

Chapter 3: China Proper: The Household as a Complex Human Ecosystem

The people can go for a hundred years without money, but they cannot starve for a single morning, thus food is the most urgent thing.

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For at least a thousand years, since the Song period, the Intensive Agricultural Zone of China Proper has supported one of the world's highest densities of population per unit of agricultural land. Supporting this population has depended on extremely intense level of land use and a continued process of further intensification, a process that was particularly rapid in the Qing period, from 1644 to 1911. At such high levels of intensity, most natural ecological buffers against disturbance have been sacrificed for gains in productivity. This has forced people to compensate for lost ecological resilience by strengthening infrastructural and institutional buffers. But the infrastructural and institutional buffers, in turn, require intensive upkeep, and if the upkeep fails, there is not much resilience left in the system, so that disturbances easily create ecological crises, something that has happened frequently in the last two hundred years. In this chapter, I first describe the spatial structure of China Proper. I then proceed to a detailed analysis of how the household, as the smallest-scale socio-ecosystem, was organized to attempt to buffer itself against these ever-looming disasters. In doing so, I explore the idea that traditional Chinese intensive agriculture was “everyday sustainable,” in Eugene Anderson’s words, at a household scale. This sets the stage for Chapter 6, where I examine how even a society and culture organized to buffer itself against disturbances lost resilience in the face of huge socio-ecosystem changes during the Qing: population growth, increase in cultivated land, and increase in the amount of water used to irrigate that land.

The Spatial Structure of China Proper

The Intensive Agricultural zone¹ forms the core of China’s national-level system. It is an area roughly delimited by two features: enough rainfall to support agriculture (usually defined as a yearly average of at least 350 or 400mm), and a topography flat enough to generate an agricultural surplus and transport it easily to markets and granaries to support the ruling classes of non-farmers who emerged about 4000 years ago. The population density is extremely high for an agricultural society, ranging in the late Qing period, before significant inputs of fossil fuel energy or artificial fertilizers, from 400 people per square kilometer of cultivated land in the north, to almost 800 in the south (Whitney 1980: 114; Perkins 1968: 212). We call this area China Proper, using an old term,

¹ Whitney (1980) calls this the zone of “peasant gardening.” Since the ox- or buffalo-drawn plow is central to cultivation in this zone, the term “gardening” seems inappropriate. Chinese peasants

because for the last several hundred years it has been populated almost exclusively by ethnically Chinese or Han people. They live and work in a highly modified ecological landscape, and practice agriculture characterized by dependence on intensive nutrient recycling, by very high labor inputs per unit of land and per unit of output, and by extensive and expensive irrigation works that serve both to boost productivity and to (partially) compensate for resilience lost by eliminating ecological buffers in the process of intensification.

Figure 3-1: map of China proper, showing topography, rainfall, and cultivated land.

Within the zone of intensive agriculture are two sub-zones. In the north, the climate is marginal for agriculture. Yearly average rainfall averages approximately 350-600mm, but varies widely from year to year, and only a few areas have reliable surface water supplies that allowed irrigated agriculture before the development of gasoline-powered well pumps that could extract groundwater (Lohmar et al. n.d: 278; Wang Jinxia et al. 2006: 276). Farming developed around staple crops that can usually receive sufficient moisture from precipitation, which is concentrated in the summer growing season. These crops were primarily grains such as millet, barley, wheat, and sorghum, and after the Columbian exchange (Crosby 1972), also corn and sweet potatoes. The growing season is short here, with between 190 and 210 days with a mean temperature above 5°C (Liu Binhui et al. 2010), and further constrained by concentration of between 60 and 75% of yearly rainfall in June, July, and August (Domrös and Peng 1988:169; Yang and Lau 2004: 1626). But the topography is excellent for agriculture, especially on the vast alluvial North China Plain, where crops can be grown almost everywhere and land transport is easy and convenient.

Figure 3.2 here: Picture of NCP in 19th century: need to get one.

The southern part of the Intensive Agriculture Zone is in some ways the inverse of the northern part: better climate but worse topography. Here rainfall is greater, ranging from 600mm. to as much as 2000mm, with a much greater proportion of the annual total—up to 35%—falling from March through May (Yang and Lau 2004: 1626). Temperatures are also warmer, giving a longer potential growing season. This climate allowed the development of irrigated paddy rice agriculture, one of the most productive systems of farming ever developed, and in more southerly regions with warmer winter temperatures and more spring rainfall, two crops of rice can be grown in one year. Growing wet rice depends on modifying pre-existing ecosystems in two ways after forests are cleared: dividing agricultural land into absolutely flat pieces—rice paddies—so that the roots of the rice plants can be covered with water, but the tops left dry, and capturing large amounts of surface water to channel into the paddies. But the topography of the South is much more mountainous than that of the north, meaning that intensive agriculture is possible only in alluvial plains or deltas, or on those hillsides that are not so steep as to make the upkeep of terraces infeasible.

Because of the possibility of producing and appropriating an agricultural surplus, the first states of East Asia emerged in what is now China Proper, probably around 4000 years ago, and large land empires developed here, from the Qin in 221-206 BCE to the Qing in 1644-1911 CE. These bureaucratic empires were ruled in the beginning by

hereditary aristocracies who appropriated the farm surplus primarily through feudal levies such as rents and labor services, and secondarily through markets; over the long course of history there was a gradual transition from hereditary rule to rule by officials recruited from the “gentry,” a loosely bounded class of landowners who had the time and leisure to take civil-service examinations. The rise of the gentry happened more or less at the same time as the rise of local and regional markets, so that by the Song period most of the surplus crops that left the farm went through the markets rather than through taxation—Perkins estimates (1968: 113-15) that around 30% of farm output in the Qing was marketed either directly or through rent paid to landlords, while taxes rarely exceeded 6-10% of grain output (*ibid*: 176). The importance of marketing for farm families created a hierarchy of market-based social systems that constitute the next several levels of the overall nested hierarchy of spatial systems in the Intensive Agricultural Zone.

G. William Skinner analyzed the structure of spatial systems *within* the Intensive Agricultural Zone as a nested hierarchy with approximately eight levels of systems (Skinner 1977, 1985). Within this Hierarchical Regional Space, as Skinner and his colleagues call it (Skinner et al. 2000), each system has a central, more urban and more developed core and a more rural, poorer periphery, and each system contains all or part of systems at the next level down. At the largest level are nine physiographic macroregions, divided by topography and with relatively minor flows of goods and people between them. These flows were great enough, however, that most of the imperial dynasties of East Asia were able to hold all or most of these regions together in a single polity. These macroregions by and large do not coincide with administrative regions; they are more ecologically than politically determined.

Below the level of the macroregion, overlapping hierarchies of local systems based on two different functions are structured differently (Skinner 1977). The administrative hierarchy, from province to prefecture to county, and in later times to township, was non-overlapping; units one level down are totally contained within units at the next level up. In the marketing hierarchy, each unit at a higher level contains part of several units at the next level down, but no unit below the level of the macroregion contains *all* of any unit at the next level down. Every unit at every level has its core in a city or market town of corresponding or higher level, from regional cities down to standard market towns, the lowest level in the hierarchy. Goods flow between rural households and markets in both directions, and between adjacent levels of the hierarchy of markets.

Because goods and people flow constantly (or every few days at least) within these systems of the marketing hierarchy, ideas and culture also flow within these systems more intensely than they flow across them (Skinner 1964-65). The key to the system lies at its lowest level, the standard marketing community, which in Qing times typically contained 12 to 40 villages. Within this community, the flows of economic goods and social interactions are the thickest, and this is the primary level at which the products of the household flow into the markets and into the coffers of the state and the landlords, and the products sold in the markets flow into the household for consumption. (See figure 3.3).

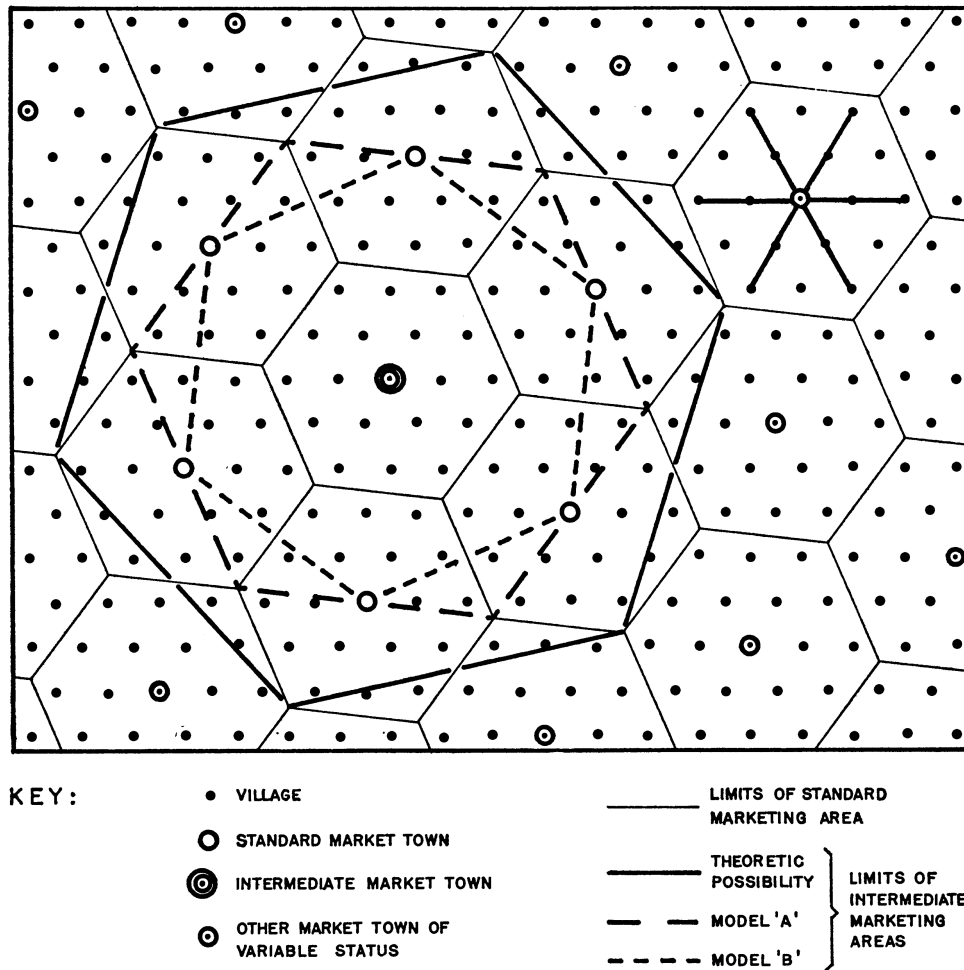


Figure 3.3: A model of how Villages and different levels of market towns are arranged spatially in a flat area in China Proper (Skinner 1964: 19)

