Even the term "hybrid," is a restricted vision when applied to the Chinese system. We may actually be witnessing the evolution of an entirely new phenomenon, one historically specific and difficult to repeat, fitting like a missing piece into the global jigsaw puzzle of the new international order.

There is no one "market socialism" in China. There are areas of pure capitalism (frontier style, speculative to a large degree) as well as spheres of Stalinesque socialist growth economies (highly controlled, rigid and bureaucratic). The spatial dimensions of socioeconomic heterogeneity are translated as uneven development or geographic differentiation in the intensity with which the new "model" appears (Lyons 1991). We are now able to identify multiple Chinas—multiple development models and paths occurring simultaneously (Muldavin 1992). Behind this phenomenon is a structural trend that resembles the distorted development characteristic of large Third World countries. The wealthier regions (particularly in the eastern portion of the country) use the hinterlands in ways that structurally limit potential

of these areas for meeting the real needs of the majority of their own populations. Perhaps China is undertaking a project that will "underdevelop" its hinterland regions (Lippit 1978) through the accelerated use of local resources.

As a latecomer into global capitalism, China faced the West with little capital organization. The material wealth of central planning could not be easily mobilized or transferred to its market equivalents. Therefore China propelled itself into the international arena of capital through the energetic use of communal capital. This included the social and organizational achievements of the communal period which have provided China with the literate, healthy, and skilled individuals so attractive today to foreign investors. Once freed from their socialist moorings, these social assets have been readily translated into China's economic growth. Communal capital contains both tangible and intangible investments. Socially oriented tangible investments in infrastructure consist of housing, clinics, schools, and administrative buildings, and by extension, literacy, improved health care, and greater access to community resources. Biophysical infrastructure is directly related to production—dams, levees, canals, roads, reforestation projects, terracing, and improvements in soil fertility, grassland, and cropland quality. In some regions, these projects were the most significant economic changes on the land. Collectives purchased machinery and operated small industrial facilities processing agricultural products, producing construction materials, and allocating special labor contributions to specific productive efforts.

In the new Chinese hybrid, privatization and reform have permitted a relocation of risk and uncertainty to the weakest class of producers, forcing peasant decision making towards ever-shorter time frames.<sup>7</sup> Whether Chinese peasants are profit maximizers or risk averse, or both (Scott 1985; Shanin 1987; Ellis 1988), this privatization of the social and personalization of the communal have profound effects on nature, as demonstrated by intensified transformation and degradation. Positive estimations of the sustainability of market socialism (Nee and Stark 1989) can now be challenged by a critical political ecology of its practice.

The Maoist development model of revolutionary China can be distinguished from Soviet-Leninist central planning by its emphasis on self-reliance. Commune-based development localized the joint development of agriculture and

rural industry by building up infrastructure, allowing for reinvestment of surplus at the commune level—harnessing long-term productivity gains to the communal project (Robinson 1971). The model reflected a peasant-centered revolutionary ideology through its emphasis on collective labor organization and an egalitarian distribution of surpluses. Traditional peasant values were reshaped to associate individual incentives with the social and political ideals of the collective good. Though current observers point to failures in the Maoist project of social engineering (Rawski and Li 1992; Selden 1995), its political success with Chinese peasants is undeniable. Much of the legitimacy of the Maoist period was gained from the overthrow of the preceding “feudal” history of oppressive landlordism. The state’s political commitment to social justice in the countryside is central to its historical role since 1949, allowing China to focus on inward development through a Maoist version of socialism as material conditions improved.

China’s collectivized agriculture differed significantly from that practiced in the former USSR. It was composed of a spectrum of organizational forms, from state farms to communes, and ranged from large-scale mechanized capital-intensive operations on flat open plains to small-scale nonmechanized labor-intensive units on narrow terraces in the mountainous interior. Communes and state farms were part of a national system of planning, which was necessarily a top-down, bottom-up, negotiated deal (Gurley 1976). It relied on imperfect coordination and communication. The commune was hierarchically divided into brigades organized around traditional villages. Within the commune, the greatest responsibilities, cohesiveness, and sharing of risk rested with teams of ten to twenty households. During its most dynamic stages, collective labor was applied at all three levels (commune, brigade, team) to rapidly develop social and physical infrastructure. In the relatively successful communes, this application enhanced productivity and quality of life (Riskin 1987). Clearly, there were many failures (Rawski 1995), but investment was usually made with an expectation of long-term collective benefits. So it is essential to see that the build-up of assets referred to earlier as communal capital was important not only because of the way it was produced, but also of how it was perceived.

Many environmental disasters followed some of the worst planning debacles of the commune

period. But the widespread perception was that this social and physical infrastructure, or communal capital, was built up under a system of socialist production in which environmental problems were also expected to be solved collectively. Indeed, Maoist planning assumed the permanence of collective and state enterprise and the success of the inward development model as a whole. The internalization of all costs, including environmental, was implicit on the Maoist commune, given the immobility of peasants and the long-term character of the development projects. In other words, there was no theory in Maoist China that placed the self-reliant commune in a competitive, global market economy dominated by capitalist industrialized states. By the mid-1970s, the 1950s commune found itself in such a world. Whatever notable and successful experiments in collectivization were achieved in China between 1949 and 1978 would not see serious mention in subsequent years. The state in post-Mao China was transformed. Policymakers concerned with China’s global position gained sway over those committed to the Maoist model. China was on its way to becoming a superpower.

## Environmental Effects of the Reforms: 1978–1995

The communes of the Maoist period proved a mixed success, with one-third failing, one-third holding their own, and one-third running quite efficiently by 1978 (Muldavin 1986; Hinton 1990; Chussodovsky 1986). The legitimacy of veteran leaders, who were purged during the Cultural Revolution but who regained power after Mao Zedong’s death in 1976, still lay with the peasantry, since rural Chinese are both the real and symbolic bedrock of the Communist Party. Failure of certain command structures opened the way for reforms. The genius of the reformers lay in exploiting the problems of collective agriculture to unite the Chinese peasantry’s historically-rooted desire for land with its strong patriarchal family structures. Dissatisfaction with command production in the socialist period, combined with disillusionment (particularly of the urban elite, but also of some peasants) as a result of the Cultural Revolution, led to a general willingness to abandon the political emphasis of Chinese rural development policy. State legitimation based on a collectivist definition of social progress shifted under the rehabilitated leadership (led by

Deng Xiaoping) to legitimation based on a retreat from the state’s active role in the rural economy.

Thus, in the post-Mao “pragmatic” period, attention shifted to decollectivization, the dismantling of the commune system in rural areas, and a move towards a market-oriented economy. Collective production was seen by many as stagnant and economically restrictive; a return to household- and individually-based systems was thought the best hope for countering these weaknesses. Peasants on poorer communes more readily embraced the reforms, while successful communes could best take advantage of efficient administrative structures and ample agricultural and industrial assets to pursue new opportunities. Such differences conditioned the outcome of the reforms.

Looking at the predominant mode of economic coordination and its basic unit, and relating these to decision-making strategies and goals, we can make general observations that distinguish the pre-1978 period from the post-1984 time of re-

forms (Figure 1). These observations reveal basic factors that have led to new environmental problems for China, produced in part by rural reforms but with broad implications for long-term sustainability of production. The most significant shift produced by the reforms was the opening of a predominantly planned economy to the decisiveness of market forces. Although planned resource allocation still exists, particularly in heavy industries, it functions now within an increasingly competitive framework, individually as well as institutionally. That competitive framework, in turn, makes planning problematic, since there has been a simultaneous shift from collective production to the household and individual. An important transfer of control over local resources has taken place, corresponding to a shift in control at the highest levels of government.<sup>8</sup>

Over a period of six years, beginning in 1978, the state was able to dismantle much of the collective control of land through the introduction of subcontracting and by parceling out per-

	Pre-Reform (up to 1978)		Post-1984 Reform Period
<b>Predominant mode of economic coordination</b> <i>Commodity allocation and resource control</i>	<b>Plan</b>  <i>Via state &amp; collectives</i>	Transition Period 1978–1984	<b>Market (increasing)</b>  <i>Via state/collectives and increasingly via markets through independent households and new-style collectives/partnerships</i>
<b>Base unit</b>	<b>Collective</b>		<b>Household/Individual</b>
<b>Decision-making strategies and goals</b>  <i>National policy goal</i>  <i>Local Policy Goal</i>  <i>Incentives and Risk</i>	<b>Long-term; egalitarian social gains</b>  <i>Self-reliance</i>  <i>Compliance with plan via negotiation</i>  <i>Socially &amp; politically based incentives with the state and collective carrying most risk</i>		<b>Short-term; competitive individual/household gains</b>  <i>Global interdependence</i>  <i>Coordination of markets and contracts</i>  <i>Economically based individual/household incentives via increased competition and risk</i>

Figure 1. Shifts in China’s rural political economy from pre-reform period to post-reform.

capita shares of equivalent pieces of land to every family—the Household Responsibility System.<sup>9</sup> Significant increases in prices for grain, as well as fertilizer availability and use, brought a rapid rise in grain production, legitimizing Deng's calls for the complete decollectivization of agriculture and the transformation of other areas of the society. By 1984, 99 percent of all communes had decollectivized agriculture and implemented the reforms. But behind decollectivization and increases in productivity was the wholesale depletion of communal assets.

