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Economic Competition and Agricultural Involution in the Precontact North American Southwest

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During the early years of the fourteenth century A.D. , a major new settlement arose at the base of the Sangre de Cristo Mountains five miles southeast of what was later to become Santa Fe, New Mexico [fig. 3.1]. This community, named Arroyo Hondo Pueblo by archaeologists, grew rapidly from a few residences to nearly a thousand rooms and perhaps as many occupants by the year 1330. For the northern Rio Grande valley at this time, Arroyo Hondo would have been a massive settlement. Although it was abandoned after only about 125 years, this boomtown became a forerunner and a prototype for the pueblos of the century just prior to the arrival of the Spaniard.

—Douglas W. Schwartz (1993:xi)

THE PROBLEM

The historical trajectories of agricultural societies in the late prehistory of the American Southwest describe a descending demographic arc. During a span of less than three centuries, from circa A.D. 1300 to 1550, farming groups that had occupied an area of more than 300,000 square kilometers were reduced to a few isolated geographic pockets of less than 5,000 square kilometers (fig. 3.2). This spatial contraction was accompanied by an estimated 90 percent decline in the

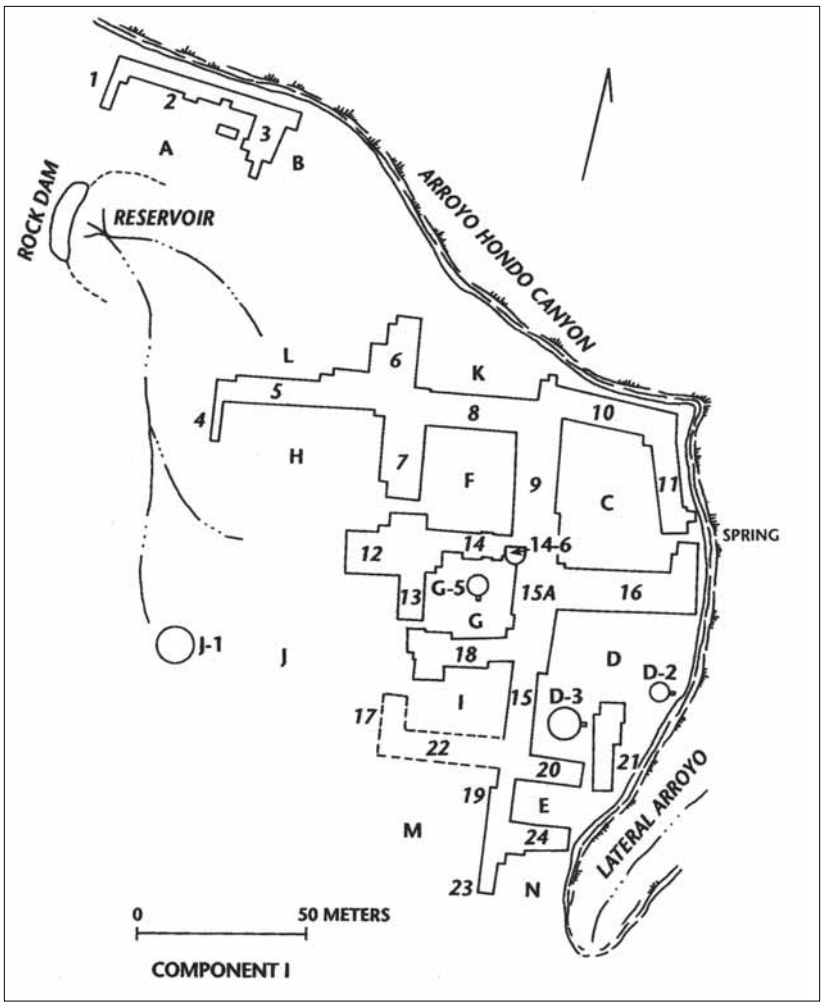

Figure 3.1

Plan view of Arroyo Hondo Pueblo (after Creamer 1993).