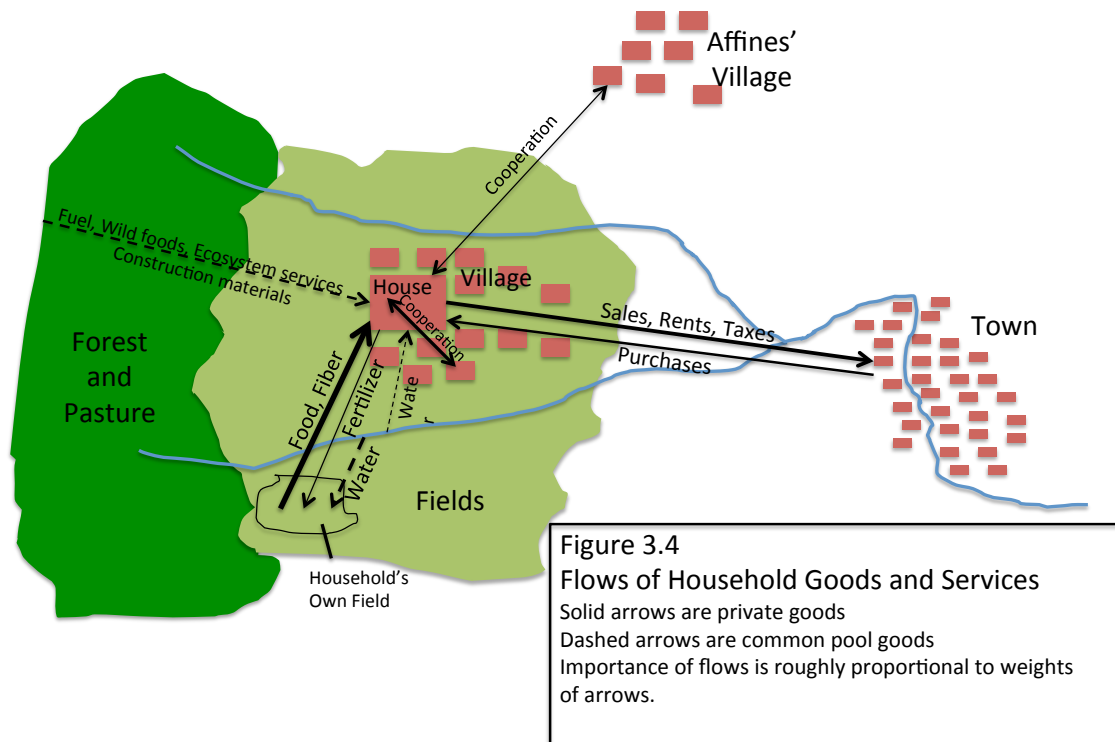
The core-periphery structure of any of these systems also has an ecological dimension. The patch structure within an ecosystem will roughly mirror the core-periphery structure in the marketing system, with peripheries tending to have more forests and grasslands, intermediate areas more grain farms, and areas closest to cities more vegetable farms. Irrigation systems also often coincide roughly with marketing systems, because both are structured partially by watersheds. Many marketing system boundaries are watershed boundaries, and because cities with markets tend to be situated on rivers, and lowlands tend to be more productive than uplands, the flow of goods between periphery and core in a marketing system will track the flow of water, sediment, wood, fertilizer, and other ecological resources and ecosystem services from the periphery to the core and, usually in lesser quantity, back again. A marketing system at any level is, then, a perfect example of a complex socio-ecosystem.

But there are still spatial systems below the level of the basic standard marketing community. One of these is the village, best defined as a rural settlement with no markets (though larger villages might have a few small shops). In most but not all of the

Zone of Intensive Agriculture, rural households live in closely packed clusters of houses, surrounded by all the families' fields and, in some hilly areas, by forests and/or grasslands farther away. Only in a few areas—notably in Sichuan and parts of Taiwan--does each family or group of families live on its own farm, as is customary in North America. Some villages have their own irrigation systems, while others share irrigation works with neighboring villages. A village, then, like a standard marketing community, is both a social and an ecological system.

The Chinese Household as a Socio-Ecosystem

The household was the smallest-scale socio-ecosystem in China, the smallest unit that had both ecological and social dimensions. Smaller-scale ecosystems (a field or a stream) lacked a clear social dimension, and smaller-scale social systems (nuclear families within a household) lacked a clear ecological dimension. We can think of a household as a group of people and the rights they hold to resources at several spatial scales, extending outward from their house to the village, the village landscape, and the standard marketing community. At each of these scales, the household holds rights and obligations relating to resources, some of them privately held and some of them held as members of a common-property regime (Ostrom 1990).² The flows of goods and services between these different scales are illustrated in Figure 3.4:



² These rights have varied historically with changes of government. During the socialist period, households held fewer rights in their own right than before or after.

The household was made resilient by a set of buffers or guarantors, ecological, infrastructural, institutional, and cultural. Population growth and the accompanying ecological changes during the Qing dramatically weakened the ecological buffers, which were only inadequately compensated by infrastructure and institutions, leaving the great majority of households much more vulnerable to cross-scale disturbances and surprises. Household-level vulnerability and its consequences, in turn, reverberated back up the hierarchy of scales, all of which had lost resilience as part of the same system-wide process. We will see in later chapters how the household as a socio-ecosystem was weakened by the collectivization of the mid-1950s, broke down almost completely in the national-scale collapse of the Great Leap Forward, was partially restored in the recovery from the Great Leap and more fully with the decollectivization of the 1980s, and has eroded more gradually again with the economic growth of the reform period. But first we need to look at how the household worked before the 1950s.

It is difficult to find detailed descriptions of households at the beginning of the Qing period. But we know enough to be confident that the basics of the system were unchanged through the early 20th century, and so we can combine suggestive accounts from the Qing and earlier dynasties with detailed descriptions from early 20th century ethnographies to build a coherent picture of how ecology, economy, and values combined into an “everyday sustainable” system of production and consumption in premodern Chinese households.

Resilience ecology did not invent the idea of the household as a socio-ecosystem composed of people and their rights to resources. This combination is embodied in the Chinese word *jia*, which means both house and family.³ The personnel of a Chinese household consisted of one or more patrilineally related men and their wives, widowed mothers, and unmarried daughters. Sons took in wives, daughters married out, and eventually, usually after their father’s death, sons divided into separate households. A *jia* thus had no fixed size or composition, but rather experienced a temporal cycle of growth and division in each generation.⁴

The House

The house was the smallest spatial scale where the household held rights and obligations with respect to resources. Houses everywhere were built of locally-available materials. Walls usually used some combination of mud, brick, stone, and wood. By the Qing in most places, wood was scarce, and used only for pillars, posts, beams, and door or window frames (Jing 2000: 7, Gao 43ff, Osgood 1969: 97). But in places like Xiakou near Ya’an in Sichuan, where forests were abundant, houses were built of both stone and wood (Leonard n.d., Figure 3-3). Stone might be the primary building material in places with a nearby quarry, as Youmu near Sanxia in Taiwan, or might be used for foundations

³ *Jia* 家 in fact means family in the larger sense of patrilineal kin, as well as in the sense of a household. There is also another word, *hu* 户, often translated as “household” and contrasted to “family.” But in fact *hu* is really a legal unit in a system of state registration and taxation. And “household” as one meaning of *jia* is very clear; when people divide their household property and establish separate stoves and budgets, they *fenjia* 分家, divide the *jia*.

⁴ For a comprehensive account of the developmental cycle of the Chinese household, see Cohen 1976.

only, as in Gaoyao in Yunnan (Osgood 1963: 97), or might be absent altogether. In parts of the loess plateau in the northwest, people lived in cave houses, wholly or partially dug into the hillsides (Golany 1992, Myrdal 1965: 44-48, Liu Xin 2000: 43-50). Roofs were tile from local kilns or thatch made of straw from locally-grown grain (Osgood 1963: 99-100; Yang 1945: 38-19; Skinner n.d.).

Houses were built to provide maximum protection from the elements with minimum additional use of energy, what we might today call passive climate control. In very cold places, there were no windows (Yan 2003), since glass was rarely available, glazing was bound to be leaky, and any opening let in cold air. Everywhere in the north, heat from the kitchen stove was recirculated through a series of flues under the brick sleeping platform, or *kang* 炕 (Gamble 1963: 18), Liu 2000: 45, Hinton),⁵ and in very cold climates during cold months even guests (who were usually relatives) were entertained on the *kang* itself (Yan 2003: 116). In hot places, open-grilled windows, protected from the rain by overhanging eaves, provided much-needed ventilation (Figure 3.5), and thick mud walls insulated from both summer heat and winter cold (Gao 1999: 43-44). Verandahs covered by wide, awning-like eaves provided a place to sit or squat and work or chat out of the rain or the direct sunlight, while still taking advantage of daylight and ventilation (Figure 3.5).

⁵ In the local speech of the area of north Shaanxi where Liu worked, this heated bed is called a *pei* 被.

Figure 3.5: Lattice window with decorative carvings on a house in Manshuiwan, Sichuan. The window provides ventilation while the verandah overhang eliminates the necessity to cover the window in rainy weather. Photo by the author.



Figure 3.6: House in Manshuiwan, Sichuan, built of local materials including river cobbles flooring in the courtyard, locally quarried stone under the eaves, and local wood for walls and pillars. The space under the eaves serves as a convenient place to eat, socialize, or do handicrafts. Photo by the author.

The spatial plan of the house mirrored both the internal structure of the family and the relationship between the household and outsiders. Specific house plans varied, but the ideal house in any location was usually built around an open courtyard (Figures 3.6, 3.7, 3-9), often entered by an outside gate, locked at night and protected symbolically against intrusion by bright paper images of fierce military “door gods” (Fig 3.8). Even cave houses in Shaanxi followed this pattern. Within this ideal house, there was usually a main room or *ting* 廳, with an altar to the ancestors (Figure 3.9), seating for guests, and often miscellaneous storage. Opening into the *ting* or the courtyard or both were bedrooms belonging to various nuclear families within the *jia*. Somewhere there was a kitchen, often to the side or back of the *ting*. The kitchen had both material and symbolic significance for the household; materially it was where food was made edible, and symbolically the stove served as a synecdoche for the household; households that had divided from each other could not share a stove, and another word for dividing the household was *fenzao* 分灶, or dividing the stove.



Figure 3.7: Extended family compound in Xiyuan, Taiwan, built around an open courtyard. The *ting* is in the middle, surrounded by related households' rooms in the wings. Photo by the author.



Figure 3.8: Military door gods, who protect the household from intrusions, Mianzhu, Sichuan. Photo copyright Burke Museum of Natural History and Culture.

Figure 3.9: Domestic altar in Xiyuan, Taiwan. The gods, depicted in the scroll painting, are worshipped on the right side, and the ancestors, enshrined in the tablets on the wooden cabinet, on the left. Photo by the author.