In rural areas, where collective industries existed at a number of levels—team, brigade, commune, and county—results of decollectivization produced both local advances and setbacks, creating a varied landscape of industrial change. At the team and brigade (village) level, most collective industrial works and sideline industries were contracted out to individuals, families, or small groups of families. At the commune level, a combination of individuals and hired managers was used. At the county level, most industries remained in the hands of the local state. Thus, the most unequal distribution occurred at the village level, where industrial assets were often limited (tofu factories, flour mills, machine shops, etc.). This led to rapid social stratification in many rural areas, as a few lucky peasant households gained control of collective assets and were transformed into a new class of small industrial and commercial entrepreneurs (Odegaard 1992).<sup>10</sup> By comparison, in most places, land distribution was carried out in a roughly egalitarian manner. Those households fortunate enough to acquire industrial assets were able to invest profits in such goods as better houses. Figures 2 and 3 show how two peasant households, each with identical land holdings, fared after redistribution of collective industries. Note that both houses serve as backdrops to the traditional outdoor grain bins. The household in Figure 2 received a small grain mill, while that in Figure 3 is still wholly dependent on its harvests.

In agriculture, risk was transferred to households within an unregulated atmosphere. Between 1984 and 1989, total grain production fluctuated below the 1984 peak, while unit yields stagnated (see Figure 4). Causes of the stagnation in grain production include decreasing profitability, a subsequent shift to cash crops, and unsustainable production practices. Much of production gains obtained during the boom period (1978–1984) can be attributed to technical

factors of production such as fertilizer application rather than social reorganization (Stone 1988). Problems associated with these technical factors therefore loom large in the subsequent period of stagnation. For example, the expected benefits of freer input flows following the lifting of the state monopoly on agricultural inputs in the mid-1980s (World Bank 1990), were undermined by the potential for huge profits in the black market. In part due to the long chain of middlepersons, prices were so high that the already minimal profitability of grain production simply vanished.

As peasants across China shifted cultivated land from grain to cash crops, they created a contradictory relationship with the state. Though still required to provide a set quota of grain to the state, they were simultaneously being encouraged to respond to market opportunities. Peasants in Jilin Province responded by putting filler materials in their quota grain deliveries (“A Big Case of Grain Filler . . .” 1995). Still, grain production's lower profitability relative to cash crops left peasant farmers striving to increase grain yields on smaller and smaller parcels of land in order to free more land for cash crops. They attempted this by using costly chemical fertilizers and pesticides, purchased with profits derived from their expanding acreage of oilseeds, tobacco, cotton, and other high-input cash crops. Most farmers hope that this shift in practices will enable them to meet their quotas *and* make money. The adoption of a host of unsustainable practices raises their dependency on costly agricultural chemicals, as farm households jump onto the increased-production treadmill. Falling grain production area in China (ZTNJ 1996) thus reflects an increasingly vulnerable and risky agricultural system, predicated on the decreasing resilience of soil. This policy assumes that China's fields can absorb endless increases in chemical fertilizers and inputs with no negative results.

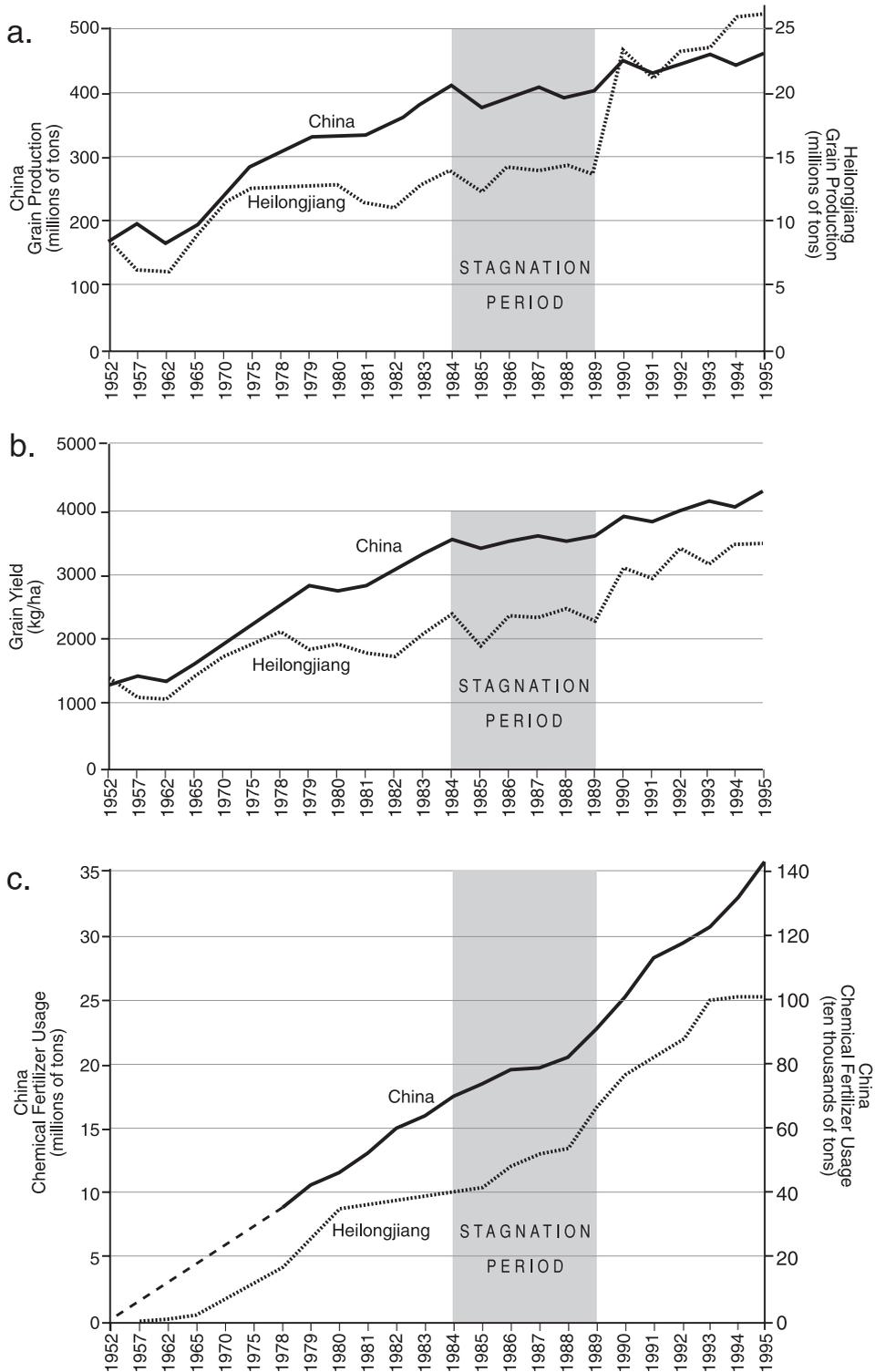
Historically, intensive Chinese agriculture developed with characteristics that were integral to sustainable farming (King 1911), but that also degraded specific environments. *Ch'i Min Yao Shu: An Agricultural Encyclopedia of the 6th Century* carries detailed instructions for proper maintenance and improvement of cultivated land—crop succession and green manure practices to improve soil fertility, field infrastructure to prevent erosion and improve yields, and various methods for insect protection—as well as methods for crop storage and food processing.



Figure 2. Rich peasant home gained from transfer of grain mill after decollectivization.



Figure 3. Poor peasant household received no decollectivized assests.



**Figure 4.** Grain production, yields, and fertilizer use for China and Heilongjiang showing the 1984–1989 stagnation period. Source: CSY 1992: 222, 312, 323–334; 1993: 332, 348, 349; 1996: 368, 371; HLJSY 1992: 347, 351, 354; HLJSY 1993: 319; 1995, 1996; Liu 1992: 47–50; CRSY 1992: 272; 1995.

Two thousand years ago, agricultural practices involved livestock, fish, crops, and humans in a complex and highly-evolved system of production (Shih 1962). King (1911) described many of these systems still in effect during his travels in early twentieth-century China. Yet despite this vast knowledge, environmental degradation also occurred, largely as a result of the extraction of wealth by the state and local landlords. War and rebellion also took their toll, devastating large areas, as occurred in the early Qing dynasty (Purdue 1987). Land reclamation and repopulation followed, demonstrating that degradation could be slowed or reversed through monumental exertion of human labor (Cressey 1934). The post-revolutionary period is just a snapshot in this long evolution of land use in China, but it is one in which the history of sustainability is being rapidly forgotten. Today, most agricultural land under cultivation is in a degraded state ("NEPA Issues China Environmental Survey . . ." 1994). In place of monumental tasks that were a hallmark of Maoist communalism,<sup>11</sup> massive inputs of chemical nutrients and individual labor make crop production viable.<sup>12</sup>

Without a concerted national effort to develop alternative practices such as agroecology and integrated pest management, or to rescue indigenous knowledge, it appears that the sustainability of agriculture in China will end up dependent upon expensive nonrenewable resources that in themselves have destructive long-term effects.<sup>13</sup> Combined with decreasing social welfare and increasingly volatile local markets, agricultural production and rural industry have shifted towards practices that provide short-term returns but result in rapid, often degrading, exploitation of natural resources and labor. Granted, there were numerous examples of environmentally unsound decisions prior to the reform period (Smil 1984, 1993; Ross 1988; Howard 1993), but the reforms introduced new negative elements that exacerbated environmental problems and decreased sustainability in the new hybrid system of China (Edmonds 1994; Muldavin 1992).

