



# INTENSIFICATION AS SITUATED PROCESS

## LANDSCAPE HISTORY AND COLLAPSE

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So far as I have observed in *Mysore*, ground, once brought into cultivation for rice, is universally considered as arrived at the highest possible degree of improvement; and all attempts to render it more productive by a succession of crops, or by fallow, would be looked on as proofs of insanity.

(Francis Buchanan 1807)

In nearly all discussions of the intensification of production, and especially of agricultural intensification, questions of cause have dominated. Even in my own previous work (Morrison 1994a, 1995, in press), which focused on process, and in particular on what I referred to as the *courses* (or trajectories) of change, critical discussion (e.g., Stone and Downum 1999) concentrated largely on the very aspect of intensification—cause—that I was *not* discussing. Such critiques missed my primary point that intensification needs to be studied as a process that is itself complex and variable, consisting of numerous coexisting strategies, processual complexity that seems to mirror the organizational complexity of real productive systems. Perhaps because of the initial dependence of the field on the Boserup model, which presented a very limited range of intensification strategies, changes in production are too often viewed in terms of only a few kinds of strategies (fallow reduction, timing of cropping cycles, and construction of irrigation facilities, for example), even though these important changes represent just a few of the many possibilities open to agriculturalists.<sup>1</sup> Among the strategies of intensification little-discussed in the literature are those that perhaps seem unrelated to agriculture (e.g., wage labor, craft production; cf.

Morrison 2001a) or that apparently violate the normative Boserupian sequence of change. As an example of the latter, my own work in southern India revealed sequences involving the later addition of land-extensive forms of production to an existing repertoire involving more land-intensive forms, as well as the adoption of a range of intensification strategies other than fallow reduction (Morrison 1995).

In this chapter, although I do consider some of the causes of long-term agricultural change in southern India, I want to focus instead on how we might use the strengths of the archaeological record to examine both the *courses* and *consequences* of changes in production.<sup>2</sup> Historically, the intensification of both agricultural and nonagricultural production has resulted in radical transformations of human life. High-yield intensive agriculture, for example, undergirds urban life; both the earliest cities and the contemporary megalopolis would be unthinkable without the long history of agrarian change that led to intensive, commercial farming. Agricultural intensification, too, is necessary for the elaboration of occupational specialization. Long histories of intensification have, in some parts of the world, radically transformed vegetation, landforms, soils, and even climate. Past consequences become future possibilities, so that understanding intensification at one point in time often requires analysis of longer-term change. In spite of this, archaeologists rarely discuss intensification in terms of its consequences or potential consequences, something, as I discuss below, our data are uniquely suited to address.

### THE CONTEXTS OF PROCESS: STUDYING LANDSCAPE HISTORIES

We would do well to think of intensification as an example of a *situated process*. Here I stress both *process*, as noted above, as well as *context*. Because I have already written extensively about intensification as an internally complex process (Morrison 1994a, 2001a, in press a), I will leave this aspect of the equation aside for now. In terms of context I emphasize here three related but distinct issues: (1) the embeddedness of intensification strategies in total socioeconomic systems; (2) the historically accretional nature of landscapes on and within which agriculture takes place; and (3) the specific (but temporally shifting and never fully shared) cultural contexts in which decisions about production are made.

The first of these three issues relates to overall contexts of production—intensification, like other changes in the organization of production, must be understood in terms of total economies.<sup>3</sup> Here I stress what is no doubt noncontroversial to most anthropologists: that changes in agricultural production are always linked to and cannot be understood apart from the larger productive picture. The latter might include, for example, collecting

and hunting, wage labor, military service, or craft production, and its overall contours will depend critically on issues such as the availability of markets, transportation routes, structures of tribute or taxation, and many other factors. Such concerns enter into decisions about agricultural production no less than more commonly discussed factors such as the availability of labor and irrigation or the nature of soils, climate, and rainfall. Analysis of the intensification of production entails analysis of production, conceived broadly.

The second way in which context enters into the process of intensification is the location of human action within long-term landscape histories (Morrison in press b). I use the term *landscape* to mean a particular spatial and temporal field, both material and ideal, a kind of *constructed context* constituted both by the structure and dynamic of the natural environment and by human action. Landscapes are culturally constructed—both materially and conceptually *built*—variable in their perceived structures and meanings, even at a single point in time, phenomenal and ideational variability that is balanced by a less-shifting materiality. The landscapes I consider here are largely anthropogenic, highly restructured by generations of human action. By *landscape history* I mean the specific historical trajectories of landscapes (although I am certainly not making a claim of total historical uniqueness or lack of general process). Study of specific landscape histories show us that history matters—producers do not begin anew each time they make a decision but are instead constrained by features of the landscape itself, that accretional product of the past.<sup>4</sup> Without an understanding of landscape history, individual instances of intensification (or its reverse) might seem inexplicable, as I discuss below.