The house also contained quarters for domestic animals, which were an essential form of privately held household property. Sometimes they were housed in rooms opening onto an outer part of the courtyard, sometimes in a separate building in back of the courtyard, enclosed by an outer fence that might also contain a vegetable garden or an orchard. Pigs provided nourishment—pork was the meat most often eaten, though most families by the early Qing could probably only afford to kill one or two pigs per year, making meat a rare treat. Perhaps even more importantly, a pig was, as Mao Zedong famously said, “a small scale organic fertilizer factory” (Mao 1959). For this reason, in many areas the family toilet adjoined the pigpen, so that all the human and pig excrement collected in a single pit, from which it could be scooped out periodically and mixed with straw or grass to ferment and make what is sometimes called *nongjiafei* 農家肥, farmhouse fertilizer. Manure and straw from the stables of draft animals were added to the mix if available. And a pig was a source of income when it could be sold to the market in the town. Poultry—chickens everywhere, and ducks where water was abundant—performed a similar function to pigs, providing food in the form of eggs and on rare occasions meat,

contributing small amounts of manure to the fertilizer, and bringing in a little cash when sold at market.

Draft animals contributed manure and could be sold on occasion, and in a few cases eaten, but their main contribution was labor, both in agriculture and in hauling things to town. For this reason, and perhaps because the meat of an old draft animal was very tough, beef was never a favored food (M. Yang 1945: 47).⁶ In the south, people kept fewer animals, mostly water buffalo or oxen to pull plows and harrows, and a family rarely had more than one, unless it was raising a calf for later sale (CK Yang 1959: 38). In a few places people kept no draft animals at all, and hoed rather than plowing their fields (Fei 1939: 159). In the north and the southwest, families might have horses (usually very small), mules, or donkeys to pull carts, while oxen pulled plows, often by teaming the animals belonging to several households and plowing each household's fields in rotation (P. Huang 1985: 145-54). Sheep and goats, needing pasture, were marginal to the Intensive Agricultural Zone, and found primarily in hilly or desert regions where there was lots of land that was too poor or dry or steep to farm for profit. People in China Proper rarely or never consumed any kind of milk products.

The conceptual structure of a Chinese farmhouse is embodied in the ideal plan of a house in Mianzhu, Sichuan (Figure 3.10), where the relation of rooms to their human uses was expressed by the variety of *nianhua* or New Year pictures that were posted at various points. The main double gate of the courtyard was guarded by fierce military officials, but the doors to the *ting* sported milder civil bureaucrats. Bedroom doors had female generals from Chinese folktales, or children juggling gold and coins. An eight-trigrams sign over a door kept out evil spirits, and Sun Wukong, the Monkey King, guarded the animal pens. And some pictures were just for fun, illustrating themes from folktales or everyday life. (Harrell 2013).

⁶ The informal prohibition on eating beef in many southern Chinese areas might be considered parallel to the Indian prohibition on killing or eating *go mata* or “mother cow.” See Harris 1968.



Figure 3.10: The ideal placement of *nianhua* New Year pictures in a farmhouse in Mianzhu, Sichuan. Drawing by Andrew Whiteman

Not everywhere could one find such an elaborate symbolic structure, and indeed nowhere was every family wealthy enough to be able to afford to build the ideal style house. Less elaborate designs might have no courtyard, or no *ting*, only bedrooms and a kitchen, or in the caves of Shaanxi, one large room with the kitchen and guest area toward the outside and private family quarters toward the back (Liu 2000). Really poor people might live in a single room.

Everywhere, however, there were real and symbolic barriers between the house, the private space of the *jia*, and outside or public space. As Pamela Leonard has pointed out (n.d.), in many communities locks and door gods were reinforced by dogs, who would readily bite suspected intruders, or at least snarl threateningly and raise a huge racket when strangers came around. In the southwest, it is customary when visiting an unfamiliar village to pick up a stick to swing at a threatening dog, or to carry a couple of rocks to cast perfunctorily or sometimes in panic when one suddenly hears a bark or a growl.

The Village

Most rural Chinese live in villages, and the village was the next larger spatial and social scale at which the household held rights and duties to resources. In most parts of China, there is nothing like what Americans would think of as a farm, a house surrounded by its outbuildings and its fields. Only in two kinds of exceptional circumstances would one find farms in China: in mountainous areas where resources were dispersed and distances between a house and its fields were long, and in a few wealthy plains areas where resources were distributed evenly, most famously on the Chengdu Plain in Sichuan (Skinner 1964: 6) and in parts of Taiwan (Figure 3.7). Everywhere else people lived in dense clusters or tightly packed rows of houses (Figure 3.11) surrounded by the two ecological zones at the next larger spatial scale: privately held agricultural fields and commonly held resources such as lakes, canals, roads, pastures, or forests. Within the village but outside the walls and symbolic boundaries of the house, the household held a series of collective rights and obligations.



Figure 3.11: A tightly packed village: Yishala in Panzhihua, Sichuan. Mud walls in the foreground, whitewashed on many of the houses. The wooden frame of a house under construction will be filled in with mud walls and a tile roof. The mountain in the background was traditionally forest commons. Photo by the author.

Most rural households had the right and duty to engage in a series of reciprocal exchanges with other households in the village, who were kin, neighbors, or most commonly both. Closely related households, the result of family division, often shared courtyards or built their houses adjacent to one another, and saw each other daily coming and going within the village, out to the fields, or into the town on market days, as well as visiting each other's houses frequently. Over the course of generations large numbers of related people, all descended from a common patrilineal ancestor, would come to live in a

village or a section of a village, and form a corporate lineage that often held resources in common, worshipped its ancestors collectively, and presented a united front to other lineages who might share the same village or live in adjacent villages (Freedman 1958, 1966; J. Watson 1974, Baker 1968, Potter 1968). But common lineage membership was not the only basis for cooperation between neighbors; not everyone belonged to a lineage (R. Watson), and there were places where lineages were unimportant or nonexistent (Hinton 1968: 21, Harrell 1982: 117-20).

Households exchanged goods and services on the basis of balanced reciprocity within the village, and also with close relatives outside it. Farm labor was the most important of these. A group of three or four families might own a share in a draft animal, for example, and help to plow and plant each family's fields in turn (P. Huang 1985: 151-2). Or if one family owned draft animals and another did not, then the poorer family might contribute labor in exchange for the use of the animal. In rice-growing regions, the complex relations of households within an irrigation commons meant that people with neighboring fields would have to coordinate their agricultural schedules to make sure their water usage would not conflict with one another's, as well as to protect against others' possible cheating in their use of common-pool resources (Santos 2004: 153). People also socialized constantly with members of other households in their network, whether in public areas like village lanes or around wells, or in the outer portions of each other's houses. In the Taiwan village where I lived in 1972, people left their doors open during daylight hours, and walked into other people's front rooms or kitchens without knocking.⁷ It is important for us to remember that in Chinese villages, men shared their public spaces and the public parts of their houses with the same people throughout their lives, and women shared these spaces with the same people until they were rather traumatically married, usually outside their village, but then shared their spaces with members of that village for the remainder of their lives. The degree of everyday familiarity even with people outside one's household—their attachments, cooperation, quarrels, disputes, reconciliations—is difficult to imagine for people who have grown up in a mobile, urban setting.

Although village boundaries were clearly marked, villagers' close relations with other households were not usually confined to the village. The degree to which village boundaries determined networks of cooperation varied across cycles of tranquility and chaos (Skinner 1971). In relatively peaceful times and places, every household cooperated, though not as intensely every day, with households outside its village, almost always of two kinds: members of distant branches of their own lineage, and affines—relatives of the mothers, wives, and daughters-in-law who had married into one's own household or husbands and husbands' kin of the paternal aunts, sisters and daughters who had married out. When the countryside was chaotic and plagued by banditry and violence, villages drew in on themselves, built defensive walls, and severely limited the degree to which their households could collaborate with outsiders. Limiting this kind of collaboration might well have been necessary in the interests of security, but it also undoubtedly diminished resilience against various types of disturbance.

⁷ No fierce guard dogs there. There were symbolic boundaries to the houses, to be sure, but they were more permeable in practice than elsewhere, and perhaps reflected the openness of society in Taiwan at that time.

Equal exchange between households in a kin- and neighbor- based network did not preclude great differences in status. A single lineage might contain wealthy landlords or even officials, as well as their poor relations who were tenants of either the landlord families or the lineage itself (Watson 2004[1982]; 1985). Even fairly closely related families, if their status was so widely unequal, did not ordinarily participate in equal exchange.

Within the socio-ecosystem of the household, the most important relationships in the village zone were the social ones. But there were also ecological relations; village households held common rights to a variety of resources within the village, most commonly roads and lanes, where all villagers could go without restriction, even when defensive walls around the village prevented outsiders from using them, and wells, which were usually located in public spaces and open to use by all villagers. In the north Taiwanese village where I lived, almost all wells, which provided water for domestic use, were also held as commons; only two or three families had private wells, and when drought struck in 1973, one family whose well still had water allowed other people to draw modest amounts for their daily use. Public wells were also common in North China at the turn of the 20th century, including Ding County (Ting Hsien) in Hebei (Gamble 1928) and Shandong (Smith 1970 [1899]: 20-23).

The Resource Circle or Village Landscape

The next spatial zone outward consisted of the ecological resources to which village households had rights, and can be divided conceptually into two sub-zones: agricultural fields and orchards, where households' rights were almost all privately held; and waterways, waterworks, forests and pastures, where households held rights and obligations as members of common property regimes. The majority of the resources that households consumed came from this zone.

Privately managed fields. The most important privately owned resource was agricultural land. By the beginning of the Qing, almost all land was held privately or by corporations such as lineages (Eastman 1988: 74). Farmers either owned their own land or rented from private or corporate landlords, paying rent that was increasingly converted from grain to cash throughout the Qing period. Only in a few places, mostly near the capital and in Manchuria, was there any remnant of manorial lands for which people owed labor services (Huang 1985: 85-89). In parts of the north, there was also an increasing tendency for landowners to hire labor rather than rent land to tenants, though tenancy also remained common (ibid.: 95). But on the whole, a family had private rights to all the produce if it owned its fields, and to a stipulated portion of the produce if it rented them. Some families owned some fields and rented others, or if they were wealthier, they might work some of their own fields and rent some to tenants.

People managed their fields to provision the members of the household (including, in some cases, the animals) as efficiently as possible. With limited resources, this meant balancing needs for food energy, protein and micronutrients, clothing, fuel, construction materials, and ceremonial expenses. Depending on circumstances, at least some of these needs came not directly from the family's own fields, but rather through cash income from selling the products of the fields in the town. As population grew

throughout the Qing, villages had to increase either the area of their fields or their productivity, or else some residents would have to migrate to open up new lands. Perkins has calculated that throughout the course of the Qing, *per capita* grain output remained about constant, meaning that total output increased proportionally with population, i.e. it increased by a factor of between 2.4 and 3.6, depending on what population figures we use for the beginning and end of the dynasty. Perkins also asserts that about half this increase was due to increasing the area under cultivation, and half due to improving yields per unit of area (1969: 13). Both these processes—expanding the cultivated area and increasing the productivity of the area cultivated—eliminated buffers and thus reduced socio-ecosystem resilience at both local and larger scales, which is part of our historical story. But the need for efficiency at any given time also explains the allocation of fields to various crops that serve different needs.