## The Case of Heilongjiang Province: 1978–1995

Since 1982 I have worked for periods of time in Heilongjiang Province, as a consultant to the Ministry of Agriculture on rural development in

Zhaozhou County and other areas, and as a Fulbright Scholar (1988–1990) in Bayan County conducting doctoral research on three villages. The case studies in this paper are drawn from field work and observation in these two counties (Figure 5).<sup>14</sup> Zhaozhou County's flat expanse is split in half, with crop cultivation dominating the eastern portion and herding of livestock the west. Further east in Bayan County, field crops predominate on the richer alluvial soils, supplemented by a significant forestry sector in the rolling hills and low mountains. Heilongjiang Province, although described here as a hinterland, fulfills a historically important role as a resource-rich industrial pole of the northeast economy. Heilongjiang was developed into "the great northern granary" in less than a century by all three political systems—imperial, republic, and people's republic. The project has always been hampered by particularly long harsh winters that limit the region to single-season crop production, preventing the intensification of production through multiple cropping prevalent in other parts of China. Yet for China, Heilongjiang serves as an important indicator of wider changes, as the reforms re-create a speculative and unregulated frontier of natural resource exploitation.

Plans to diversify and expand Heilongjiang's economy are based on the vast resources available. With a total area of 454,000 square kilometers, this border province's 35 million people are economically dependent upon significant grain and agricultural commodities traded to Russia and the rest of China (HLJSY 1992). In addition, Heilongjiang is a major industrial center and source of raw materials such as oil and lumber. One-twelfth of the total cropland and one-sixth of the total commercial grain production of China are concentrated in this northern province (Zhao 1981). Moreover, much of the western marshy grassland region, fed by the floodwaters of the Songhua River,<sup>15</sup> has served as the historical grasslands of the minority Mongol herders, who graze cattle, sheep, and horses, and hunt indigenous species such as deer and antelope. These indigenous practices have been altered by recent Han settler-agriculturalists who increasingly push grain and cash-crop cultivation into these areas as well as introduce more intensive grazing systems (see Figure 6).

Given the inevitability that the reforms would have a different impact both within and among villages, townships, counties, and provinces, my

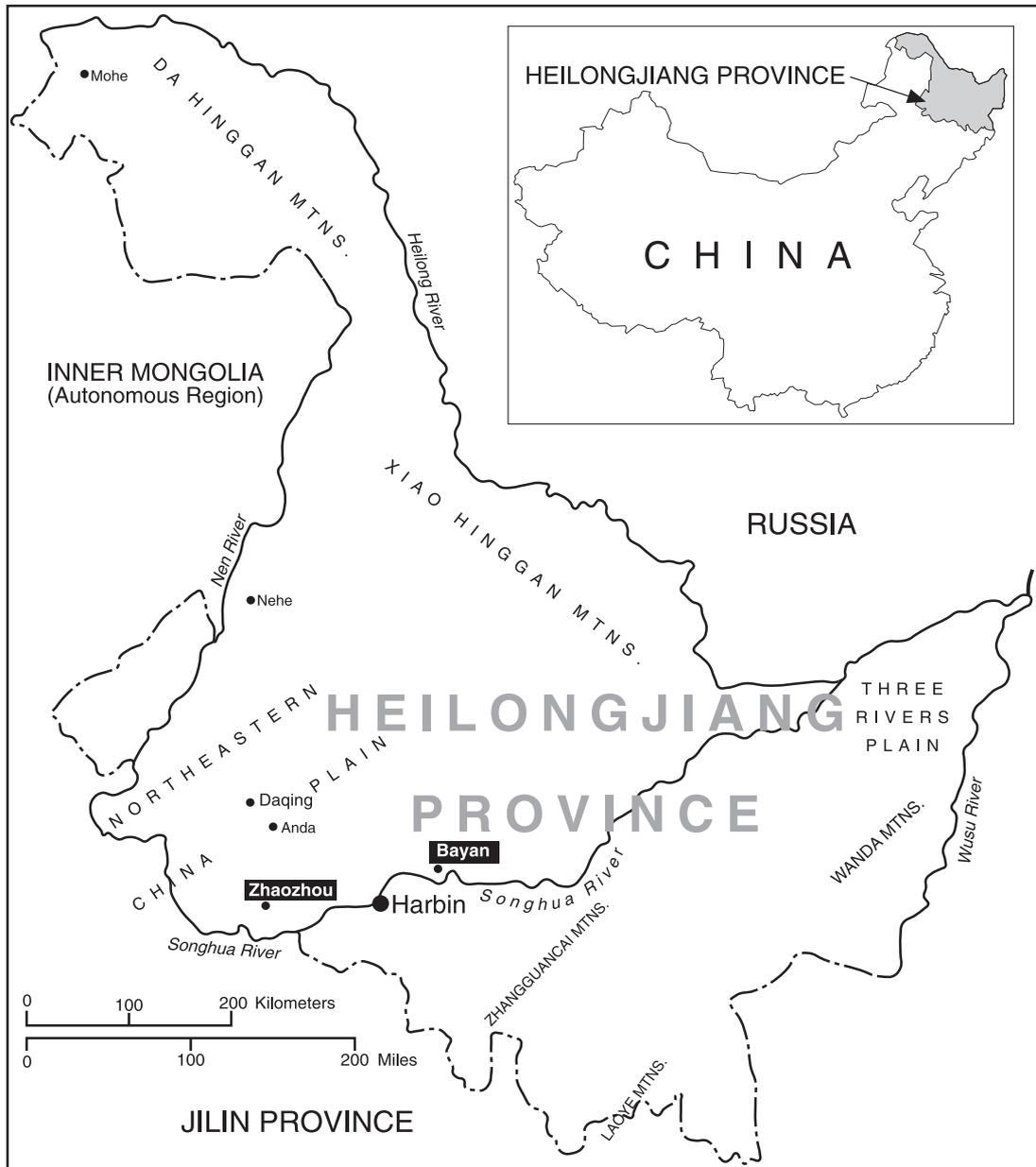


Figure 5. Heilongjiang Province, China, locating Bayan, Zhaozhou and provincial capital, Harbin.

concern during my stays in Zhaozhou and Bayan Counties was to determine how the reforms would shape and structure agrarian change when implemented in relatively poor hinterland areas of China. Taken together, the empirical village-based observations in Zhaozhou and Bayan Counties allow a more nuanced understanding of specific causes of environmental problems in contemporary rural China. Three dimensions of

agrarian change are considered: (1) land-use intensification, (2) agroindustrial pollution, and (3) declining communal capital.

### Intensification of Land Use

The range of choices theoretically available to peasant heads of households are moderated by



**Figure 6.** Land use in Northeastern China plain research area showing wetland regions, Songhua River basin, and Nene tributary.

two factors: the perception of risk and the pressure to increase yields. These limitations should temper notions that the outcomes of farmers' decisions are somehow optimal, or that choices are purely economic. In fact, farmers often decide to do things that go against their own better judgment. I witnessed individual claims being made on formerly collective resources in both agricultural and grassland regions, and how this was related to an evolving social stratification. Grasslands were appropriated by villagers according to their socioeconomic status and access.

Lands were staked out in a competitive rush, using squatter rights, limited fencing materials, and expanded numbers of animals to lay claim to previously collective grassland reserves. This is one example of environmental degradation, attributable to the impacts of state policy reform on agrarian dynamics, that I witnessed in Zhaozhou County while working with the Ministry of Agriculture on livestock development projects. The most serious environmental degradation resulted from this combination of deregulation and the releasing of large numbers of households into a

previous common property system following decollectivization. A similar process in Bayan County was exemplified by the rapid degradation of forest reserves.<sup>16</sup>

**Croplands.** The necessity to intensify production under a situation of increasing risk imposed a series of interrelated choices on peasant households. Peasants resisted adding organic nutrients to their fields because they had to use crop residues to meet immediate household needs—pulling up whole stalks and roots to provide winter fuel and feed for household and livestock. Amplifying the problem were shorter fallow periods and declining green manure (plant material incorporated into soil while still green [Brady 1984]) and compost returned to fields because only minimal manure, household, and crop wastes were available. All green-manure cropping ended one year after the implementation of reforms in Zhaozhou County as these crops were replaced with cash crops, resulting in a 50 percent decline in green-manure area. Likewise, manure delivery to fields for composting and spreading declined rapidly in Bayan county. When waste was available, it was used on intensive garden plots. Thus the village was required to impose a quota of compost to be returned to the fields. Peasants found many creative ways to meet this demand, for example, by adding large quantities of dirt or other filler material to the piles. This gave the appearance of composted mounds being applied to fields, but a quick check found them lacking the expected and needed organic matter (Muldavin 1992).

Intensification of land use in Zhaozhou and Bayan counties in the early 1980s also led to a rapid decline in overall soil fertility. As peasants abandoned sustainable agronomic practices, they increased their use of chemical fertilizers, postponing for a number of years the visible signs of declining organic matter. Salinization, ground water pollution, and micronutrient deficiencies were direct consequences (Muldavin 1983, 1986, 1992). As a result, yields stagnated and then declined. Crop rotation was simply abandoned throughout Heilongjiang in favor of monoculture, with the choice of crop (especially corn) depending on short-term profitability.<sup>17</sup> Peasant farmers complain about the “soil burning” of long-term fertilizer use. Because of a loss of structure and decline in overall quality, the soils became harder and less friable, with available nutrients actually diminishing despite large additions of chemical fertilizer (see Figure 4). Further, with a

lack of new investment in what is now a crumbling irrigation infrastructure resulting in a decline of available water, agricultural production has become less stable as it has intensified, forcing some farmers to extend crop production to previously uncultivated lands.

**Grasslands.** The western edge of the northeast China plain, from northern Hebei through western Liaoning, Jilin, and Heilongjiang, is a transitional zone between the Mongol steppe grasslands and the agricultural lands of sedentary peasants (see Figure 6). Agricultural production has been extended beyond lands appropriate for cultivation. Although short-term cropping is feasible in small areas of the grasslands, their large-scale transformation into cropland has reduced and degraded remaining pastoral areas, precipitating widespread desertification.