The third way in which the process of intensification must be viewed as situated is its operation within specific cultural contexts. I have suggested above that landscapes be seen as historically produced outcomes created by both human and nonhuman actions; obviously landscapes are always viewed by people and acted on by people with specific cultural understandings. At the same time, however, these cultural understandings are not nearly sufficient to understand historical process—humans cannot make the world any way they choose. Still, the motivations that drive production, while significantly constrained by both basic human needs and conditions of plant and animal growth, are to a large extent, flexible, as I show in the following brief case study. Agricultural production, in particular, is significantly structured by cultural notions about food—what is appropriate to eat, for whom, and in what contexts. Food restrictions and desires may engender technological change, labor increases, or forms of production that a strict cost-benefit logic could never predict. In the case discussed here, one critical factor in long-term agricultural histories has been the high cultural value placed on rice, a crop whose production entails both high costs and high rewards.

In this chapter I summarize some aspects of long-term agricultural change in southern India, a history marked by a sustained but irregular trajectory of agricultural intensification, punctuated by brief periods of “disintensification” or “collapse.” In the context of a more general discussion of the long-term productive history of this region between the Neolithic (3000 BCE) and the Late Middle Period (1600 CE), I focus on one episode of “collapse,” the rapid transformation in land use, settlement, and political organization following the abandonment of the city of Vijayanagara in the late 1500s. This case illustrates the three points made above about the contextualization of the process of intensification. First, changes in agricultural strategies cannot be separated from larger political-economic structures; following the fall of the city, both the loss of urban markets and changes in taxation radically restructured the organization of production. Second, contingent trajectories of landscape history matter—the consequences of change in one period resonate on the landscape, shaping the possibilities for later change. In this case we can see that the course of intensification did not operate in reverse; instead, understanding this specific instance of collapse requires attention to long-term landscape history. Finally, both the shorter history of the Vijayanagara urban collapse and the longer history of agrarian change in dry interior South India make clear the importance of specific cultural regimes of value in shaping production choices. Here I focus specifically on the great importance attached to rice, but it would be possible to identify many other such examples.

#### LANDSCAPE HISTORIES IN SOUTH INDIA: LONGER-TERM CONTEXTS OF AGRICULTURE

The low and annually variable rainfall of the dry interior of southern India is temporally concentrated, falling primarily during the southwest monsoon of the late summer/early autumn. Unlike the tropical vegetation of India's southwestern coast, the semiarid interior contains only minor concentrations of thorny deciduous forests amid extensive field systems and savannah-like expanses of grass and shrubs. Today, the high granitic hills of northern Karnataka, in the heart of the rain shadow that covers all of the peninsular interior, consists largely of exposed rock with minimal soil development. Agricultural fields are concentrated in (but not restricted to) the colluvial valleys between outcropping ridges and along the limited alluvium of the Tungabhadra River. In spite of its modest natural endowments, however, this region has managed to support large, permanent villages and towns for at least the last 3,000 years and has been an agricultural landscape for the last 6,000.

The earliest agriculture in southern India dates only to about 3000 BCE, the beginning of a period known as the Southern Neolithic (ca. 3000–1000 BCE),

when extensive dry farming of millets and pulses supplemented an economy based largely on cattle pastoralism (Korissettar et al. 2001; Possehl and Rissman 1992). The Southern Neolithic was marked by a considerable amount of experimentation with new crops (and animals). According to Fuller (2003) the staple crops of the earlier part (2800–2200 BCE) of the Southern Neolithic—*Vigna radiata* (Mung bean), *Macrotyloma uniflorum* (Horse gram), *Bracharia ramosa* (Browntop millet), *Setaria verticillata* (Bristly foxtail millet), and *Dioscorea* sp. (yams)—were supplemented during the middle years of the period (2200–1800 BCE) by *Lablab purpureus* (Hyacinth bean), *Pennisetum glaucum* (Pearl millet), *Triticum* sp. (wheat), *Hordeum vulgare* (barley), and perhaps *Lathyrus sativus* (Grass pea). By the latter Neolithic *Cajanus cajan* (Pigeon pea), *Gossypium* (cotton), *Linum usitatissimum* (flax/linseed), and perhaps *Eleusine coracana* (Finger millet, an African import) were added to the mix. During the Southern Neolithic, too, sheep, goats, pigs, and domestic cattle were kept for the first time, animals that would be part of faunal assemblages of all subsequent time periods.

The earlier part of the Southern Neolithic appears to have been a period of relative aridity in this already-dry region, making dry farming even more problematic than it is at present. Because Neolithic people were certainly at least occasionally mobile, moving out from more tethered locations for grazing and raw material procurement as well as visits to other settlements and ashmound locations, and because few of the settlements in this area have been excavated or studied in any detail, it is impossible at this point to know the scale of regional population, though clearly it was larger than that of preceding periods.<sup>5</sup> Many excavated sites, including Tekkalakota (Nagaraja Rao and Malhotra 1965) and Brahmagiri (Wheeler 1947), have very deep and substantial Neolithic deposits, so if these represent periodic reoccupations by mobile people, reoccupation must have been very regular and may have involved large groups of people over a substantial period of time. Not all Neolithic sites are large and deeply stratified, however, and we have as yet only a very superficial understanding of how these smaller locations fit into the overall pattern of land use and the use of space on a regional and supraregional scale.