Food is the most basic of needs, as the epigraph to this chapter attests. Our dietary requirements are of three kinds: energy, protein, and micro-nutrients such as vitamins and minerals. Energy, of course, comes from the sun, but humans as heterotrophic organisms cannot consume sunlight directly. It must be converted into a usable form by autotrophs, namely plants, through photosynthesis. Once the plants have converted solar energy to a form usable by humans, we can get it directly from the plants (mostly in the form of carbohydrates) or we can get it from animals who, like us, eat plants for food energy. But animals are inefficient converters of plant energy into flesh, so that it is much more energy-efficient for us to eat the plants directly than to eat the plant energy in a form converted by animals. Although one gram of protein provides about 4 calories of food energy, approximately the same as one gram of carbohydrate (Harrison et al. 1988: 481-83), it takes several times as many calories of plant food energy (about 2.3x for carp, 4x for chicken or eggs; 8-10x for pork, and over 20x for beef) to produce animal food with the same amount of energy available to us directly from the plants (Smil 2002: 129-30). If we could easily manufacture our own proteins from components in plant foods, we would have no need for animal foods in our diet. But in fact it is very difficult to do so. We can get most of our protein requirements from vegetable foods relatively easily, but not all, since all plant proteins lack at least one amino acid that humans cannot manufacture on their own. In addition, vegetable protein is not absorbed as efficiently as animal protein (Smil 2002: 128). This means that to be a vegan is to monitor one's diet with almost scientific precision, or at the very least to eat a lot of corn, beans, and squash simultaneously, as some traditional American cultures did (LaDuke 2005). Better to consume some animal protein—animal foods are an inefficient way to get energy, but a good way to get protein. Still, we do not need much, especially as adults. It has been estimated that humans can survive on a diet in which as little as four percent of calories come from protein (Harrison et al. 1988: 483). Such a diet would provide at least 50% more calories from the same amount of crops than would a diet in which 18 percent of the energy came from protein, such as that consumed by Kikuyu people in Kenya in the 1950s (*ibid.*: 482). In a situation where it is hard to get enough calories, animal foods, which are an inefficient source of energy, are a luxury, at least beyond the bare minimum necessary to provide sufficient protein. In Qing China most farmers consumed only very small amounts of animal foods, just enough (or maybe not quite enough) to get sufficient protein. The rest of the diet came from plants—staple grains and tubers were the source

of the great majority of calories, and vegetables were a source of micronutrients and a way to make things taste less bland and monotonous.

In Qing China, however, not everyone was a poor farmer. Rights to agricultural land and other resources were unevenly distributed, so that wealthier people could enjoy what were considered “better” diets, including more protein and fat, and a greater variety of vegetables and other flavoring foods. In addition, even within any given area the wealthier families grew and ate more of what were considered higher-quality staples, such as wheat or rice, and less of the poor people’s foods such as corn or sweet potatoes.

An adequate diet for a retired person, or for a farmer during the slack season, however, would be totally inadequate for a farmer during the busy season; ten hours of heavy labor in the fields during plowing or harvest might double the caloric requirements for a young man.⁸ It is very difficult to eat enough carbohydrate foods to meet these increased requirements (Torún et al. 1981:25), though Chinese farmers did consume prodigious amounts of rice or other grains. Animal foods, of course, provide fat as well as protein, and fat can also be obtained from vegetable oils. Fat provides about 9 calories per gram, so that consuming an extra 100 grams of fat on a busy day would provide an extra 900 calories, or much of the extra energy needed for a day of heavy agricultural labor. Martin Yang recalls from his childhood in Shandong in the 1920s, for example, that poor people ate little or no meat for most of the winter, when there was little farm work to be done, except for a few days of celebration at the New Year festival. At the busiest times of the agricultural year, by contrast, even poor farmers might try to have a little meat at one meal each day, in order to keep up their strength for the arduous labor in the fields. (Yang 1945: 32-33).⁹

Even the best-off farmers in most regions grew mostly grain. In the north, people commonly grew a variety of grains, each on land that was most suitable for that particular crop (Buck 1937: 27). These included spring wheat in the far north, winter wheat, millet, sorghum, oats, and barley, and after the Columbian exchange potatoes, sweet potatoes, and corn. For example, farmers on the Shandong coast in the 1920s grew wheat, millet, barley, soybeans, corn, sweet potatoes, and peanuts. They supplemented their diets with many kinds of vegetables, grown on gardens near the house, including “cabbage, turnip, onions, garlic, *chiu-tsai* [garlic chives], *yuan-sui*, radishes, cucumbers, spinach, several

⁸ These needs are calculated from the energy consumption figures provided in Harrison et al. (1988: 480-81)

⁹ It is surprising to a non-expert who reads labels with minimum daily requirements of this or that how little we actually know about human nutritional needs. The WHO/FAO continually revises its minimum recommendations, partly because there are complex interactions between protein and energy, and between the level of protein intake and the efficiency of nitrogen uptake. In general, at lower levels of protein intake, the uptake efficiency of vegetable protein approaches that of animal protein; at higher levels, protein from both sources is taken up less efficiently, but vegetable protein uptake efficiency declines faster than that of animal protein. The relationship between energy intake and protein uptake, however, is inverse: the more calories you consume, the more efficiently you absorb protein (Inoue et al. 1981). Given how little we know about these matters, combined with our total lack of quantitative knowledge about Qing dynasty diets, we can’t really say whether or not traditional Chinese diets were deficient in anything under normal conditions.

kinds of string beans, squashes, peas, and melons (Yang 1945:16).” They also grew a few fruit trees.

Agricultural fields supplied more than just the direct food needs of the household. Yang, again, provides a fine description of the practices and the rationale:

...every bit of vegetation that cannot be used for other purposes is carefully gathered and preserved to feed the kitchen stoves. The main sources of animal feed are the stalks of millet, the vines of peanuts and sweet potatoes, and many kinds of grass. In addition, the houses are all thatched with straw, except for a few that have been recently built with tile roofs. The farmer does not consider it economic to use green manure, since there are so many other uses for vegetation. Wheat stalks, for instance, are used for cooking. The ashes are taken out from the stove and mixed with animal manure to fertilize the field. Thus, the stalks serve two purposes: cooking and fertilizing [M. Yang 1945: 24].

Agriculture in the southern part of China proper differs from that in the north in one fundamental way: in areas with reasonably flat land and sufficient water, at least, there was one major staple crop: wet-field rice. Rice could not be grown everywhere, and in hilly regions, people divided their land into two types: *tian* 田, or wet-rice fields, and *di* 地, or dry fields, usually on hillsides that could not be easily terraced or where water could not be channeled by gravity, where they grew less productive and less desirable staples such as sweet potatoes, potatoes, or corn. Rice could also not be grown at all seasons; in the northern and western parts of the rice zone, where spring was cooler and dryer, rice could be grown in the summer, but even the *tian* did not have enough heat or water in spring, and people grew dry crops such as winter wheat, corn, or rapeseed. In the more southerly areas, particularly the southeast, there was enough heat and water for both spring and summer crops of rice (Buck 1937: 83-86).

A rice field, or rice paddy, is an intricate ecosystem characterized by high productivity, high responsiveness to labor inputs, and long-term sustainability if maintained properly. Wet-field rice agriculture is far more productive per unit of land than any other widespread form of farming.¹⁰ Whitney estimates that under Qing or Early Republican conditions, rice fields in Guangdong, which were double cropped, produced approximately twice the amount of grain (and, since most grains have equivalent food energy, twice the food calories) that could be produced in dry-farming areas. They also required about three times the labor per unit of land, meaning output per unit of labor was lower for rice than for dry grains (1980: 111-115). In other words rice agriculture, as practiced in Qing and Republican times, required large amounts of labor per unit of land and per unit of output. This is easy to understand when we look at what rice farmers actually do. First, the landform requires meticulous care. During the early part of the growing season, rice plants must have water covering their roots, but not so deep as to drown the shoots. This means spending considerable time keeping the fields level and their banks in order, as well as maintaining the irrigation ditches that let water

¹⁰ The *chinampa* system practiced around the margins of the lakes in the Valley of Mexico and a few other places in pre-Columbian times probably had a similar level of productivity, and is indeed a similar ecosystem (See Arco and Abrams 2006).

in and out of the field. And the water level must be checked frequently, especially at the beginning of the cycle when the plants are small, and at anytime there are heavy rains or unusual drought periods. The soil also has to be enriched, usually by adding farmhouse fertilizer. The crop itself requires considerable time input, and as China's rice-growing regions added population over the last 1500 years, inputs have steadily increased, as have outputs, though marginal returns to labor diminish after a certain point (Figure 3-11). Jia Sixie's *齐民要术* *Qimin Yaoshu*, or *Important Skills for Ordinary People*, China's first extensive agricultural manual, has a chapter on wet-rice cultivation, but does not mention transplanting. In Jia's time, farmers simply plowed the fields, let in water, and sowed the seed, allowing it to grow and mature where it germinated (Jia 1982 [6th century]: 100). By the time of Wang Zhen's *Nong Shu* 農書, or *Book of Farming*, written in the Yuan dynasty, transplanting was a regular practice in the lower Yangtze region (Wang Zhen 1987 [1313]: 361). Today a farmer sows seeds very densely in a specially-prepared seed bed, waits for the seedlings to grow to a length of 12-15cm, then digs them out with a flat-bladed shovel, transports them to an already flattened and flooded field, where he or she walks backward in the mud, placing clumps of three or four seedlings in neat rows spaced about 15 or 20 cm apart (Figure 3.12). In Jia's time, the field was weeded once before planting and once when the sprouts were 7-8 *cun* [20-25cm] long; in the 20th century before the widespread use of herbicides, three weedings were customary, crawling in the mud and feeling the weeds out with one's hands.



Figure 3.12: Transplanting rice seedlings. Shisantian, Taiwan. Photo by the author

Rice is sensitive not only to labor input, but of course to water. If an area lacks water in the crucial growing period, the plants will dry out quickly, meaning that drought, though it is rarer in rice regions, is more disastrous. Too much water can also ruin a rice crop, but if the irrigation system is properly maintained (which itself, as we have seen, requires considerable labor) a farmer should be able to protect rice fields from all but the most severe typhoons or other torrential rainstorms.