It is impossible to travel through Zhaozhou County without being struck by the immensity of environmental decline due to sodic alkalization. Upon entering the county, one sees large white plains of salt-encrusted soil where recent thunderstorms leave puddles of water. As the water evaporates, it draws more of the killing salts to the surface from the shallow groundwater table, where they mix with the rainwater and flow into other areas, stunting the growth of grass and crops (Figure 7).<sup>18</sup> These conditions, combined with polluted effluent from the Daqing oil field just to the north, can make one imagine these blasted lands as empty of life. In fact, this damage is the spreading result of intensified grazing and cropping in an extremely vulnerable, yet highly productive ecosystem. What is also surprising is how abruptly these landscapes change. Tall waves of grass stretch for miles (Figure 8), interrupted as one nears another village surrounded by sodic alkali flats and fields of stunted crops. Zhaozhou County's villages together contain a total of 300,000 people, who, between 1978 and 1984, doubled their livestock numbers despite the ongoing decline in available grassland. Foraging in a smaller area, cattle, sheep, and goats are ever more rapidly destroying the remaining productive lands, as depicted in Figure 9 (Muldavin 1986).<sup>19</sup> Social stratification is a further result of these processes. The ability to fence off range land was constrained by access to fencing wire—an expensive and scarce commodity. Enclosures of grassland by wealthier peasants forced larger numbers of livestock into a diminishing area (Muldavin field notes 1984, 1988, 1989). As large areas go

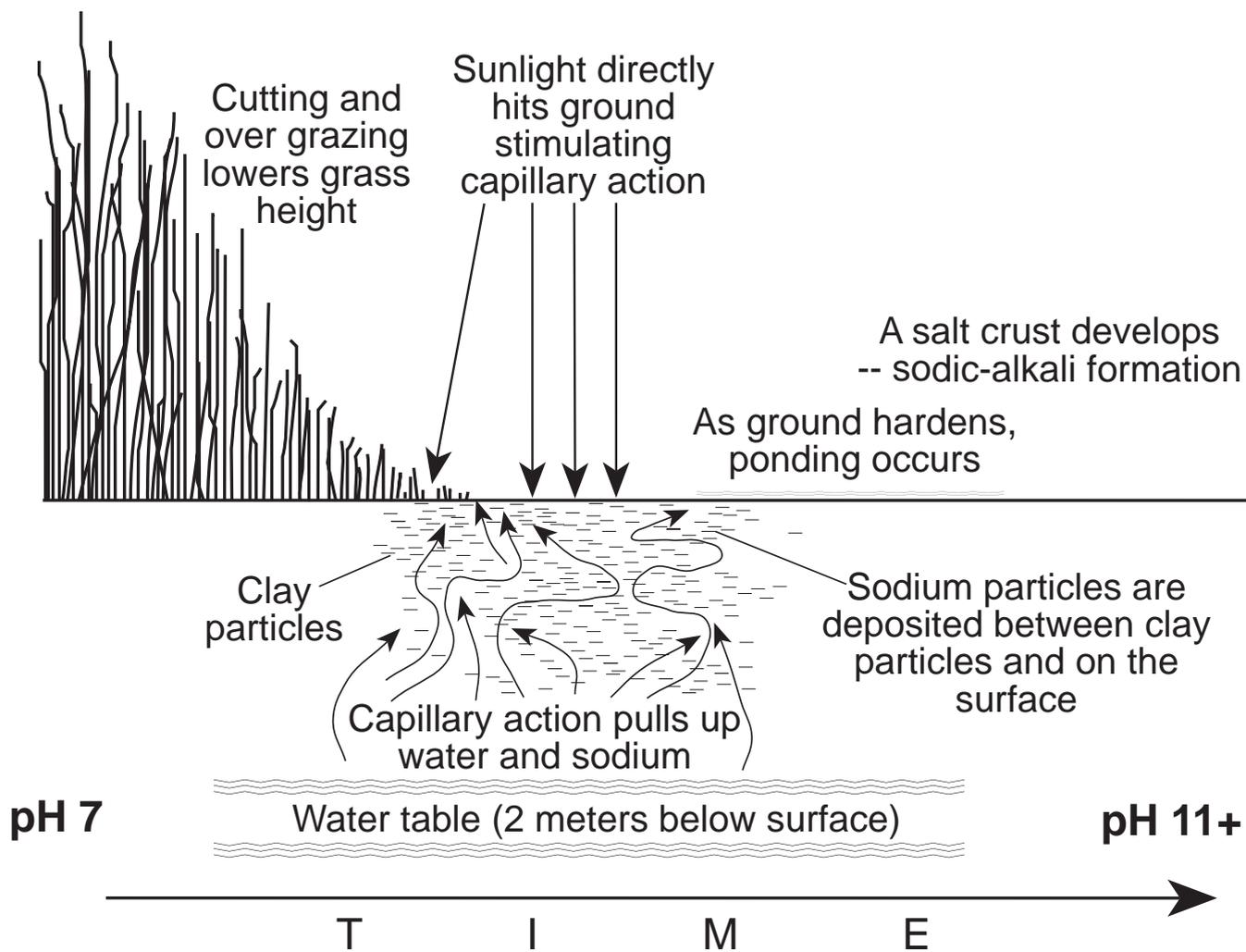


Figure 7. Diagram of process of sodic alkalization in grasslands over time: crust and hardening develop gradually as pH values rise from 7 up to 11.



Figure 8. Healthy summer grassland in Zhaozhou County.

out of production through rapid degradation, as can be seen in the final stages of denuded grasslands in Figure 10, grazing pressure is increased on the remaining lands.

This intensified use of grazing lands resulted from decollectivization and the subsequent lack of control over livestock numbers and grazing area rights. Peasant herders rapidly increased their herd sizes after the reforms as a means of improving security and laying claim to previously communal grasslands. With the expansion of agricultural land and the degradation of pastures near villages, herders moved their flocks farther away, setting up temporary houses to guard their animals and stake claims to land. But the effective deregulation of grasslands meant that the rapid decline in land quality was difficult to monitor, let alone reverse. In some areas, no contracts (via the Household Responsibility System) have been made between herders and the village government. If such contracts existed, they might provide at least passive land-use regulation and reduced risk to herders. In the absence of collective regulation or household contracts within a functioning institutional regulatory system, whoever can seize control uses the land. Consequently, strong incentives for increasing herd size were directly induced by decollectivization (Hinton [1990] documents the same process in nearby Inner Mongolia).

Accelerating internal desertification in Heilongjiang Province is tied closely to the rapid increase in the use of marginal lands coming with the decline of collective control (Muldavin 1986)—a direct result of the fact that much of the most marginal land is part of the collective holdings. As land use in general is intensified, production increases are achieved through environmentally destructive practices, often resulting in desertification of vulnerable regions. Officially designated desert area in China increased from 1.3 to 1.5 million square kilometers between the late 1970s and 1990 (Liang 1988).<sup>20</sup>

**Soils and Forests.** Lands lost to animal and crop production are often used as sources of adobe. The sodic-alkali nature of these soils acts as a water repellent, and thus the topsoil makes bricks with good durability. Soil for bricks is only taken from the top meter, often in areas that still have a short grass cover. In Zhaozhou County, thousands of hectares have been pockmarked in this fashion. This practice has increased rapidly due to the rural and urban

construction boom of the last fifteen years and is compounded by the building of larger homes.<sup>21</sup> The construction boom increased the demand for wood, cement, iron products, and other housing materials as well as for land itself (“Peasants Illegally Use. . .” 1995). Rampant cutting of roadside windbreaks, nurtured collectively over thirty years, became unstoppable. It is now possible to drive for miles past stumps of trees felled in the last few years. In Fendou Village, Bayan County, the elder villager assigned the difficult task of protecting village trees, described how every night a few more trees disappear in a process he called “nibbling” (“Henan Province Solved Two Cases” 1995). Despite fines and increased policing, the practice only accelerates (Muldavin field notes 1989). In Zhaozhou County during 1983–1984, I witnessed the abandonment of tree-planting programs, as well as the subsequent rapid harvest when forest plots were contracted for management to individual households. Trees were reduced to logs piled in front of the former commune’s headquarters (Figure 11). Combined with intensified grazing pressures, cutting forest for wood products and fuel serves to increase soil erosion by breaking through the protective soil cover (Muldavin 1986, 1992; Hinton 1985, 1990). In merely four years, between 1985 and 1989, there was a 48-percent decline in the area covered by windbreaks nationwide (ZNTN 1992).<sup>22</sup>

Rapid destruction of tree-based erosion control systems was even more evident in Bayan County during 1988–1989 (Muldavin field notes 1989). In Fuxiang Village during the 1980s, the uncontrolled harvesting of forest stands on the hills overlooking the village led to serious soil erosion. The forest “reserves” now consist of barren and rocky yellow subsoils. The mass wasting and soil slumping on the denuded hillsides have covered the valley and alluvial cropping areas with low-quality silt. The slopes, still classified as protected forests, are barren and eroded (Figure 12). Thus, not only have forest resources disappeared, but agricultural lands have been rendered useless—a dual destruction of the village’s two primary assets. The village leader acknowledged the problem but felt helpless to stop the process given the unregulated climate that typifies current resource use (Muldavin 1992). Furthermore, county leaders are unable to organize sufficient labor and funds to replant denuded hillsides or windbreaks.



Figure 9. Sheep on overgrazed grassland create patches of salt crust.



**Figure 10.** Sodic alkalization after severe overgrazing with erosion and hardening of surface.



Figure 11. Destruction of trees: former commune facility used to warehouse raw logs.