We may, however, be more certain that the Neolithic was the beginning of the long trajectory of agricultural history in this area, and, although we know little at present about what went before it, we do know that the Neolithic represents both rupture and continuity—continuity in that some excavated sites show stratified deposits of the Paleolithic and/or Mesolithic under Neolithic levels, rupture in that the herding and farming carried out in this period stand in stark contrast to the economic strategies of those preceding it and in the way in which places were marked and modified on the landscape.

Although the landscape of the peninsular interior, especially during the increased aridity of the Southern Neolithic, but today as well, was inhospitable

to rice (*Oryza sativa*), rice is nevertheless found in some botanical assemblages of the Southern Neolithic. Never amounting to more than a trace amount in this region, rice was better known elsewhere on the subcontinent, where its pedigree is also longer. By sometime in the Iron Age (1000–300 BCE) and certainly by the Early Historic period (300 BCE–500 CE), rice cultivation became well-established in northern Karnataka, irrigated by a range of strategies from annual river inundation to wells and runoff-fed reservoirs. The locally intensive production of rice, as well as more extensive farming of pulses, millets and other grains, may have, in some important respects, underwritten the trend toward settlement aggregation and allowed the establishment, during the Iron Age, of very large towns or small cities such as Kadabakele, which sprawled more than 40 hectares across a high granitic outcrop.<sup>6</sup> Iron Age and Early Historic settlements in our study area cluster densely along the banks of the Tungabhadra, the only perennial water source in the region and the only river reliable enough to support the production of water-demanding crops such as rice. How did this grain, so poorly suited to local environmental realities, come to dominate not only the historical record of southern India but also local imaginations?<sup>7</sup> Why was so much effort expended in creating the conditions under which rice could grow?

Although we are not yet in a position to answer these questions, our ongoing research on the Iron Age and Early Historic in this region may eventually help us better understand the long-term courses of change. Already, we can suggest that the transition to locally intensive production of rice and other crops, necessary to support the dense population aggregations and increased social differentiation of the Iron Age and all subsequent periods, led to significant changes in regional environments, including localized deforestation and perhaps large-scale erosion off the ubiquitous granitic hills. Certainly by the early fourteenth century CE, the Early Vijayanagara period, pollen analysis (Morrison 1995) has shown that the regional vegetation was already largely anthropogenic, with both cultigens and field weeds constituting a significant part of the regional flora. In the Iron Age and Early Historic, too, some of the basic technologies of production, including a wide range of facilities designed to capture monsoon runoff, were developed, technologies that by the British colonial period would be seen as iconic of South Indian agriculture (Morrison in press b). Thus, the nearly 4,000-year history of agriculture that preceded the Vijayanagara period created conditions of possibility for Vijayanagara-era producers and consumers, conditions that would affect choices about intensification and, later, about how to respond to the fall of the city of Vijayanagara and the subsequent demographic collapse of the region.

## MIDDLE PERIOD SOUTH INDIA: COURSES AND CONSEQUENCES OF CHANGE

If the long period between the beginnings of agriculture and the establishment of the great imperial city of Vijayanagara in the early fourteenth century set many of the conditions of possibility for agriculturalists, investors, pastoralists, and others, it is also the case that human action over the 300-year Vijayanagara period (ca. 1300–1600 CE) transformed local landscapes to an unprecedented extent, reworking local vegetation, slopes, and soils and creating new configurations of settlement, transportation, irrigation, and sacred spaces. The history of Late Middle period (Vijayanagara) agriculture is discussed in more detail in Morrison (1995, 1997, in press b), Kotraiah (1995), and Stein (1980); here I simply summarize some trends. The information below derives from several sources, including archaeological survey and excavation (Sinopoli and Morrison 1995, in press a), analysis of texts (Kotraiah 1995; Morrison and Lycett 1994, 1997; Morrison 1995; Patil 1991a, 1991b, 1992, 1996), and paleoenvironmental analyses of pollen, sediment, and microscopic charcoal (Morrison 1994b, 1995).

### *Causes*

Much of the impetus for agricultural expansion and intensification in our study area came from the expanded population created by the fourteenth century establishment of the city of Vijayanagara atop an older sacred place, in a location that had not supported a large settlement since the Early Historic period and, later, by the massive expansion of the urban population in the early sixteenth century (Morrison 1995).<sup>8</sup> Urban population growth, mostly fueled by in-migration, was to a large extent also responsible for rural population expansion, especially in the sixteenth century, when agriculture was pushed to the margins (Morrison 1997), both in terms of distance from the city and of movement into areas (and forms of production) that entailed greater risks of crop loss.