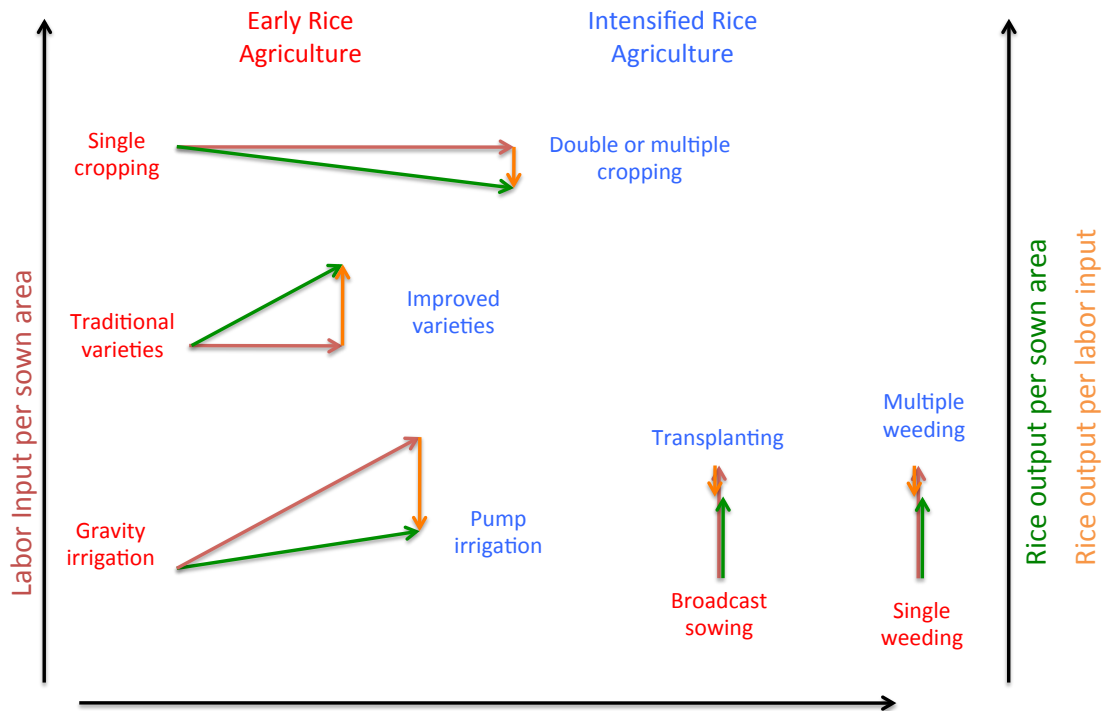


Figure 3.13: Relationship between various processes of intensification in rice agriculture. All intensification processes increase output per sown area. Multiple cropping, improved varieties, and pump irrigation also increase sown area. Only improved varieties increase output per unit of labor; other forms of intensification display diminishing marginal returns to labor inputs, and will only occur as Boserupian response to population growth or increased extractions from the Town. Only the directions of the arrows are significant; the position of each process on the graph is wherever it fits.

Rice fields, then, are not isolated from their surroundings, but intimately connected to other aspects of the ecosystem. They depend on fertilizer, mostly from the house, for soil-building and enrichment, and on streams, lakes, reservoirs, and irrigation ditches for water supply and drainage. They are also host to large numbers of other organisms: a group of biologists working in Sri Lanka identified 494 species of invertebrates (40 of them pests and 200 of them natural enemies of pests), and 104 species of vertebrates in a single rice field (Bambaradeniya et al. 2004). Not all of these have any kind of economic importance, but those that do include frogs, who eat harmful insects and provide animal protein; fish, which can be raised in a traditional polyculture with rice (Fernando 1993); ducks, who can feed on the gleanings left after the harvest and who can provide eggs and meat; dragonflies, who eat mosquitoes, and wild birds, who eat insects and can be hunted for food.

Since rice agriculture was more productive than dry grain farming, and could support a higher population density per unit of farmland, more people lived within a day's walk to and from local markets in rice-farming areas, meaning that the south was in

general more highly commercialized than the north, and also that there was more surplus available to go to the town in the form of sales, rents and taxes, thus supporting a larger landowning leisure class, particularly in areas like the Yangtze Delta, Pearl River Delta, and coastal parts of Fujian, where flat, fat rice fields stretched to far horizons (Skinner 1964: 32-34). Rice-growing regions also had higher degrees of tenancy (more of the product leaving the household as rent), and more land owned by corporations such as lineages. But even land that was corporately owned was not managed as a common property regime; each piece of the land was rented to a single farm family to cultivate and pay rent on.

Resources Managed as Commons. If agricultural land was privately managed, most households also shared in some kind of common pool resource; the most widespread of these were forests, water, and fisheries.

Not all villages had access to forests, and in fact the story of China's long-term loss of ecological resilience is to an extent the story of deforestation, something that intensified with the population growth and opening of new agricultural lands in the Qing. (Elvin 2004: 84-85; Marks 1998: 318-22; see also chapter 6). But those villages situated where there were trees within reasonable walking or carting distance very often managed their forests as a common-property resource, with more or less formal management, by a village, a lineage, or sometimes even by an association of several villages (Menziés 1994: 79). At Kao Yao on Dian Lake in Yunnan, for example, in the 1930s there was a formally appointed forest manager, who sold trees from the commonly-held forest, and also supervised periodic burning of the undergrowth (Osgood 1963: 118-19). Common rights to forest resources are reported from as far-flung areas as Weihai Wei in Shandong (Johnston 1910:167),¹¹ Gao Village in Jiangxi (Gao 1999), Zhaojiahe in north Shaanxi (Liu 2000: 84), in Nanping County, Fujian, and many sites in Huizhou, southern Anhui (Menziés 1994: 78-85). It is not clear, however, whether common-property regimes were successful in protecting or sustaining forest lands. Johnston says of Weihai at the turn of the century that the only places where substantial groves of trees remained were around the villages themselves and in graveyards, where cutting was forbidden (1910: 167). Given that deforestation was a general trend throughout the Qing (Marks 1998: 319-27; 2012: chs. 4 and 6; see also chapter 6, below), it may have been that, under heavy and increasing population pressure, many forests were victims of a Hardinesque Tragedy of the Commons (Hardin 1968).

As Ostrom's now-classic work (1990) has pointed out, however, common pool resources, properly managed, do not inevitably lead to Tragedies of the Commons. When social groups that own and manage common property resources are able to exclude outsiders and regulate their own members' access to common goods, many common-property resource systems endure sustainably for hundreds of years. This kind of common property regime serves as an institutional buffer against decreases in the

¹¹ Johnston anticipated by over three-quarters of a century the distinction made by Ostrom and others between common-property and open-access regimes: "The trees in the neighbourhood of villages and in graveyards are common property, and it is very rarely, therefore, that they are cut down: elsewhere trees are very few..." (1910:167).

resilience of the system; erosion of these institutions is in a sense like erosion of the topsoil on a sloping field. Menzies (1994:85-6) describes how many of the forest commons existing in the Qing period met Ostrom's conditions for long-lasting and successful common-property regimes. And many local irrigation systems were clearly well managed commons. Fei (1939) describes a system in Wujiang County that would make Elinor Ostrom proud:

The North *cien* (an area of contiguous fields that shared a water supply, and was diked off from surrounding streams and adjacent *cien*) consisted of 336 *mu*, or about 22 ha of land. Water was pumped in and out by treadle-operated pumps at fifteen spots near where the *cien* opened to the stream, and each pump required three workers. Households were assessed labor duties on days when pumping needed to be done, one laborer every day for every 6 *mu* (.4 ha or one acre) owned by the household, meaning that a household with 3 *mu* would need to send a worker only every other day, etc. Households were organized into 15 groups, one for each pump, and each household supplied the group manager one year in rotation. An elected chief manager was in charge of the managers, and held a feast for the other 14 at the beginning of the agricultural year. Fei continues:

Whenever draining is needed, the chief manager will give orders to the managers. Early in the morning these managers will inform the workers on duty by beating a bronze brace. If anyone on duty does not show himself at the pump half an hour after the signal, the other two charged to work on the same pump will stop their work, take the pivot of the pump to the nearest grocery, and bring back to the spot fifty-three pounds of wine and some fruit and cakes, the cost of which will be charged to the absentee as a fine. But if the manager has not informed the absentee he himself must bear the responsibility (Fei 1939:172).

The commons also had rules against taking water out of turn, or taking more than one's fair share:

People are not allowed to build dykes in the stream in order to monopolize the water supply. This is a common issue of dispute between villagers, especially during drought. The water introduced on to the farm by human effort belongs exclusively to the person who has effected this by labour. The dykes are not allowed to be opened in order to "steal" water from a higher plot. But a single plot may be owned by several persons. Each has a part in it. Since there is no dyke to separate the parts owned by different persons, the water is shared by all. In such a case, the labour spent in irrigation is equally distributed between the owners according to the size of the land in the plot. Most important of all, the level of the plot is maintained evenly in order that there should be a fair distribution of water. This is another cause of dispute, because, as I witnessed on several occasions, each farmer tries to lower his own part in order to receive a favorable reserve of water.

The natural products of water—consisting of fish, shrimps, and weeds which are used for fertilizing the farm—are the common property of the village. This means

that the inhabitants of the village have equal rights to these products, and that people from other villages are excluded [Fei 1939: 176-77].

Many village-based or geographically based irrigation commons are reinforced by ritual. In Taiwan where I lived in 1972-73, there was a small Earth God temple that did not belong to any village, but rather to a group of about 15 families whose fields were irrigated from a common source. On the god's birthday every year, the families brought offerings to the temple, and contributed money to hire a puppeteer for a short show. Giving offerings to the god and participating in a common, if simple, ceremony were ways of ensuring that all shareholders in the water commons met their obligations and did not cheat each other of water.

One of Ostrom's famous design principles for successful common property management is that the commons excludes outsiders, people who are not members of the community, from using the resources. We can see this principle operating in Fei's example above, and it is also reported from Jiangxi, where lineage villages had frequent disputes over the boundaries of their water and forest commons (Gao 1999: 12-13).

The Town and the Standard Marketing Community

Chinese intensive agriculture developed in conjunction with the production of agricultural surpluses and their appropriation by non-farming elites in the first two millennia BCE: already in the late Shang (1350-1050 BCE), the royal house and its subordinate local ruling lineages appropriated large amounts of surplus (K.C. Chang 1980: 235-40) and the "leakage" of some of those surpluses into markets probably began around 500 BCE (**check**—). By the Qing dynasty, as mentioned above, a third or more of the farm produce was marketed; some of the money farmers received for this surplus went as taxes to government coffers. The tax revenues, of course, went to pay government expenditures, including those for the upkeep of larger-scale waterworks and other human-modified aspects of the ecosystem. Another portion of the surplus went from tenant farming families to their landlords, again sometimes directly and sometimes through market exchange. Tenancy rates varied greatly both between and within macroregions; Shandong, according to several different data sources from the early 20th century, had a rate of between 10 and 14 percent, while rates for Guangdong, Sichuan, and Hunan were much higher at between 48 and 65 percent, reflecting the greater productivity of rice agriculture. But it appears that the overall rate of tenancy in China Proper as a whole probably never deviated from the range of 30-40% of farm families from the Ming through the Republic (Perkins 1968: 87-101). And a final portion of the farm surplus consisted of the difference between the price farmers were paid for their produce and what they had to pay for what they bought in the market (see figure 3.4, above, for a graphic representation of these flows). Because exchange was possible and made for more efficient use of household resources, and because the state was able to enforce unequal exchange, the largest scale at which most Chinese farm households held rights and obligations was the Standard Marketing Community (Skinner 1964), whose focus or node was in the market town, where one or more members of most households attended periodic markets every few days.