## Agroindustrial Pollution

Industrial pollution occurs on such a large scale in both rural and urban areas, and is so completely uncontrolled, that China faces imminent and serious environmental disasters (Edmonds 1994). With more than 80 percent of industrial waste water reentering waterways untreated, it is no wonder that almost 50 percent of inland water is too polluted to drink or to support aquatic life (Liang 1988; He 1991). Unregulated township and village enterprises (TVEs) pose serious health threats at the village level through groundwater contamination and other forms of pollution. Although many are collectively owned, few localities are willing to impose on their own enterprises regulatory controls that would decrease their competitiveness (Yang and Wei 1996). TVEs expanded rapidly in the new hybrid economy, many subcontracting to national and international firms. Their rapid growth is due to a combination of flexibility and low-cost production, which they achieve through their ability to hire cheap labor, use older, highly-polluting methods and machinery, and ignore all environmental and occupational health and safety regulations (Odegard 1992; "The Situation of National Wastewater Discharge" 1994). Often built on the limited arable land (declining by one percent each year nationally), and being spatially far-flung, they are virtually impossible to monitor or regulate, making them potentially more hazardous than spatially concentrated urban industries.

In the three Bayan County villages I observed, industrial and agricultural pollution were largely unacknowledged contributors to public health problems. These problems are further compounded by the declining quality of health care over the last fifteen years, as collective services disappear through lack of funding and organization (Davis 1989; Henderson 1993).<sup>23</sup> For example, the potato-starch noodle mills in Hesheng Village simply empty their effluents into dirt-lined ditches alongside the roads. A purple-colored chemical used to process potatoes into starch made it easy to identify the contamination of local groundwater when families began drawing violet water from their household wells. In another village in Bayan, all the fish raised by two households were killed by chemically contaminated water from a number of small village industries. Fishers along the Songhua river, at the southern border of both Zhaozhou and Bayan counties, reported rapid declines in fish yields as chemical

runoff from TVEs and agriculture increased dramatically. Brickworks in many villages burn large quantities of low-quality coal. By the end of the day, a low, fog-like inversion spreads across the villages and combines with widespread use of small fires for cooking, to make rural air quality very poor. According to local health workers, the high level of particulate matter in the air leads to rising rates of associated illness and disease (Muldavin HSVS, BCSI 1989). Not only air quality is affected by the widespread use of high-sulfur coal in TVEs, however. Despite producing a third of China's industrial output, TVEs receive only 20 percent of state-supplied energy inputs for industry (FBIS 1992). The gap in supply is filled though production from largely unregulated small-scale collective and individually run coal mines—60,000 of which are scattered throughout the countryside. First expanded under the commune, their current growth is responsible for widespread destruction of adjacent forests and fields. Mine tailings are a further health hazard, polluting land and water alike.<sup>24</sup>

## Environmental Decline and the Mining of Communal Capital

By 1984, the collective ceased to exist as the allocator of capital and labor. In the aftermath, capital and labor investment declined in large-scale infrastructure while being redirected into short-term projects. Observers from widely differing schools of thought (Lin 1993; Hinton 1990) recognize that state investment in agriculture and infrastructure has fallen significantly since the reforms were implemented, with resulting negative impacts on production (Odegard 1992). Expenditure on agriculture as a whole, as a percentage of total (national) state expenditure, has been in continual decline since the late 1970s. From more than 13 percent of the state budget at the time of Deng's ascent, state expenditure had fallen to less than nine percent by 1981 and has averaged below 5 percent in the 1990s (ZTNJ 1991, 1992, 1993; Qiu 1996). By 1988, one-third of state investment in agriculture was financed by foreign sources, principally the World Bank (Muldavin 1992).<sup>25</sup> This rapid decline in state capital investment in agriculture, combined with the redirection of collective labor and capital, prefigured the agricultural stagnation between 1985 and 1989. Together with declining household investment, these changes remain as major

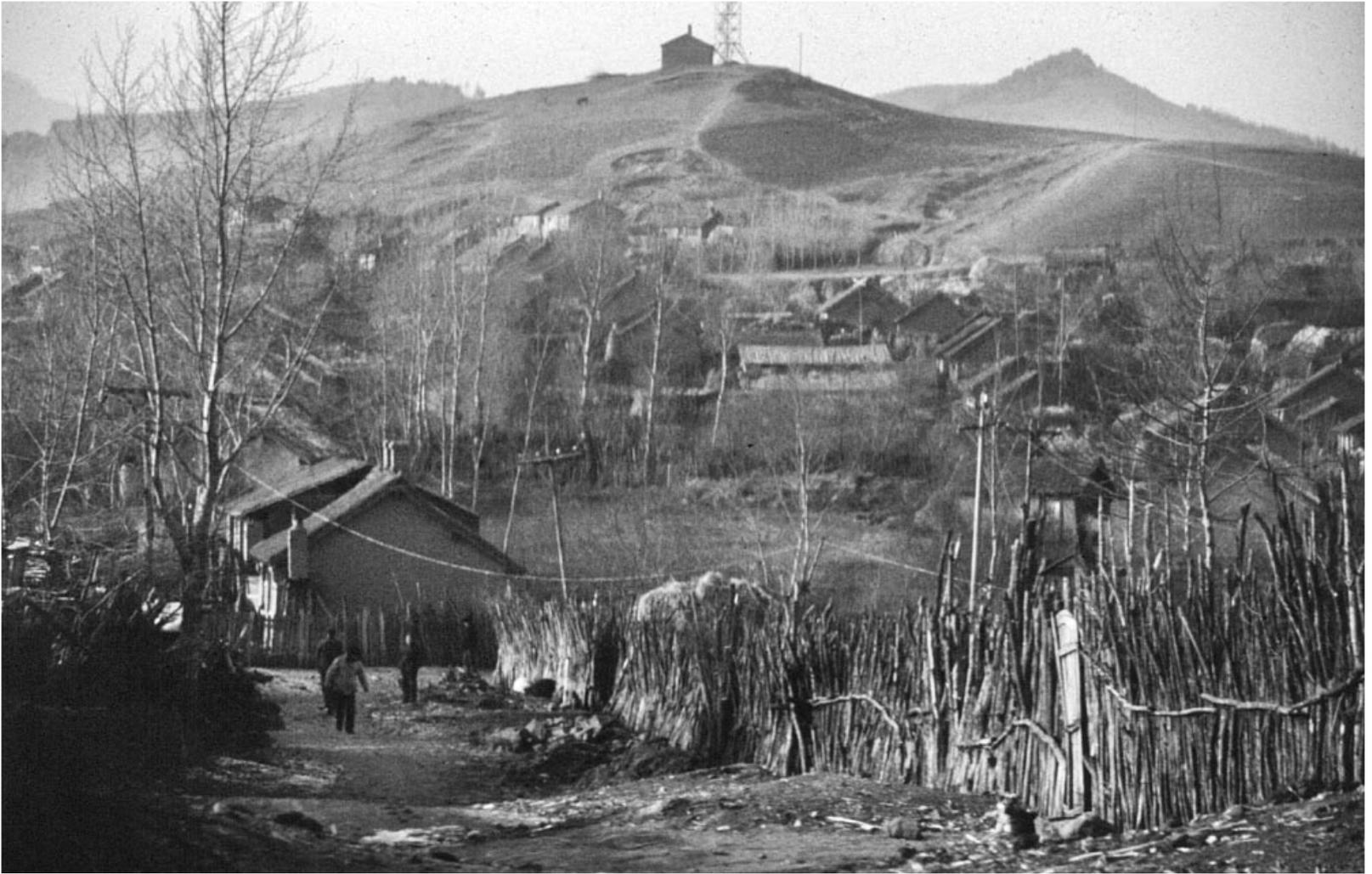


Figure 12. Fuxiang Village, Bayan County: denuded hillsides of previously forested areas.

barriers to the improvement of land and labor productivity in agriculture (Lardy 1984; Stone 1985; Walker 1984; Muldavin 1986). Repeated calls have been made in the last few years to divert state revenues to agriculture. In 1989, the Vice Minister of Agriculture (Wang) said that large capital construction projects in agriculture were being successfully implemented with a new land conversion tax being the major source of funds. Yet problems in collection of this and other agricultural taxes hinder proposed increases in investment. Another difficulty is the translation of top directives and transfer of monies down through the institutional maze into productive investment, without most getting “lost” along the way. Total projected investment needs of rural China until the end of this century exceed 1.5 trillion RMB (180 billion USD), with the state expected to contribute less than one-fifth, and the rest expected to come from peasant savings, the savings of TVEs, and the weakened collectives (Delfs 1984; Du 1985; Riskin 1987; Qiu 1996). With institutional structures at a local level severely weakened by reforms, it is difficult to imagine the funding and smooth implementation of rural development projects. Ultimately the state will have to recognize institutional failures and renew support for local initiatives. These will inevitably present cases where the rehabilitation of collective assets and common property play a determining role in future solutions. Their economic viability will first have to be appreciated.

Throughout China, villagers have been unable to organize the necessary labor and capital investment for agricultural infrastructure. Reservoirs, dikes, irrigation canals, tube wells, erosion control, tree planting—all critical to sustaining and increasing production—receive little investment for maintenance, let alone improvement or expansion, and are in a state of serious disrepair (*Peasant Daily* 1989; Muldavin 1992, 1994; Hinton 1990; Odegard 1992). The photographs of lined irrigation systems in Figures 13 and 14 contrast infrastructure before and after full implementation of the reforms (1983 and 1995). Figure 14 shows that for lack of labor and capital, a valuable resource has been abandoned. Although collectively owned equipment and facilities were often distributed along with land (*Peoples' Daily* 1982), water control infrastructure remained under collective management. Yet collectives experienced a massive decline in investment capital while simultaneously being stripped of authority and assets (ZNTN 1992). Such loss of control

over the utilization of resources led to severe overdraft of alternative water resources in many areas (Hinton 1990; He 1991; Edmonds 1994).