Urban markets and the changing structure of tax demands also transformed local agriculture in a number of ways. Production for markets was attractive to some producers (chiefly those with access to irrigation who could grow the products in demand by local elites, temples, and others dependent on purchased foodstuffs). For others, market participation was a necessary outcome of taxation practices that extracted in-kind payments from rice growers and in-cash payments from all others (Morrison 2001b, in press b). Taxation and other forms of revenue extraction had direct effects on productive strategies, including decisions about intensification. Within this context both regional environmental variability (soils, slopes, water sources, availability of forage) and transportation possibilities (distance from the city, connection to road

networks) played important roles in the eventual structure of agricultural production in that place. Finally, culturally specific food preferences and restrictions were also salient. Muslims and foreigners such as the Portuguese, who came from the coastal colonies to trade, preferred grains such as wheat and were not averse to kinds of meat eschewed by most local residents. At the same time, local elites and deities had strong preferences for rice, as well as for other products of irrigated lands (coconuts, for example), and these players exercised their power to obtain such produce. Although we have less information about the preferences of the nonliterate, some contemporary residents of dry farmed regions express a preference for millets and other grains that they perceive as more filling and strength-giving and whose production is less risky. Decisions about agricultural practice took in all of these factors.

### *Courses, Part One: The Founding to the Fall of the City*

Briefly, the founding and rapid growth of a large city in a place never politically central and in between existing settlement clusters required rapid and profound transformations in production. Vijayanagara city was located in a bend in the Tungabhadra River, one of the few places in this region where it was possible to build long, river-fed canals that (mostly) ran across rich alluvial soils. Canals were supplied by diversion dams or *anicuts* built across the braided channels of the Tungabhadra. In flood season river water ran right over the tops of the anicuts, whereas at other times the weir would divert all the flow into a canal. Although one small canal system had been built in the area prior to the establishment of the city, there was a rapid investment in canal construction starting in the early fourteenth century. At least two reservoirs were supplied by canals; one of these (the Kamalapuram reservoir) was constructed in these early years of the city's history. All the early canals and canal-fed reservoirs (as well as most Early Vijayanagara settlements) of necessity lay close to the city, in the limited alluvial zone along the river. Several factors seem critical in understanding the course of this fourteenth-century intensification. First, irrigated production was geared toward supplying the city and was financed in large part by elites. Second, the early focus on irrigated agriculture, in spite of the massive labor requirements not only of facility construction but also of the day-to-day production of paddy rice (Morrison 2001b), made possible the production of rice, as well as other desired crops such as coconuts, areca nuts, flowers, fruits, and vegetables.

At the same time, regional agricultural strategies included extensive rain-fed dry farming of millets, pulses, and sorghum, some of this aided by small-scale facilities such as terraces, gravel-mulched fields, and check dams. Larger runoff-harvesting facilities such as reservoirs (Morrison 1993, in press b) were

also important, but, again, these were clustered in areas nearer the river. In general, however, the extent of nonperennially irrigated lands was limited, and there are only a moderate number of Early Vijayanagara villages in zones beyond the reach of canals.<sup>9</sup> Thus, we see a significant early investment in facilities designed to support irrigated, wet agriculture. Both the construction and maintenance of these facilities, as well as the forms of production they supported, required significant inputs of capital and labor. The initial intensification of agricultural production, in this case, then, did not run from more extensive to more intensive forms of production, nor did different strategies follow one another in succession; instead, a diversity of forms of production was maintained throughout (Morrison 1996).

During the Late Vijayanagara period, especially the early sixteenth century, there was a dramatic spatial expansion of agriculture in the region, with entire valleys becoming home to long chains of interconnected reservoirs supporting small patches of more intensive cultivation within a landscape of long-fallowed dry-farmed fields. These outlying areas also saw the establishment of many new villages. It is clear that, at a regional scale (Morrison in press a), one strategy of intensification in the sixteenth century was the expansion of both grazing and dry farming, extensive forms of land use.

Simultaneous with this outward expansion was an in situ intensification of areas closer to the city. North of the river, several runoff-fed reservoirs fell out of use as canal irrigation was extended. Canal water was even brought to a large island in the river near the city, which was supplied, at considerable cost, by the construction of an aqueduct. Perhaps the most interesting feature of sixteenth-century agricultural expansion and intensification was the focus on runoff-fed reservoirs (Morrison 1994b, in press b). Reservoirs could sometimes support limited cultivation of rice or other wet crops, but more commonly, it seems, they watered traditionally dry crops such as millets. During the later Middle Period widespread textual discussion of both the religious merit and political value of investment in reservoirs is unmatched by a similar focus on canals, perhaps because the latter were rarer. The construction of canals, a more costly undertaking, was more exclusively a royal activity in the area immediately around the city (Morrison and Lycett 1997), although canals in the northern part of the empire as a whole were endowed by a variety of kinds of elites.

Both canals and reservoirs require large investments in labor, time, and resources. Canals, despite their significantly larger costs, seem, however, to be ultimately less risky enterprises, producing larger--and more highly valued--harvests. Analysis of actual use-lives makes it clear that canals are more stable in the long term than reservoirs, though this stability needs to be contextualized in light of the cultural value placed on rice and other wet crops. There is no doubt that canal construction and extension required significant resources and

specialist labor; the services of specialist engineers, as well as laborers, were required. It is not, however, clear that engineers were routinely engaged for reservoir construction, although specialist reservoir “diggers” were certainly in existence. Furthermore, canal construction is locationally constrained in powerful ways, and canal zones are inevitably small in this environment.