Although Chinese agriculture was commercialized very early on, the Qing was a period of intensification of markets, as increasing population density increased the number of people living close enough to standard markets to make the trip there and back in a single market day (Skinner 1964: 11). Perkins estimates that as an average for the Qing period, somewhere between 27 and 38% of all agricultural produce in China Proper was marketed; this was much higher in regions where people grew cash crops rather than primarily grain (1968: 115). Through the market farm households obtained things that they could not produce themselves from local materials, or which took so much labor to produce themselves that the work might better be invested in producing crops or animals for sale. Skinner provides us with a vivid description of a standard market in the mid-20th century:

During the few hours of market before the inward flow of villagers is reversed, the meagre facilities of the typical standard market town are sorely taxed. Most such towns have only one real street and lack a defined single marketplace altogether. Instead there is a multitude of petty marketplaces, one for each product. The grain market may be held in the temple courtyard, the pig market at the edge of the town, while each of the various items of perishable products and minor crafts produced locally has its customary marketing section along the main street. Even though most sellers at any standard market are likely to be itinerants, the standard market town normally has a certain minimum of permanent facilities. These typically include—in addition to the socially important tea houses, wineshops, and eating places—one or more oil shops (selling fuel for wick lamps), incense and candle shops (selling the essentials of religious worship), and at least a few others offering such items as looms, needles and thread, brooms, soap, tobacco, and matches. Standard market towns normally support a number of craftsmen as well, including most typically blacksmiths, coffinmakers, carpenters, and makers of paper effigies for religious burning. A few crude workshops to process local products may also be located in a standard market town.

The standard market functions in the first instance to exchange what the peasant produces for what he needs. The peasant needs not only goods of the kind already suggested, but also the services of tool sharpeners and livestock castrators, medical practitioners and “tooth artists,” religious specialists and fortune tellers, barbers, myriad entertainers and even, on occasion, scribes. While many of these services are not available every market day, itinerants purveying all of them occasionally visit every standard market.

The standard marketing system also has a modest financial dimension. Shops in the town extend credit to regular customers. Certain shopkeepers and landowners lend money to peasants in transactions which may take place in the town on market day. The rotating credit societies of the peasant are also usually organized in the teahouses on market day and are thereby restricted to villagers from within the system. In addition, certain landlords maintain an office in the town which collects rent from tenants.

With regard to transport, village communities normally include a few landless peasants, as they are usually termed, who are regularly for hire as transport coolies. (Not only the local elite but also the stratum of the peasantry which is fully “respectable” eschew such public manual labor as carrying or carting bulky produce.) These men normally cart goods along the village paths serving a single marketing area and thus constitute another element in the standard marketing structure as a spatial-economic system [Skinner 1964: 20].

Marxists would call the drain of agricultural surplus from the house to the town, enabling officials, landlords, and merchants to live at a higher standard of living than the farmers, exploitation of the farmers’ labor (e.g. Mao 1935). Chinese classical philosophy, on the other hand, like the ideologies of ruling classes everywhere, saw this as an equal exchange, which was set out in a famous passage by the 4th century BCE philosopher Mengzi or Mencius.

There are those who labor with their minds, and those who labor with their strength. Those who labor with their minds rule people; those who labor with their strength are ruled by people. Those who are ruled feed people; those who rule are fed by people. [Mencius, Duke Tengwen, First Part, Fourth Chapter. See Tianya n.d. Shijie Shuju 1965: 73; author’s translation].

Ruling and feeding: a fair exchange if one believes that orderly rule is necessary for peace and prosperity. And it appears that most farmers believed that this relationship was indeed fair. We have no testimony from farmers in the early Qing, but evidence from the Communists’ attempt to convince farmers of the Marxist view seems to indicate that it was initially a hard sell (Hinton 1968: 129; Friedman al. 1991: 86-88). Farmers believed, for one thing, in fate. In a society like Qing China with private landholdings and at least a limited market in land, there was in fact considerable mobility, and the belief that one could better one’s lot by hard work, thrift, and intelligence was pervasive. Fate was not an excuse for laziness or prodigality. At the same time, people’s efforts did not always pan out. Some worked hard, saved frugally, acted morally, and ended up poor, while others cheated, lied, and debauched and ended up richer. Fate was an explanation for these otherwise inexplicable disparities (Harrell 1987, Arkush 1984, Leonard n.d.). For another thing, farmers’ ethics were not egalitarian. Hierarchy to them was a natural part of human existence, within the household and between households. Farmers might or might not ever have heard of Mencius, but they mostly agreed with his principles. They subscribed to what James Scott (1976) has famously called “the moral economy of the peasant,” a belief that a certain amount of hierarchy, and the extraction of resources from the household to the town, is normal and morally acceptable. It was when the limits of what was normal were breached, when extractions by rent or taxes or special levies began to interfere with the basic livelihood, that poor people rose up in opposition to what they considered *excessive* extraction by the town. As we will see, uprisings and rebellions increased in severity and frequency with the decrease of system resilience in the Qing, and in fact contributed to the process of declining resilience.

These four concentric zones, then—the house, the village, the resource landscape (divided into mostly private fields and mostly commonly held forests and waters), and the marketing community—constituted the ecological and social world of the Chinese farm household until the advent of modern economic change and fossil fuel energy. The stocks and flows of resources within this little complex human ecosystem were vulnerable to both slow variable change within the system and disturbances that came from outside, whether from weather or from larger scales in which these systems were nested. But the degree of vulnerability or resistance to these disturbances depended on a series of buffers or guarantors, to which I now turn.

Buffers, Guarantors, and Everyday Sustainability in the Traditional Chinese Household

Living and dying in their complex human ecosystem, members of a Chinese peasant household strove both to elevate their status and to preserve their security, or to increase both their productivity and their resilience. In order to do so, they needed to pay attention to the relationships and flows among resources at all four spatial scales of their system: protect the house, maintain social reciprocity within the village, conserve the private and common resources of the landscape, and keep relationships with the town at level acceptable in the moral economy. The danger that farmers probably always realized was that the tradeoffs between productivity and resilience were complicated and difficult to manage. Some actions, as explained in the previous chapter, boosted both productivity and resilience. Converting a sloping field to terraces made the field both more productive—rice could be grown there where only a lower-yielding crop was possible before—and more resilient—properly maintaining rice terraces not only stops erosion; it also builds soil and helps conserve soil organic matter (Pampolino et al. 2008). Other actions, however, increase productivity in the short term, while decreasing resilience. Building one's rice fields not by terracing a slope, but by enclosing the margins of a lake (Schoppa 1989, Perdue 1982, Shapiro 2001: 115-37), for example, may make that piece of geography more productive, but it may also decrease resilience by replacing a wetland that previously served to absorb water in times of floods and to provide cheap protein from fish or shellfish.¹²

If the relationship between productivity and resilience is not linear, it follows that there are certain states of a household ecosystem that can remain stable for a long time. These are states in which there are many kinds of buffers or guarantors that preserve the resilience of the system. But slow variables within the ecosystem can lead to processes that encroach on the buffers and decrease the system's resilience to disturbances. The

¹² I disagree here with eminent environmental historian Mark Elvin, who sees waterworks as almost uniformly decreasing resilience: "...man-made systems of water control are to a greater or lesser degree inherently unstable, and constantly in interaction with disruptive external environmental factors... Water-control systems are where society and economy meet the environment in a relationship that is more often than not adversarial [2004: 115].

imperative to protect the household becomes self contradictory when population is growing. A household will need to use more landscape resources just to maintain the same standard of living. This means using them at a greater rate than they can be replenished, or encroaching on buffers and thus decreasing resilience in the interest of productivity, or both. Protecting the house may thus contradict the goal of preserving the resources of the fields and commons. Similarly, the interests of the household may conflict with those of other households in its network, causing conflicts over private or especially commons resources that will end up fraying the bonds of balanced reciprocity. And powers in the town may increase their extractive demands to the point where the household cannot protect itself without degrading the resources of the fields and commons or straining the bonds with other households in the village or other parts of the kin network. This causes further encroachment on buffers and further decreases the household's systemic resilience to disturbances that come from a larger scale.

Here I will first enumerate and describe the buffers, and then outline how processes of population growth and economic growth may encroach upon or undermine those buffers.

Buffers and How They Work

All the types of buffers discussed in Chapter 2 are important for understanding the household ecology of the Chinese peasants. In this highly modified ecosystem of intensive agriculture, ecological buffers have been weakened through intensification, but are still important, and infrastructural buffers have taken on a crucial importance in at least partially making up for the lost buffering capacity of the ecological buffers. In this system, buffers work in one or both of two ways. They prevent disturbance from ruining or diminishing a crop, and they provide substitutes when a crop is ruined or diminished.

Ecological Buffers. These mainly protect a household's private and common resources against disturbances that come from nature, primarily in the form of weather and secondarily insect plagues. As mentioned earlier in this chapter, rainfall is very irregular in most parts of China proper, with floods and droughts both common. Chinese writers have long recognized the value of wetlands and their ability to absorb surplus water in times of unusually heavy rainfall. Around China proper's two largest lakes, Dongting Lake in Hunan and Poyang lake in Jiangxi, rich, low-lying farmlands were developed early for rice cultivation, but until the mid-Ming, rice was only grown in a single season and only on those lands that were neither subject to floods nor difficult to irrigate, so that the natural overflow capacity of wetlands allowed rice farming to proceed without undue fear of floods or droughts. With population growth in those areas however, agriculture was intensified, as described in chapter 6.

Forests also serve as buffers both directly and indirectly. Directly, forests decrease flow volume downstream in two ways: the trees take up water and prevent it from filling and overflowing streams, and both tree crowns and forest-floor litter deflect raindrops in hard storms, which would otherwise loosen soil and cause erosion of bare ground; they thus prevent floods in the short run. Indirectly, by preventing runoff, they decrease

the flow of sediment to downstream areas where it would alter the hydrology by raising riverbed levels and thus causing the streams to overflow at a lesser volume, a problem that plagued the Yellow River and many other rivers in northeast and north China from early times, since those areas were somewhat deforested even 2000 years ago.

Potential agricultural land left fallow also serves as a buffer, primarily against loss of resilience through slow variable change. Land of whatever sort that is farmed every year loses nutrients and, depending on the topography and cultivation methods, usually loses topsoil. Allowing land to stay fallow allows the soil fertility to recover without using up the valuable fertilizer that is thus available to enrich the fields that are being farmed. Only dry land, however, serves as a buffer if left fallow. Rice paddies are renewable yearly by intensive cultivation, fertilization, and water control, so they have always been farmed every year.

Crop diversity is another important buffer. Both weather and pest infestations typically affect some crops more than others. An example from the Upland Mixed Zone is equally applicable to China Proper: farmers in Yangjuan Village, Sichuan, grow corn, buckwheat, potatoes, and oats every summer. In August, 2004, a violent hailstorm struck in the middle of the night, severely damaging the corn crop. But buckwheat and potatoes were unaffected. **Need more cases.**

All of these buffers are spatial ones; growing different things in different fields, rather than growing the single most productive crop everywhere, protects against disturbances that might otherwise ruin that crop, or provides functional substitutes (Low et al. 2003) if the crop is ruined. But perhaps the most important buffer is a temporal one; being able to produce a surplus that will carry over from one year to the next. At low densities of population and morally economic levels of extraction, all but the poorest farm households were able to save a portion of their crop, in case the following year's crop failed. Storage thus buffers across time in the same way that diversity buffers across space.