A rapid acceleration in local-level “natural” disasters in the last few years is attributable largely to the delayed effects of this decrease in capital investment. As irrigation systems fall into disrepair, villages are left with no buffer against the unpredictable rains. Village informants describe in detail the contradiction between their attempts to meet subsistence needs and the demands of local state authorities for higher taxes. Widespread anger towards local representatives of the state, an increasing trend throughout much of rural China (Muldavin BCSII 1994, field notes 1987–1988; also field notes from Henan Province 1990–1994) is a portentous sign of rapidly eroding political legitimation. Ignoring these environmental and economic problems may invite civil unrest. Yet rather than rebel, peasants often rely on the state’s forbearance in attributing actual and fictional shortfalls to “natural disaster.”

An attempt to build a levee in Hesheng Village is a good example of accelerated “natural disaster.” Using contracted labor-duty days, work has been organized annually to construct a levee to protect the village from floods (see Figure 15). Yet the village has been unable to complete construction. Failure to collectively organize and invest the requisite capital and labor necessitates starting the project over from scratch annually, as the product of each year’s labor is washed away. The villagers are so demoralized by the Sisyphean nature of this task that it is no longer possible to rally their efforts around the project. The result is the progressive impoverishment of Hesheng Village. For a number of years, the village has been unable to deliver its quota of grain to the township because the entire harvest was destroyed, and the village became completely dependent on state relief. Families have outmigrated, further complicating attempts to complete the levee. These migrants join the millions of peasants wandering across China in search of work (Muldavin HSVS 1989; also Hesheng Village Meeting, Nov. 10, 1989). In late 1994, it was impossible to reach the village for a follow-up research visit because it was under water (Muldavin BCSII 1994).

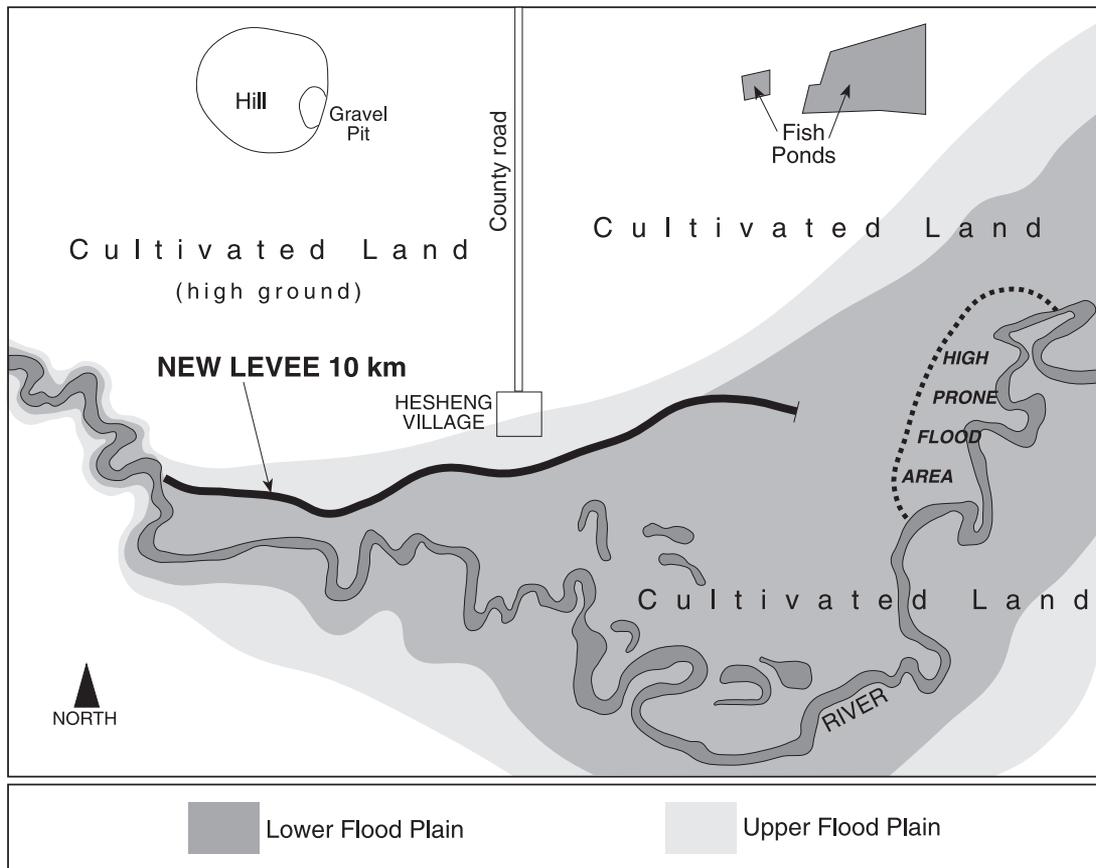
Disasters such as this can be ignored while economic growth in agriculture remains high, but that growth itself is being obtained by a redirection of investment. Capital previously used for large-scale infrastructure and collective projects has been diverted to purchase chemical fertilizers,



Figure 13. Water flowing in well-maintained ditch before reform.



Figure 14. Silted-up and overgrown ditch in disrepair after reform.



**Figure 15.** Hesheng Village cultivated lands and levee project along Songhua River floodplain showing high flood-prone area.

plastic sheeting, small pumps for water control, and other agrochemicals (ZNTN 1992; Muldavin field notes 1990) as well as to household consumption (Zhang 1993; “Life vs. Death. . .” 1989).<sup>26</sup> Similarly, investment in TVEs comes at the expense of other investments in infrastructure needed for long-term production gains. Given the fact that many unregulated TVEs contribute to increased local air, water, and soil pollution, the much-touted change in locus of control over capital investment and planning, from the center to local authorities, has not brought the expected advantages or met the objectives promised by decentralization. Indeed, the capacity for local people to organize or plan more sustainable production has been directly hampered by the “gold rush” on communal capital.

The failure to recognize the value of collective assets has already cost the economy in losses attributable to the increased frequency of natural disasters. Such disasters seem to be occurring in

greater numbers, not all of which can be attributed to climatic variation. For example, there was a 25-percent increase in the area covered and affected by natural disasters between 1985 and 1991 [ZNTN 1992].<sup>27</sup> The best example of human-induced environmental problems is the increased flooding that has followed in the wake of the practices described above. Raised silt loads and deposits in lower reaches of the major rivers threaten dike systems weakened by lack of repairs and investment. Reservoirs are rapidly silting up, undermining water conservation efforts, decreasing both flood control and the electricity-generating potential of the large-scale hydroelectric projects on China’s major rivers. In my Heilongjiang work, I observed a correspondence between increased flooding and peasant requests for forbearance from state-imposed production contracts. In fact, these requests are but one of many tactics used by peasants to reduce the pressures to which they are now exposed. Thus they

are part of an attempt to test the legitimacy of the state, often before committing conscious acts of resistance.

## Political and Ecological Aspects of State Legitimacy and Peasant Resistance

The phenomenon of passive rural resistance is well examined by observers of peasant societies (Scott 1976; Shanin 1987). Chinese peasants insulate themselves from volatile change through such “weapons” as lying to state authorities about actual natural conditions or otherwise limiting the state’s ability to demand surpluses. These passive forms of resistance (cf. Scott 1985; Peet and Watts 1996) have been engendered by excessive taxation, declining subsidies, inflation, and corruption, all of which have been brought to the surface by the social and environmental context of rapid decollectivization. The misinterpretation of passive resistance as strictly economic, or its recasting as a temporary response to market dislocation, is not, however, conducive to a rethinking of state policies. Certainly, elements within the state are quite cognizant of these problems, and there is a rigorous debate over the extent, pace, and consequences of reform (Sun 1995).

More activist, militant, and even violent forms of resistance have emerged in ethnic and class-based conflicts in both hinterland minority regions and the heartland of Chinese agriculture, flaring into local, but nonetheless important, incidents of rebellion. By 1987, rising real costs of agricultural and agroindustrial inputs caused unrest and demonstrations. Since 1990, some peasants have gone beyond small-scale acts of resistance such as cheating on grain quotas (“A Big Case of Grain Filler. . .” 1995), risking more direct acts that demonstrate the economic vise on peasant households. A recent peasant revolt in Renshou in Sichuan Province highlights the difficulties of a state trying to impose levies on peasants when rural household incomes are stagnating or declining (Muldavin 1992). When peasants refused to pay taxes in rural Heilongjiang, local police (whose wages are dependent on tax income) went with local cadres to peasant homes to demand payment.<sup>28</sup> If the peasants did not pay, the police took household goods of equivalent value. In cases where peasants accused the local leaders and police of unfair

treatment, they were punished through the cancellation of the state contract for their fields. They were left with only a small quantity of ration, or subsistence, land (Muldavin field notes 1990, 1993; also in Henan Province). With such high costs attached to political protest, peasants develop indirect forms of resistance.