In many ways reservoirs are, in contrast to canals, a dubious economic investment. Although they may allow for limited wet cultivation or make dry farming more secure and productive, reservoirs silt in, breach—sometimes with disastrous consequences, as when the entire village of Daroji was swept away by a catastrophic dam breach in the nineteenth century—and in this semiarid environment, fail in some years to collect any water at all. In at least one historically recorded famine (Morrison 2000), reservoir-irrigated areas actually fared worse than dry-farmed fields because of the rapid evaporation of water needing to flow some distance before reaching fields below—in this instance rain-fed fields actually failed less disastrously. Reservoirs create only isolated patches of irrigated ground, unlike the continuous distribution of canal-irrigated lands, and the very dispersal of such patches also increases transportation costs.

On the other hand, reservoirs encode considerable cultural value of their own, particularly through their close association with Hindu temples and religion (Morrison in press b). Constructing a reservoir was a highly valorized act—more so even than canal construction, if the inscriptional record is any guide. Reservoirs, like temples, sons, treasures, and literary works, were also seen to endure. They constituted one of the “sevenfold progeny,” links between the present and the future. If modernist architecture can be seen as a “defense against the terror of time” (Harvey 1989:206), a striving for eternity against a universe of flux, South Indian progeny might be seen in an analogous but somewhat different light. Here there is a focus on extension and longevity but one that adopts a procreative rather than creative stance. To “give birth” to a reservoir, temple, son, or other form of progeny is an ironic, if apt, metaphor in this male-dominated society where the actual work of reproduction is often elided. The donor, as the text asserts, “causes the structure to be built,” but in texts the actual labor of building, plowing, growing, and so on takes place invisibly—transparent work that nevertheless leaves enduring remains.<sup>10</sup> Further, as the archaeological data make clear, reservoirs vary tremendously in size so that the ambition of building or rebuilding a reservoir was much more possible for most people than the excavation of a canal. Inasmuch as patronage of irrigation was linked to political legitimacy and as political ambition was widespread and far-reaching in this decentralized empire, the plurality of power holders alone makes the proliferation of reservoirs somewhat less surprising.

Here, too, landscape histories matter. Reservoirs can be placed in areas where canals could never reach and thus are suited to the rocky, dissected

landscape of northern Karnataka, with its seasonal rainfall. Places with long histories of cultivation, too, may be hemmed in with preexisting rights and restrictions on the use of land. The construction of a new facility inevitably disrupts these social arrangements as well as existing physical patterns of water flow and transport. Canals must of necessity follow a carefully laid path to maintain an appropriate gradient, and such a path may well burst through existing features and lands already under cultivation. Reservoirs, on the other hand, are more modular, and new facilities, within limits, can be placed in the interstices of older ones. Political clout, as well as resources, then, necessarily paves the way for major changes in irrigation regimes.

By the early sixteenth century, then, agricultural practice on a regional scale became both more intensive and diverse. Areas where more canals could be built or older canals could be extended came under irrigation, and north of the river this meant that land under older runoff-fed reservoirs was converted to permanent irrigation. To the south of the river a rapid process of filling-in proceeded so that small spaces within the canal zone where canals could not reach were served by new runoff-fed reservoirs and wells. Farther out, well past the limited alluvial strip of the Tungabhadra River, entire areas such as the Daroji Valley and the Dhanayakanakere area were converted to cultivation by the residents of a series of relatively closely spaced villages, the landscape transformed into a patchwork of reservoir-watered and dry-farmed fields. Pollen and microscopic charcoal (Morrison 1994b, 1995) confirm this archaeological picture, showing that regional vegetation was already significantly transformed by centuries of human action well before the founding of the city.

In the complex history of agrarian change through the 300-year Vijayanagara period we can see a multifaceted process of intensification involving, among other things, the construction of new facilities, changing fallow regimes, multicropping, adoption of new crops, extension of cultivation to new areas, changing market systems, changing tax structures, and significant mobility of cultivators (Morrison in press b). Even this brief example from a single region points to the importance, within an overall trajectory of intensification, of the maintenance of diversity and of the demonstrated flexibility of farmers who were willing to adopt new crops, shift crop assemblages, reorganize production toward markets (and away from them, too), leave their homes and land when necessary, and even engage in armed rebellion when access to land and oppressive taxation threatened (Morrison 2001b). Under adverse environmental and social conditions farmers showed an impressive technological virtuosity, constructing (and maintaining) a wide range of facilities and employing a range of strategies such as manuring, mulching, weeding, and intercropping, keeping themselves and others fed.