Figure 3.14: Chart of ecological buffers and how they work.

Infrastructural Buffers. These once again illustrate the principle of the curvilinear relationship between productivity and resilience. They both buffer against both sudden disturbance and restrain or stop the slow variable change that decreases system resilience.

The prime infrastructural buffers are waterworks. The farmers around Xiang Lake in northern Zhejiang understood this when they dammed the flashy Puyang river and created the artificial lake for the first time a thousand years ago. Before the lake was created, water supply for rice agriculture in the region was unreliable (Schoppa 1989:6). At the very low population densities in the pre-imperial period, this was probably not a problem, as storage and diversity provided sufficient buffering. But with the increase of population as early as the Han period, and the great increase in the Song period in particular, intensification was necessary. Xiang Lake, built during the Song, was among the many reservoirs built by local people under gentry leadership (ibid.: 11-16) The lake buffered across both time and space. It could absorb excess rainfall and store it until it could be released later, slowly and reliably, thus preventing floods on lands that

previously served as wetland buffers, but could now be used as rice land because an alternate buffer was available in the lake's increased storage capacity. If the lake was kept full at the end of the rainy season, excess water could also be released in time of drought, meaning that rice could be grown reliably in places where it previously could only be grown in wet years. But there as elsewhere, improvements to productivity only increased resilience up to a point. When people began enclosing land around the margins of Xiang lake to create increased paddy land, they took away buffering capacity which could not be replaced by that of the lake, at the same time that they reduced the volume of water that the lake could contain. Increased productivity thus brought decreased resilience. Keith Schoppa tells the story of the off-and-on 900-year battle between those who encroached on the lake to increase cultivated area, and those who argued for keeping the lake's buffering functions against flood and drought.

Dykes are another example of waterworks that can increase resilience while increasing productivity at low intensity, but increase productivity at the expense of resilience as they are intensified. A dyke that prevents flooding of lands that flood only in the wettest years, as was built on the margins of Dongting Lake in the mid-Ming (Perdue 1982: 754), or those built to enclose the polder lands in the Pearl River Delta before the Qing are prime examples; these caused little if any flooding of pre-existing fields, which are after all upstream from the polders. The dykes built along a tributary of the Pearl River near Guangzhou as late as 1936 (CK Yang 1959: 26), seem to have had similarly benign effects. These dykes could allow farming on lands that would otherwise serve as buffers only in extreme cases, and increase productivity over the long run. But as with so many other modifications of the landscape to increase productivity, later dykes around Dongting lake prevented the lake from serving its previous buffering function by absorbing the seasonal swell of the Yangtze in summer, and thus did two things to decrease resilience. First, the new rice lands that had been created by these dykes were still more susceptible to flooding than the pre-existing fields, and more families were thus dependent on fields that were prone to flood. Second, by taking away the overflow capacity of the former wetlands, it made even the pre-existing fields more vulnerable (Perdue 1982: 757). The same thing happened in the Pearl River delta, where by the 1730s newly enclosed polders built in response to Qing population increase were seen to be obstructing stream flow, and thus ordered destroyed (Marks 1998: 311-12).

Chinese civilization was made possible in many ways by waterworks, and thus even if we doubt Karl Wittfogel's grand hypothesis (Wittfogel 1957) that hydraulics lead inevitably to despotism, we can still recognize the important and necessary contribution of hydraulic construction to civilization. But the downside of this history is the development of a hydraulic mentality that has continued to pervade Chinese official and even scientific thinking to this day: there is no water that cannot be measured, controlled, and put to direct human use given the proper technology. Water control and its ambivalent effects are a big part of Chinese history not only traditionally, but even today; in early 2011 the government announced plans to spend four trillion RMB on waterworks in the 12th five-year plan (Xinhua 2011.1.20). I explore the recent expansion of waterworks and its ecosystem effects in chapter 9.

Terraces, not only for rice but also for dry crops as employed in the loess region of the northwest, are other infrastructural buffers against erosion, and thus against the loss of topsoil or even of agricultural land altogether. If terraces are built on previously forested land, there may be a net loss of resilience, since the ecosystem services of the previous forest are lost. But the net loss is smaller than otherwise, and the productivity gains are almost always considered to be worth the tradeoff. If terraces are built on land that was previously farmed as sloping fields, however, there is a net gain in both resilience and productivity.¹³

Institutional Buffers. The everyday transfer of products from the household to the town is asymmetrical in favor of the town, especially if we look at rents, taxes, and differential market prices. In addition, many disturbances are not the result of weather or insect events, but of deprecations caused by extraction, particularly for military purposes (Elvin 1999, 2004). But there are aspects of the town and of larger-scale systems that serve as buffers as well: maybe Mencius was more than just an apologist for exploitation. Larger-scale waterworks, when managed with an eye to resilience, come in this category. In addition, grain-storage and distribution systems managed by government agencies also use resources from larger scale systems to buffer the effects of weather at smaller scales. A prime example of this was the Qing dynasty granary system. Every county was required to have a series of both publicly and privately provisioned granaries. Local governments either put tax grain into the public facilities or, after land taxes were consolidated and paid in cash, used tax revenues to purchase grain on the market to fill the granaries. Wealthy households were required to establish village granaries with private contributions. Furthermore, local officials were directed to monitor rice prices in the markets at very short intervals, and if prices were rising, they took a series of proportionate measures to make sure that local poor people could get the grain they needed, including relief distribution of raw grain, soup kitchens serving cooked grain, selling at below market prices (which drove down prices in the market), or loans to be paid back at the next harvest. When this system worked, as in Zhili (modern Hebei) in 1743-44, there was very little starvation or famine-induced migration in the area (L. Li 2007: 221-49; Will 1990: 182-208).

Regulating the grain supply demonstrates how complex the role of markets can be: they can either increase or decrease resilience. In the absence of a market, a household that grows all of its food is “self-sufficient,” it does not depend on a market for its basic daily livelihood. That household’s ability to continue supporting itself in cases of disturbance depends on ecological buffers such as those described above, as well as on the ability to use its network as a buffer. If ecological buffers are insufficient—if the household does not have enough grain stored up, if it has not planted diverse enough crops, if a disturbance affects all its fields at once, etc., and other households in the network also have insufficient ecological buffering, then the household, along with its network, will experience food shortages. It will have to migrate, perhaps, to find food, or turn to emergency sources such as the famous tree bark or grass roots. If there is a

¹³ The buffering capacity of terraces has been demonstrated at places as far afield as the area around Lake Pátzcuaro in central Mexico (Fischer et al. 2003; Cohen 2010).

market nearby, however, food may come into that market from other areas not hit by the disturbance. A household can purchase food, if it has the funds or can borrow them. This is a big “if,” (Drèze 1990: 16-19) and the reason why the Qing government watched grain prices so closely. But at least the market brings the possibility of food being physically present in an area that is hit by major disturbance. In this situation, the presence of the market increases resilience.

At the same time, of course, markets can have the opposite effect. In good times, households pursuing productivity increases will often switch from subsistence to market production, and rather than market 20 or 30 percent of their crops, might switch primarily or even exclusively to market production, as happened in areas of the Yangtze delta during the Qing, where farmers produced nothing but cotton and silk, and purchased all their foods in the market, or at least began to depend on market crops for most of their income. Such market dependency was a tradeoff between productivity and resilience, and when the markets for their products declined or disappeared due to disturbances in the form of cheap imported industrial cloth, people experienced great hardship. We can illustrate the relationship between markets and resilience in the following diagram.

Fig 3.15: Markets and Resilience

Relationships among households within the village and outside also sometimes served an important buffering function. Everyday exchanges of labor, in such things as water regulation, planting, and harvest, kept households from excessive labor demands. And relatives, including affines, were always an important source of small loans, particularly in the form of rotating credit societies.¹⁴ When a household had large ceremonial expenses, such as for a wedding or funeral, guests contributed money, and household members kept careful, written records of the contributions. When a household that had contributed to an earlier event had its own wedding or funeral later on, the original host household would contribute a similar amount. In all these exchanges, the network of village and extra-village households served as a kind of savings bank, functioning to buffer across time in the same way as storage of surplus in the household or in the government granary. But in times of major disturbance, there were limits to the buffering capacity of this network. All the poor households in one place were likely to suffer from the same episodes of disturbance, and would have little to contribute to each other in times of trouble. Wealthier members of the network might give assistance, but charge interest, thus reinforcing their own dominance; moneylenders in the town were notorious, like moneylenders everywhere, for exploitative loans given to troubled

¹⁴ If a household needs money, it can organize a group of trusted households who will each lend the organizer an equal amount of money. The organizer will pay the money back in as many installments as there are households in the society. Each time the organizer pays back an installment, the other households pay another installment into the pool. The pool goes to the household who bids the largest discount. A household who has already taken the pool pays the full amount; a household that has not yet taken the pool continues to pay the discounted amount. Thus households either pay interest to take the money early, or earn interest by waiting to take the money late. The organizer neither pays nor earns interest, but is responsible to make good if any other household defaults on its obligations.

households in times of desperation. Their presence might have increased resilience over a short time scale, but the debt they took on meant decreased resilience in the longer term.

The role of lineages deserves special mention here. Chinese corporate lineages by the Qing period operated on a knife-edge between egalitarian and hierarchical values (R. Watson 2004 [1981]: 79). On the one hand, all households in a lineage had equal rights to certain services that lineages provided, such as education, food from rituals, and sometimes emergency relief. It is clear that a very poor household that was a member of a large and wealthy lineage was better off than an equally poor household that had no wealthy and powerful relatives. At the same time, lineages, through renting their collectively owned land to their poorer members, extracted wealth from the poor households. Like many institutions, the lineage probably served to increase resilience of the household ecosystem, but extracted its costs in doing so.

Cultural Buffers

None of these ecological, infrastructural, or institutional buffers would work without households' willingness to act so that the buffers could do their work. In a hierarchical society like the Chinese, where mobility was possible and everyone was striving to get ahead, where equal partible inheritance among sons meant in fact that not getting ahead was actually getting behind, what kinds of beliefs and values kept people from degrading resources and eliminating buffers for short- or medium-term economic gain? There is a temptation to cite beliefs from elite philosophies, particularly Daoism, to explain "traditional Chinese beliefs toward the environment" (See Shapiro 2001: 7, Taylor 1998, Birdwhistell 2001, Cook 1989) These are important at larger scales, but at the level of the farm household, I think we need to look for less formally articulated but still strongly held values. Among these I would count generational continuity, within-network reciprocity, frugality, and aesthetic appreciation for landscapes.