The testing of state legitimacy is a critical weapon in the peasantry’s relationship with the state. It is considered a moral right to request assistance after a flood, and the state has little choice but to come to the aid of stricken communities. As a result, declarations of natural disasters as a means to obtain assistance have become an essential ploy by villagers who have mastered the art of “poor-mouthing” to strengthen their claims (Swift 1989; Sen 1994) (Muldavin HSVS, FDVS, FXVS 1989). For example, between 1981 and 1989, natural disaster claims were made for seven of nine years on behalf of villages in Songhuajiang Township in Bayan County (Muldavin 1992). These claims were made to justify lower annual quota requirements, increased disaster relief, development aid, cheaper and more abundant inputs, and free credit (see Figure 16). In Hesheng Village, repayment for credit from the township cooperative declined in years of natural disasters, when loans were either pushed forward or written off. This adds to local officials’ and peasants’ temptations to have their area declared eligible for disaster relief. Such costs accrue to the provincial and central governments, which must replenish credit sources each year.

Peasants thus leverage assets from the state based on historical agreements between the Communist Party and the peasantry. In a sense, the “party of the peasants” has to provide a morally correct patronage system of asset distribution to its supporters. If it were to lose its rural support base, it would be further weakened in relation to pressing urban demands. Thus, the environment has become part of the political terrain in which Chinese peasants negotiate their relations to the state. In this derivative system, it is difficult for the state to take stock of the problems that accumulate around its reform policies. Yet it is premature to say that policy reform in China has created a crisis from which the state and its institutions cannot escape. Nevertheless, China may be the first modern state to face an intractable legitimation crisis based on environmental decline.

There remain various paths that could engender a more equitable, albeit slower, pace of economic change for regions like Heilongjiang, as

Year	Rainfall above or below 50-year average (480 mm)	What was claimed
1981	+10 mm	minimal claims
1982	-5 mm	serious pest infestation affected a large area
1983	+14 mm	minimal claims
1984	+28 mm	spring drought and flood
1985	+85 mm severe flooding (village under water)	flood relief necessary
1986	+93 mm severe flooding (village under water)	flood relief necessary
1987	+11 mm	late freeze and unseasonably low temperatures late into spring, hail storm (8/22/87), flooding
1988	+24 mm	flooding (173 mm of rain in two days)
1989	-6 mm	spring and summer drought

**Figure 16.** Natural disaster claims and actual weather conditions, 1981–1989, for Bayan County, Heilongjiang Province. Source: author; Zhao 1994:176.

well as for the booming south. Nonetheless, the traditional alliance between the Communist Party and the peasantry is threatened by the new hybrid regime and appears to be unraveling in many areas of the countryside. A decline in state subsidies aggravates problems caused by the reforms but also relocates the political conse-

quences of tumultuous change on the state itself. With decentralization, the state loses sources of revenue and reduces its commitment to social well being, becoming in the process a target for discontent.

If Chinese central planning and government are giving way to an authoritarian but “market-

preserving" federalist system (see Montinola, G., et al. 1995), then Western observers will wait a long time to see the institutional changes they have anticipated for China. There is little evidence that the Chinese variant of modern industrial capitalism redresses environmental problems. These problems call into question the long-term viability of China's derivative economic system—closing the door to sustainable development and opening the door to unrest.

## Conclusion

A national policy that relies on a raid of natural systems structures economic growth on ecological decline. Since China's introduction of reforms in 1978, resource degradation takes many forms: increased use of marginal lands, more intensive cropping patterns, increased and uncontrolled use of destructive chemical inputs, a decline in agricultural infrastructure investments, rapid exploitation of existing assets through industrialization and accompanying pollution, land conversion, and the rampant destruction of ecosystems through industrial mining and the search for construction materials. While the Maoist assault on nature could be seen as inherent to the ideologies of "socialist developmentalism," post-1978 China is promoting a use of resources that has come to resemble a "run on the bank."

In Heilongjiang, people are learning that in a decollectivized world, problems are now the "externalities" of economic boom achieved through the faster utilization of natural resources, typical of agriculture in frontier regions throughout the world. This is not typical, however, of a peasant commune where all problems were expected to be solved locally. There is no brigade or team or campaign that will eliminate pests, clean the water, dig canals, or repair the roads.

It is a commonly held view that reform of collectively based, planned economies requires decollectivization to occur simultaneously with the promotion of market mechanisms. In fact, the two need not be tied together. A shift from collective to household economy is not a necessary corollary to the transition from command to market economies (Nove 1983; Bardhan and Roemer 1993). Within the local and regional heterogeneity of China's political economy, reforms take diverse paths. Alternate pathways are emerging, for example, a shift to markets within a predominantly collective economy allowing peasants to

employ long-term decision-making strategies in production alongside short-term market ones. This arrangement can spread the increased risk of market mechanisms over larger groups (Bardhan and Roemer 1993). Such an institutionalized competition within a collective market economy could reduce the mining of communal capital.

In Heilongjiang Province, recollectivization by poor peasant households into small groups might not only help to spread risk but also increase efficiency and power, and insulate the now-individualized households from an unstable economy. This kind of collective market economy may soon predominate, according to the deputy director of agriculture for the province, and is being closely watched in Beijing as a strategy to overcome some of the contradictions of the more general hybrid system (Sun 1990). What is critical in any assessment is to learn in what ways small-scale reunification is truly a voluntary bottom-up adaptation to problems of decollectivization or, in contrast, a top-down means of surplus extraction by the state.<sup>29</sup>

An alternate path is to have individual decision making within a planned economy with certain state guarantees left in place (that is, an individual planned economy). This path could provide adequate social welfare and stability of markets for individuals to make long-term decisions regarding production. In fact, intervention of this sort (though short-term and reactive) has been the method most often used to deal with crises arising from the reforms (Zhang et al. 1989). Both alternatives already exist in certain of China's regions and localities. Thus, a wide range of options are already in place to deal with the problems facing rural China—all of them better than a complete turn to a market economy composed of millions of small producers. The resulting picture of agrarian and ecological change, emerging from an array of often contradictory forces—from state policy to local resistance—has evolved toward a mosaic of mixed market and socialist forms, some with government sanction, some without. These forms range from the individual to the collective, and in recent years in Heilongjiang Province at least, have defied the national trend by increasingly relying on government intervention in the local economy for long-term market planning and stability. This situation provides a space for dialogue between different state institutions and independent social movements—the development of civil society.

The abrupt dismantling of collectives and their replacement by individual/household production units, in concert with the shift from plan to market, is causing a complex of significant problems, many of which have severe environmental consequences. Within the new economic context provided by the hybrid system, there are deepening contradictions: lowering the productivity of the resource base and bringing a decline in the long-term development potential in many areas of rural China. The structural problems of the hybrid system are manifested in numerous ways, including stagnant output of grain, soil-degrading intensification of land use, environmentally toxic agroindustrial development, declining capital investment by communities, increased vulnerability of poor peasant households resulting from greater risk, declining subsidies brought about by a state revenue crisis, and declining purchasing power due to inflation. These problems are important components of the subsequent delegitimization of the state.

China's restructuring, coming from its experiments with socialism and its articulation with the global economy, significantly increases its dependency on international markets as outlets for its products and as sources of capital, technology, and imported commodities.<sup>30</sup> This paper shows how costs and risks of the new hybrid are transferred to nature. Combined with unstable and changing tenure relations, short-term practices are emphasized over long-term sustainability. Thus, the "problems of market triumphalism" are mirrored by quite similar problems of socialist-market triumphalism in China. Rapid social stratification, in line with global trends, has occurred as control of productive assets, particularly nonagricultural ones, has been concentrated in the hands of a new wealthy elite (Odgaard 1992). A significant number of China's peasants, and to a lesser degree urban residents, are experiencing declining living standards (Muldavin 1992).<sup>31</sup> In 1993, 4.3 million people saw their incomes skyrocket to 32 times the rural average, but the incomes of 400 million people declined (Schell 1995). The failure of the commandist state—or of the magic of trickle-down—to redistribute the wealth of the rapidly developing coastal and southern regions to the poorer, agriculturally dependent hinterlands and peoples, amplifies the sense of multiple Chinas.

Taking into account the immense heterogeneity of China, locally-based collective action and long-term production strategies must be promoted if the

difficult problems of sustainability are to be resolved. The state's ability to maintain legitimacy through its paraphernalia of subsidies and debt is structurally limited by fiscal crisis (Muldavin 1996). Furthermore, the inequitable growth of the past fifteen years has been achieved through mining of communal capital. Thus, China's emergent derivative hybrid of socialism and capitalism—authoritarian, corrupt, speculative, exploitative of labor and nature—is based on fundamental contradictions that will not simply go away with the completion of a "transition" to a market economy.