### *Courses, Part Two: The Collapse and Aftermath*

The fall of the city of Vijayanagara was both precipitous and dramatic. Situated near the northern boundary of the empire, it had been besieged several times but had never fallen. While many of the early military expeditions to the south had succeeded in (sometimes loosely) incorporating territory, near-constant warfare with polities to the north and northeast did not bring those areas into the Vijayanagara state (Stein 1980, 1989). In 1565, near the village of Talikota, in one of the contested regions north of the city, the Vijayanagara armies fell to a combined force created by an alliance of the five Sultanates who divided this territory. This defeat occurred at a time of dynastic uncertainty, and there has been much discussion of why, specifically, this defeat occurred and why the city was so quickly abandoned. In any case the city was burned, sacked, and looted, actions that were not only documented by both sides but that also left a clear trace on many of the monuments. The king and court, as well as most of the elite stratum of the city and the service personnel they relied on, fled, relocating to one, then another, of the empire's southern strongholds. After the abandonment of the city and as the zone of Vijayanagara control moved south, the capital of the empire was also shifted southward in a series of moves as the power and spatial scale of the empire slowly contracted.

The study area came under the control of the Sultanate of Bijapur and, soon thereafter, under various local leaders in what is usually called the Nayaka period. Many of these leaders claimed a mandate from the Vijayanagara state (e.g., Ota 1999), and indeed some of them were local governors or other leaders (*nayaka*) during the earlier period of greater centralization. The Nayaka period was one with a patchwork of small rulers, among whom we must count the Vijayanagara king, who now oversaw a much smaller territory south of the erstwhile capital. This was also a period of some unrest in the countryside, a complex political field entered decisively by the British in 1799, when they defeated the indigenous ruler, Tipu Sultan, whose reach extended almost as far north as our region. Although the territory south of the Tungabhadra was briefly claimed by another indigenous ruler, the Nizam of Hyderabad, it became one of the districts ceded by him to the British in 1800. Thus, the area south of the river, where the abandoned city of Vijayanagara lay, became part of British India, while the region north of the river remained part of the princely state of Hyderabad until Indian Independence in 1947.

Although the city of Vijayanagara, whose population has been estimated at between 250,000 and 500,000, was quickly and completely abandoned after 1565, nearly all of the small agricultural villages surrounding it remained occupied, even those, such as Kamalapuram, that had been engulfed by urban sprawl during the sixteenth-century expansion. Demographic loss was not restricted to the urban elite but also included many lower-ranking craftspeople,

servants, merchants, temple personnel, and others.<sup>11</sup> Even though most rural villages were not abandoned, the loss of urban markets (and shifts in the structure of tax demands) meant that production was radically restructured. The only area where we have documented significant settlement abandonment and contraction is in the outlying dry-farmed areas first used intensively in the early sixteenth century. Even here, however, farmers, herders, and others in many small villages continue to eke out an existence.

The complex sixteenth-century agricultural landscape did not (and perhaps could not) last very long. With the defeat of the imperial armies and the plunder and abandonment of the capital city, the majority of consumers disappeared from the local scene; and, no doubt, many of the preexisting arrangements around the control of land, water, labor, and produce were suddenly disrupted or called into question. Within a relatively short period the majority of these outlying reservoirs, many already choked with silt, were either abandoned or allowed to grow smaller and less effective each season (Morrison in press b).

At the same time that many (but not all) dry-farmed areas fell out of use, the extensive canal network in and around the city continued to be used and maintained. Although the city itself lay in ruins, changes to the landscape, both material and conceptual, continued to shape the ways local people could and did interact with it. Should we not be aware of local landscape histories, we might assume that canal irrigation was beyond the reach of local farmers and the decentralized patchwork political system they lived in, since they had neither the resources nor the structure to create such a system. However, the prior existence of the canals made such distinctions moot. The Vijayanagara channels are enduring landscape features, "facts on the ground," and the post-Talikota history of the region makes little sense unless this is taken into account. Although canals are costly to maintain, they do allow both high and consistent yields. More than this, however, they also supported culturally valued crops. Rice continued, certainly, to be valorized, but farmers working in the irrigated zones along the river shifted production to commercial crops such as sugarcane as soon as the conditions for its sale became sufficiently appealing under the British.<sup>12</sup>

Significantly, as the Vijayanagara canals continued in use long after the fall of the city, they also continued to attract "royal" attention. British colonial irrigation records show extensive work on repair and maintenance of canals and their headworks; the British even extended a few Vijayanagara-area canals, cutting through solid rock to extend their reach. Thus, there was a sporadic but sustained government effort to preserve and even extend valuable canal systems.

The history of collapse in this region, even in the sketchy outline given here, can thus be seen to follow a course dependent on a large number of local



variables, including political organization, cultural values, and environmental change. Just as the course of intensification at Vijayanagara did not move simply from more extensive to more intensive forms of cultivation, this particular trajectory of collapse was not "intensification in reverse." Many of the (already failing) runoff-fed reservoirs were abandoned for both solid environmental reasons (they were full of silt, unreliable, even dangerous) and explicable political reasons (their patrons were gone, making repair very difficult). At the same time, land- and labor-extensive forms of production such as dry farming, grazing, and collection continued, as did labor-intensive irrigated agriculture under canals. Even in this later period, then, there was a simultaneous diversity of production strategies on a regional scale; subsistence production existed side by side with commercial cropping, a pattern that continues to this day. This course of change, while not illogical from the standpoint of local farmers, astute calculators of benefit and loss, was critically dependent on local landscape histories and on the enduring changes created by earlier generations.