Generational Sustainability. The household was the everyday unit of production and reproduction, but it was not necessarily the most important kin unit in the thinking of most Chinese. Equally important was the descent line, which Arthur Wolf describes as a group of agnatically related males stretching as far back in history as could be traced and as far forward in the future as could be imagined (Wolf and Huang 1980: 61-63). In fact, rights of ultimate ownership and disposal of property, including house and land, resided not in the household but in the descent line. Household members had rights to *use* the property and derive their livelihoods from it, but not to dispose of it. And households were ephemeral; people moved in and out through birth, marriage, and death, and the household itself rarely lasted more than three generations before it divided and thus ceased to exist. The descent line as a corporation, on the other hand, was conceptually perpetual, though in fact it also divided when the household did. The combination of long-term residence in one place (some lineages could trace their ancestors in a single village back 30 or more generations) and continued dependence on the same field resources led people to think long-term. Resources had come to the household from generations past, and would extend many generations into the future. Taking care of the land and other resources was not a matter of this generation, of an investment that would pay off when it was cashed in, but something that ought to persist through the ages. **Need quotations here. From genealogies and ethnographies.**

Taking care of resources for future generations does not necessarily mean taking care of the same resources. There were lively markets in farmland extending as far back as the Warring States period. **Need to say this the third time?** It was not exclusively a matter of preserving a particular piece of land or forest long term, though people certainly strove to do so as one arm of a strategy of intergenerational sustainability. The strategy as a whole, however, was to ensure that future generations of the descent line would have access to a sufficient, and ideally growing, resource base.

Reciprocity with other households

Expectations of reciprocity with other households—chiefly fellow villagers and affinal kin in other villages—also served as a buffer that evened out short-term risk against disturbances. And in fact, the value of cooperation is recognized both in sayings and in elaborate exchanges designed to do nothing more than keep up reciprocity even in times of no particular need.

Need to fill in material on sayings.

More important, however, than sayings are acts of symbolic reciprocity intended to demonstrate sincerity and reliability in relationships. Chinese households do not start out trusting each other. In fact, cooperation on the basis of some sort of universal human brotherhood or ethical obligations to people in general is difficult in Chinese society.¹⁵ There is no basis for trust between people with whom one does not have a pre-existing relationship; exclusion of outsiders from cooperation is analogous to guarding the household symbolically with a wall, door gods, and fierce dogs. Neighbors and relatives still entered the house, and did so frequently. But the boundaries and suspicion that came with them were clearly visible. People do not pick up trash in public places; in fact most people litter indiscriminately in public places. In order to have reciprocity, one has to have trust.

If a potential cooperator is a relative, or a close neighbor with whom one has everyday contact, it is easier to cooperate. But there is still a potential for mistrust between households that are all trying to sustain their own resources over the long term. The surest way to assure a return favor from someone is to do an important favor, and people definitely keep track of what they have done for others and what others have done for them. But opportunities to do major favors are irregular, and in between there is a constant flow of gifts, courtesies, invitations, and common participation in ritual (Yan 1996). For example, upon a marriage engagement, Chinese almost everywhere make or purchase a large number of cakes, which go first to the close relatives of bride and groom, and then from them on to the relatives and neighbors of the relatives. Anytime anyone travels outside the village and immediate market town, it is imperative to bring back gifts for relatives and neighbors. Moon cakes are perhaps the most salient example. People rarely if ever *eat* mooncakes, or they eat only a few. Mostly they give them as presents to each other, and a family can give moon cakes to many, many other families without

¹⁵ Not unknown, however. The 5th-4th century BCE philosopher Mozi advocated egalitarian “universal love” or *bo'ai*, and Buddhist ideas of compassion entered Chinese discourse in the middle ages and influenced the neo-Confucian philosophers of the Song.

buying more than one or two boxes of them, as they will be getting presents from others and can pass them on. **find examples from fengsu section of gazetteer(s).** By such regular and customary exchanges, people demonstrate their reliability, and especially the likelihood that if they do ask someone for a major favor, it will be returned when needed.

Cooperation and reciprocity are thus acknowledged virtues, and when there are trusted relatives and neighbors, one can call on them for help in times of trouble. But at the same time, the higher obligation of intergenerational continuity gets in the way of collaborating outside the immediate descent line, except when managing commonly held resources, and a value on reciprocity is probably only a minor cultural buffer.

Frugality. Frugality or thrift is probably the single most important cultural value contributing to the resilience of the HFT complex. Fei Hsiao-t'ung summed it up beautifully writing about farm families in Wujiang County, Jiangsu in the 1930's:

To be content with simple living is part of early education. Extravagance is prevented by sanctions. A child making preferences in food or clothes will be scorned and beaten. On the table, he should not refuse what his elders put in his bowl. If a mother lets her child develop special tastes in food, she will be criticized as indulging her child. Even rich parents will not put good and costly clothes on their children, for doing so would induce the evil spirits to make trouble.

Thrift is encouraged. Throwing away anything which has not been properly used will offend heaven, whose representative is the kitchen god. For instance, no rice should be wasted. Even when the rice becomes sour, the family must try to finish it all. Clothes are used by generations, until they are worn out. Those worn-out clothes will not be thrown away but used for making the bottom of the shoes or exchanged for sweets and porcelain.¹⁶

In a rural community where production may be threatened by natural disasters, content and thrift have practical value. If a man spends all his income, when he fails to have a good harvest, he will be forced to raise loans which may cause him to lose a part of his right over his land. To lose one's inherited estate is against filial obligations and thus will be condemned. Moreover, in the village there are few inducements to extravagance. Display of wealth in daily consumption does not lead to prestige.

Martin Yang records almost precisely the same sentiments in speaking of Taitou village in coastal Shandong around the same time, imagining a father gently lecturing his children:

Listen, children, there is nothing in this world that can be won easily. A piece of bread must be earned by one day's sweat. You cannot buy any piece of land unless you save all that you can spare through two or three years. The desire for better food, better dress, a good time, or the easy way, will lead but to the ruin of

¹⁶ I have no idea how one exchanged worn-out clothes for either sweets or porcelain, and Fei does not elaborate.

our family... Your mother and I have done and are doing our best to keep this family as well as possible. It is not because we fear that we will starve that we save, but because we want to see each one of you with a prosperous family of his own.

Many widespread practices other than eating simple food and recycling clothing testify to this ethic of frugality. In Xiajia village in Heilongjiang, a place with very cold winters, houses had no windows; in Shaanxi people lived in cave houses because they were easier to heat. Everything organic that did not have a better use went into the fertilizer pit. In addition, morality stories of the ruin brought on by profligacy were well known from operas and puppet shows.

Aesthetic Appreciation of Landscape: When I lived in rural Taiwan in 1972, the physical landscape was still recognizably that of a peasant society. Villages had mostly transitioned from mud to brick housing, and they all had electric wires, but many houses built with local materials remained, structured according to the traditional carpenters' manuals that embodied principles of proportion and orientation closely related to those of *fengshui*, which if the villagers did not know in detail, still appreciated in general. One color slide (Figure 3.16) showed a hillside of terraced fields with water running from level to level, a grove of bamboo with some farm compounds visible behind it, and forested hills in the background. I included a picture of this scene in my ethnography of the place (Harrell 1982: 4), and when I was visiting a family of long acquaintance in 2001, we pulled out the book and started looking at the pictures. When we came to this one, the grandmother remarked, *Li khua: hit ku khat sui, a jima pi: khat bai*. "Look how beautiful it was then, and now it has turned so ugly." The grandmother was expressing grief for a lost aesthetic, but one that had a long history before it gave in to the cheap variety of modernism now prevalent.



Figure 3.16 Rice terraces with courtyard house and forests in the background, Datiekeng, Taiwan 1973. Photo by the author.

Pamela Leonard connects rural aesthetics directly to *fengshui*,

Based on numerous accounts from pre-Liberation China and from modern Hong Kong where belief in *feng-shui* is open and active, plans for infrastructure or resource development are inevitably subject to community discussions which assess their value in terms of the anticipated effect on local *feng-shui*. Plans which have not adequately considered their impact on the local landscape may meet with strong objection phrased in the vocabulary of *feng-shui* beliefs.

I maintain that the practice of *feng-shui* is a key element in the creation of a personalized and moral landscape [Leonard n.d.].

while both R.F. Johnston and Martin Yang, writing about Shandong, record similar sentiments, along with the regret that people often expressed when confronting the destruction of landscape beauty:

From the present denuded condition of the hills one would hardly suppose that the people of Weihaiwei cared much for trees: yet as a matter of fact they value them highly for their shade and for their beauty. Public opinion is strongly averse to the wanton destruction of all trees and herbage [Johnston 1910: 168].

Not long ago, when the countryside was peaceful and when the P'an families were in their prosperous period, the village was admired by travelers who approached it from the south. Before one reached the edge of the river one could hardly see the village because of a thick green wall of trees. But as the traveler went on, suddenly the village burst into view before him, and in the next instant he was walking before the watching eyes of the villagers and could see the farmers hoeing in the vegetable garden or working on the threshing grounds, women washing their clothes on the river dikes while children played around them, people sitting and working under the tall willow trees, and also the big oxen and mules standing on the river bank. Unfortunately, a great part of that is gone. During the last ten years the P'an families declined rapidly. The woods have been cut, broken river levees have not been repaired, and the tall willow trees are almost gone, as are the oxen and mules [M Yang 1945: 5].

Leonard talks about a moral landscape, and Johnston and Yang about beautiful landscapes, but they are all also describing resilient landscapes. Trees are always a characteristic of these ideal landscapes, along with clear flowing streams, houses built to harmonize with the principles of *fengshui*, and ordered fields.

The Chinese farm household was thus a complex socio-ecosystem that held rights and obligations at several spatial scales of ecology and society, and attempted to both expand and protect its resources and output. It is quite possible that this socio-ecosystem as it existed at the beginning of the Qing, was “everyday sustainable,” except for two things. First, it was not an independent or self-contained system, and although some of its connections with larger scale systems served as buffers, still it was vulnerable when

extractions from those larger scales increased for political or military reasons. Second, its goals were to an extent self-contradictory. Households trying to maintain their resources and their products for consumption in the short run optimized fertility at far beyond the replacement level, contributing to population growth that itself diminished the buffering capacity of all the buffers enumerated above. This process led to decreased resilience, accelerated resource degradation, and the centuries-long ecological disaster that was the Qing dynasty.

To write the ecological history of China proper by itself would be to chart the changes over time in the flows of energy, resources, people, and ideas, both within and between spatial scales. And much of this book is about this kind of ecosystem change. But to write the ecological history of the People's Republic, one cannot confine oneself to the Zone of Intensive Agriculture. Ever since the first empires over 2000 years ago, the powers based in the China Proper interacted with the peoples and resources in the Upland Mixed Economy and Pastoral Zones. Sometimes empires gained partial control over areas included in these other zones, but this control was sporadic and incomplete, because these zones were not as productive, and thus cost more to control militarily and administratively. With the advent of the PRC, however, a regime based in China Proper gained effective political and economic control over these zones, so that portions of these zones have to be included in the overall ecosystem history of the People's Republic. We turn now to describing the ecology and society of these zones and their interaction with China proper before the time of revolution and industrialization.