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## Notes

1. Recent ethnic-based turmoil in the hinterland regions of the West, along with pronouncements from the Chinese leadership, make abundantly clear that the regime will not make the "mistakes" of the former USSR by freeing politics along with economy.
2. Political ecology emphasizes the importance of political economy in the understanding of environmental degradation—a historically informed attempt to understand the role of the state, the social relations within which land users are entwined, and resulting environmental changes. Much work has been done on the transformative effects of the penetration of capital into different aspects of the production process, the commodification of production and reproduction, and subsequent changes in land use towards more degrading practices (Blaikie 1985; Blaikie and Brookfield 1987; Neumann 1992). With excep-

- tion of emphasis given to interactions between peasant/indigenous and capitalist forms of production organization, however, the environmental effects of changes in the organization of production are under-theorized.
3. In China, it is the rural industrial complexes that now provide the greatest dynamism in the economy, while simultaneously affecting nature in unprecedented ways. As flexibility becomes the watchword of global capitalism (Sayer and Walker 1992; Scott and Storper 1986), global restructuring processes are paralleled by shifts in Chinese state policies since 1978 towards privatization, subcontracting, and deregulation. The new economic space created in China brings local labor and resources into direct global linkage with a constellation of factors choreographed by cycles of investment, technical and organizational innovation, and complex networks of contracts between firms (Page 1993). Further, this exploitation of uneven development and flexible regimes of accumulation (in particular, subcontracting networks) increases the ongoing concentration of control in the struggle over assets.
  4. Thus, theorists of the new industrial geography analyzing processes of First World industrial capitalism engage similar issues to those raised by political ecologists analyzing agriculture in Third World rural contexts.
  5. Wang (1996) and others argue that institution building is the next crucial step in China's transition.
  6. Now able to enter new regions, open thanks to market socialism (Bardhan and Roemer 1993), these modern enterprises benefit from decidedly unmodern conditions in both the exploitation of labor and nature.
  7. Deregulation and decentralization of economic activity and administration, and the increasing control at local and household levels, led to production decision making that responded to market signals in one sector while demands in others remained unanswered.
  8. Infrastructure that was built up on the commune is not what China's policy makers want today. The contemporary focus is no longer on local roads, canals, and treelines within a commune productive unit, but rather on nation-building investments of networks of satellites, telephones, highways, etc.
  9. Communes also gave up much of their regulatory power, while distancing themselves from the risks associated with production. Peasants are required to provide the state with an annual quota of grain at below market prices in exchange for long-term use of small parcels of land. A devolution in farming practices accompanied this shift in scale, from large unified plots to a mosaic of small holdings reminiscent of prerevolutionary China. Large tractors and harvesters were abandoned after the reforms, for it was no longer possible to use them efficiently on the myriad individual plots (Muldavin 1983, 1986, 1992).
  10. Parallel to this was the restructuring of collective industries. As in Russia, this can be interpreted as a transfer of collective assets to the elite, or as the transformation of political power into inheritable wealth (Cooper 1993). Typically, in urban areas this process was dominated by the new "princelings"—the children of China's aging leadership (Malhotra and Studwell 1995). The resulting class stratification is a national, as well as a highly localized and intrafamilial, phenomenon.
  11. The People's Republic of China set out in 1949 to reclaim and repopulate lands lost to production during Japanese occupation, World War II, and the subsequent civil war. The thirty years following liberation are replete with heroic accounts of turning back the desert, converting wastelands into productive croplands, reforesting denuded hillsides, controlling rivers, and bringing water to arid lands. Indeed, an entire discursive formation was built on the notion of the state-socialist transformation of nature in China. It must be stressed that the large-scale organization of labor by collectives, focused on building needed biophysical infrastructure, was very much responsible for the long-term gains in production that were achieved.
  12. In the late 1970s, fertilizer availability increased as factories built in the communal period came on line. As noted above, this increased fertilizer availability, combined with a 50-percent increase in prices paid to peasants for grain and the mining of communal capital, brought most of the increases in production. And yet, it was decollectivization that was identified by the state as the primary factor. The broad acceptance of this flawed position served to legitimize a deepening of reforms and the subsequent shift to urban areas, since the rural question had been "solved."
  13. This vulnerability is acknowledged in China, but the loss of biodiversity with the shift to hybrid cultivars, and the ecological implications of this genetic loss, remain underresearched.
  14. These sites represented a full range of agrarian change over fifteen years. Using household interviews and participant observations, I developed a rich database of individual and family responses to the implementation of the reforms. I combined this with intensive surveys of natural resources (through, for example, soil analyses), socioeconomic indicators, and production figures, as well as with first-hand documentation of environmental degradation in order to assess the character, scale, and pace of agrarian transformation within these communities. After one year of experiencing collective production on the commune and state farm, during my stay in Zhaozhou County in the early 1980s, I witnessed the phenomenal speed of decollectivization first-hand. In

- Bayan County, through cooperation with village leaders and government officials, I was free to select representative households drawn from all registered members of the community. My criteria included a constellation of cross-cutting variables in the three dissimilar villages: these variables documented family size and structure, relative social position in the community (from the wealthiest and most prominent households to the poorest and most marginalized), as well as access to land, credit, side-line, and small industrial assets. The resulting sample of households (checked against village aggregate data) provided a unique profile with which to analyze changing decision-making patterns in production and resource use. Follow-up visits through 1995 help provide a more complete timeline of changes under the reforms. These sources are cited as Muldavin field notes with year, and the three village and two county surveys in Bayan County as FDVS (Fendou), FXVS (Fuxiang), HSVS (Hesheng), and BCSI and II (Bayan County Survey I and II).
15. Freshwater fisheries along Heilongjiang's extensive river systems produce large quantities of fish for provincial export, as well as high-value caviar for the world market.
  16. It is increasingly recognized (Geography Institute 1990) that similar environmental problems are prevalent throughout Heilongjiang province, including erosion and soil degradation, air and water pollution, forest decline and grassland desertification.
  17. The impact on soil fertility was partly countered through increasing chemical fertilizer use, from 175 thousand metric tons in 1978 to more than one million metric tons by 1995 (HLJSY 1993, 1995; CSY, 1996). This growth was even more rapid than a parallel national increase from 10 million metric tons in 1978 to more than 35 million metric tons by 1995. The increased use of chemical fertilizers degraded overall soil fertility and water quality (Liang 1988; Muldavin field notes 1989).
  18. With a decline in soil cover due to intensified grazing, a process of sodicalkalinization begins, raising the pH in the upper horizons of the soil from 7 or 8 to 10 or 11. At the higher pH levels, what is left of the grasses dies off, leaving only clumps of high-pH tolerant weeds with low nutritional value (Muldavin 1986). The physical process of degradation is as follows. There is decreased grass cover on land with only slight elevation variations. Following significant precipitation (particularly in the summer rainy season), water ponds on the soil surface. Exposed to sunlight, much of the water evaporates before percolating down into the soil, drawing salts to the surface through capillary action and forming crusts of white particles. The soil porosity is reduced further by the lodging of sodium (salt) particles between clay particles, thus further restricting downward percolation of water and speeding up the process of alkalization. The result is an expansion of barren areas with extremely high-pH soils covered with a salty crust. Erosion increases, exposing even less fertile subhorizons, further complicating rehabilitation.
  19. The most common example of marginal land invasion in Zhaozhou County since 1978 was the continued transformation of tall-grass prairie into field crop and intensively grazed pasture areas. The movement into these and other marginal lands and the shift in land use from forests, marshes, and grasslands to more intensive agriculture increased output through an overall extension of areas under cultivation. Whether the choice was to rapidly increase grazing or to plow under the grasslands, the end result is the same—rapid expansion in the area of barren sodic alkali land (Muldavin 1986). It takes large amounts of water and expensive tile drainage systems to flush out the salt accumulations, and this process is financially unfeasible for the large areas of extensive grain production in Heilongjiang Province.
  20. These changes in production practices are indicative of a shift from long to short-term goals in rural decision making. Peasants are very constrained because, despite reforms, important institutions are altogether absent. Other missing elements that might serve as indicators include land markets. Land values, therefore, cannot serve as a signal of uneconomic use of resources. Similarly, the intensification and transformation of arable land through rapid and unregulated rural industrialization, expanded home building, and population increase, cannot be tempered by increases in the value of agricultural land. In this respect, reforms are premature, particularly with regard to the encouragement of rapid decollectivization.
  21. Increased standing water in this minefield of holes supplies a perfect breeding ground for mosquitoes and other disease vectors, creating a grave health problem. In this area, the mosquito carries Japanese encephalitis, a very serious disease.
  22. In fact, it has been discovered that reforestation areas throughout China have generally poor quality stands (Delman 1989:59).
  23. One of the less noted results of decollectivization is a breakdown of large-scale pest control programs. Subsequently, there is increased exposure to harmful pesticides, particularly for children and the elderly. In Zhaozhou County, the collective's former method of running sheep through a cement-lined pesticide dip to control scabies is no longer practiced. Responsibility for control of such diseases falls on the household, usually untrained female children, with little or no protective measures taken against exposure to toxic chemicals.

24. These unregulated mines are extremely hazardous. In 1996 there were 10,000 reported deaths in China's increasingly privatized mining sector, one-third of which were in coal mines ("China Discloses Blast in Mine . . ."1997:6). Although it can be argued that highly polluting industry and similar environmental problems are an inherent part of early industrialization, China's case is particularly vexing given the weakness of the institutional response.
25. This is the World Bank's own estimate, taken from notes of discussions with staff members at the World Bank office in Beijing 1989, 1990, 1991, and 1992.
26. Muldavin field notes (1983–1989); also field notes from Jilin (1984), Xinjiang (1984–1985), Sichuan (1985), Anhui (1985), Yunnan (1989), Guangxi (1988), Guangdong (1987), and Henan (1989) provinces.
27. Hinton (1990:132) discusses the collapsed terraces, groundwater overdraft, and other aspects of declining capital investment as well as resource exploitation run amok.
28. Poor peasants in areas not officially considered impoverished bear the greatest burden of an immensely regressive taxation system (Riskin 1995).
29. What may in fact be emerging is a new form of "microfeudalism," with the local neo-gentry providing protection, as well as supervision of production practices, while guaranteeing a certain level of surplus extraction for the state.
30. Therefore, China's problems increasingly resemble the restructuring taking place in capitalist economies (Page 1993). Both emerge from the need to increase the flexibility of surplus extraction on the part of dominant economic structures, institutions, classes, and actors. With China's articulation into the international economy, global "ratcheting down" effects occur domestically. China's reforms involve new kinds of institutionalized regimes of accumulation, part state, part market, relying on drawing down communal capital and increasing exploitation to enable rapid increases in total production. These new regimes have geographically far-flung subcontracting networks in which risk shed by larger firms and institutions is transferred to small firms and peasant households.
31. Based on discussions with William Hinton, Beijing, April and July 1993, and with the vice-head of the World Bank office in Beijing, April 1993.

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