#### DISCUSSION: CONSEQUENCES OF CHANGE

The long-term history of agricultural intensification (and collapse) in southern India may be seen as, in a real sense, underwriting this region's political, economic, and cultural history; without significant localized concentrations of agricultural produce, the highly stratified urban society that began to form in the Iron Age and that has continued to the present would not have been possible. At the same time, however, this changing sociopolitical context itself provides an important context for understanding long-term agrarian change, a set of contingent outcomes that became part of the field of possibility for those who come later. It would of course be impossible to dissect all of the consequences of agricultural change in this region, even in a longer format than this chapter; here I simply outline a few of these.

The environmental consequences of local land-use histories have been particularly profound. The adoption and independent domestication during the Neolithic of a range of cultigens and domestic animals had a profound effect on regional flora, fauna, and soil regimes, as well as on cuisine, labor regimes, mobility, and a host of other cultural and economic factors. African millets, introduced in the late Neolithic or early Iron Age, were followed later by New World crops and weeds, some of which now pose major ecological challenges. It is probable that the region had already experienced major episodes of erosion and deforestation by the first millennium CE, and it is quite clear that the scale of erosion and loss of woody vegetation cover during the sixteenth century remains (as yet) unsurpassed. The construction of canals, reservoirs, terraces, and other features has modified both slopes and water flows, affecting not only

sediment and vegetation but also aquatic animals and even climate. Where wet rice has been grown, what are known as paddy soils have formed, a permanent change in soil type.

The cultural consequences of intensification and collapse are also profound, though, as noted, neither cultural logics nor environmental possibilities can be seen as determining. Neolithic peoples enjoyed a range of animal foods eschewed by many later inhabitants of the region. Conversely, new tastes such as the elite obsession with rice, emerged historically and became factors in restructuring agriculture, even to the point of creating the extreme landscape modifications required to support this water-loving crop in a semiarid environment. The demographic and spatial expansion of the sixteenth century resulted in the founding of many new villages, some of which continue to be occupied, as well as the construction of roads, temples, wells, reservoirs, and other features that still structure transportation, pilgrimage and worship, residence, and, of course, agricultural strategies.

In what might be seen as an unintended consequence of the great sixteenth-century expansion of runoff-fed reservoirs, the landscape of many areas outside the city is now dotted with contemporary shrines made of converted reservoir sluice gates. These gates often contain religious sculpture, but even where they do not, both reservoirs and sluices are symbolically (and institutionally) associated with temples and with potent religious images (lotuses, the eternal ocean, mythological animals, and so forth; Morrison in press b). Here, then, the specific course of agricultural intensification—the extension of runoff-fed reservoirs into dry areas—has also restructured a religious landscape, one whose longevity has proven to be significantly greater.

Politically and economically, intensive agriculture underwrote both urbanism and specialization, including the specialization that constitutes the development of a food-consuming elite class. The mobilization of resources by that class, in turn, allowed the development (through the labor of others, to be sure) of the infrastructure (canals, aqueducts, anicuts) that allowed the production of wet rice, coconuts, flowers, areca nuts, mangos, and other desired produce in an area in which they would not normally thrive. Temples, too, were both consumers of (primarily irrigated) produce and investors in and owners of land. The specific institutional forms that prompted both urbanism and agricultural intensification—kings, nayakas, and large temple complexes, for example—also left architectural markers on the landscape—palaces, pavilions, shrines, and waterworks—that attract tourists and archaeologists to this region today.

I do not deny that it is possible to develop general understandings of the process of intensification; indeed, I would argue that it is imperative we do so. However, I would also suggest that this understanding will require close



comparison of many well-documented and long-term trajectories of change. Intensification is a process, not a quantity or an essential quality, a process that can indeed be understood in broad terms outside consideration of any particular case. Such broad understandings are, however, limited by their very generality, a quality at once their strength and their weakness. They gain analytical teeth only when applied to new cases where they may prompt new ways of looking at old information or compel researchers to gather new information as a consequence. Out of this foray into the specific we both derive our ideas and evaluate them. As such, the problem of contextualization is a critical one. I have argued that the process of intensification is itself complex, multiple, and may take many courses; here I have tried to consider a little more closely how we might situate our understanding of this complex process in terms of actual courses and consequences of change, in a world where human landscapes, both material and conceptual, with their scars of the past and resources for the present, are the places where production happens. Understanding production, then, requires attention to these places.

## NOTES

1. Archaeological research on the intensification of production has primarily been oriented toward the development of more general causal models of change, an orientation that has led to what, for the social sciences, seems to be the amazing staying power of the Boserup (1965, 1981) model of intensification (see discussion by Morrison 1994a), a relatively simple scheme that proposed a straightforward causal relationship between population pressure and (one form of) agricultural intensification, elaborating a stepwise model of cultural evolution (Morrison 1996) in which different stages of intensification were also marked by changes in land tenure and agricultural tools, among other things. Despite a flurry of criticism and abandonment of the model by some of its early advocates (e.g., Brookfield 2001), various iterations of this scheme are still being proposed (e.g., Johnston 2003; Stone 2001), even though some of these modify its basic assumptions so fundamentally that it is difficult to credit arguments that such changes are simply friendly amendments. The purpose of this chapter is, however, *not* to discuss Boserup's view of intensification, an exercise that hardly needs repeating. At this point it is possible to say a great deal more about actual historical courses of change (as opposed to a quasi-historical sequence assembled out of contemporaneous variation that Boserup had recourse to) and thus to the range of possibilities for change than was possible some 40 years ago.

2. A careful reading of my previous work will make it clear that I am in substantial sympathy with and acknowledge the value of Boserup's (1965) original contribution to this question. Clearly, people intensify (within which I would include failed attempts to increase production or productivity as well as successful ones, meaning that the

definition of *intensification* cannot be operationalized in terms of either productivity or output) production because of a perceived need to do so. Population-resource imbalances (leading to actual shortages or to the awareness of the potential for shortages) are one critical example of conditions leading to such perception. However, they are not the only such condition (Morrison 1994); it is possible to document examples of intensification where production far outstrips some (difficult-to-define) biological baseline of need, pointing to the problematic nature of distinctions between production for "subsistence" as opposed to "exchange" or "surplus" (cf. Gardner 2001). Furthermore, decisions about production strategies are always made within the context of regional power relations (Morrison in press a), so discussion of the causes of intensification also need to address issues of power in ways they have not to date done so.

3. And, indeed, in terms of "total socio-cultural systems" (Minnigal and Dwyer 2001:269), an approach I think is also exemplified in my own empirical work.

4. To a certain extent we can include as parts of these landscapes features sometimes viewed as entirely "natural," such as rainfall, crop pests, slopes, and soils given that generations of human action have helped construct these as well.

5. Ashmounds, a distinctive feature of the Southern Neolithic in this region, are actually large mounds of fired cattle dung, material that has vitrified into relatively impervious slaggy concretions. For more discussion of ashmounds see Morrison (1995), Johansen (2004), and Paddayya (1993).

6. Critical, too, is the history of *Sorghum bicolor*, locally known as *jowar*, which became one of the primary dry-farmed crops of the dry regions of South Asia by the Middle periods. Introduced from Africa around the early Iron Age, the expansion of jowar production, like that of rice, seems to have accompanied and supported urbanization in the south.

7. As I have discussed elsewhere (Morrison 2001b), the historical record of the Middle period might lead one to believe that the production of rice and other irrigated crops was the primary form of agricultural production in the region. In fact, our archaeological work makes it clear that millets and other rain-fed crops predominated throughout the period and that efforts toward intensification often included the expansion of extensive dryland cultivation (Morrison 1995, 1997).

8. There is no evidence of an Iron Age or Early Historic site directly underneath the area around Hampi that constituted the early core of the city, nor indeed is there for most of the area subsequently covered by this huge city. However, there is very good evidence for several large Iron Age and Early Historic sites alongside the Tungabhadra River in locations that would become the near suburbs of the city. Thus, the concentration of population in this area was not completely novel (see Morrison in press b for an extended discussion).

9. Here I am discussing primarily the large area immediately around the city, what we have called the greater metropolitan region (GMR). However, an important exception to this pattern is provided by the level plains that lie to the east and west of the

GMR. In these areas there are significant clusters of tenth-century to thirteenth-century (Early Middle period) settlements, most of which lie along seasonal streams that would have supported inundation agriculture of dry crops and perhaps some rice. Many of these places continued to be occupied into the Vijayanagara period (though some may have experienced population loss), so that while it is the case that *new* Vijayanagara settlements in the fourteenth century were primarily oriented to the production of wet crops such as rice, older places continued to be occupied and older forms of production continued alongside innovations such as the expansion of runoff-fed reservoirs.

10. It may go without saying that it is not the donor who supplies this labor. The work of lower-status men and women is the foundation for the merit (*punya*) accrued to the donor, just as the reproductive labor of the wife, invisible labor in these texts, is the foundation for the son.

11. Significantly, many of the large temple complexes were also abandoned, either at this time or shortly afterward. These complexes, designated as cities in their own right within the urban landscape, supported large cadres of specialists, held extensive rights in land and produce, and often had considerable stores of wealth. Still, they depended on elite patronage and protection. Elsewhere (Morrison in press b) I discuss the differential patterns of temple abandonment and reuse and their connections with local landscape histories.

12. Without discussing commercial agriculture during the colonial period in depth I would point out that tax demands also sometimes forced producers into cropping choices that they might not otherwise have followed. The extension of railroads in the region in the nineteenth century had some effect on cropping choices, as did the expansion, under colonial rule, of the towns of Hospet and Bellary.

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