number of farmers (fig. 3.3), widespread evidence for violent conflict, high infant mortality, pervasive nutritional stress, endemic diseases including tuberculosis, and declining mean age at death (Fish et al. 1994; LeBlanc 1998; Stodder et al. 2002). After a run of at least 4,000 years, agriculture seems to have been failing in spectacular fashion. And yet, in the midst of apparent collapse, farming villages of unprece-

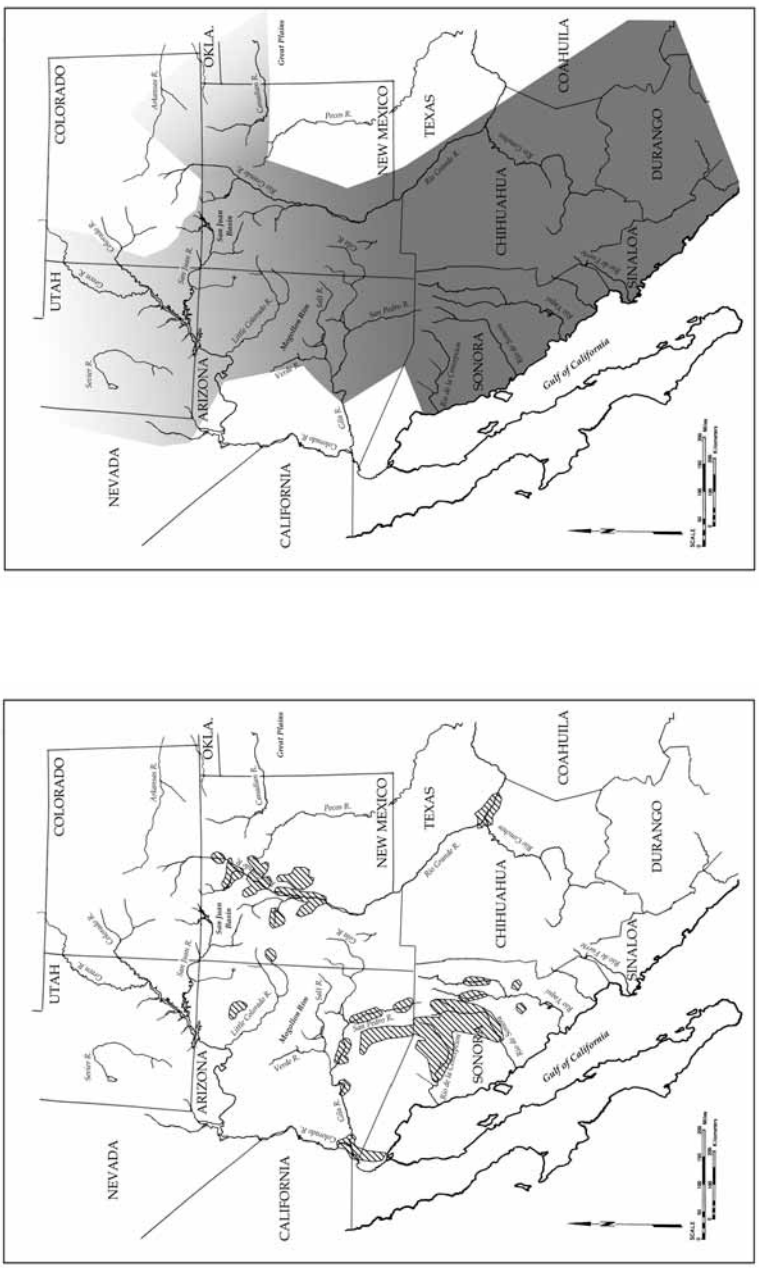

Figure 3.2
(a) *Distribution of Southwestern agricultural peoples,* A.D. *1200 (from Fish et al. 1994: fig. 7.9; Madsen and Simms 1998).* (b) *Distribution of Southwestern agricultural peoples,* A.D. *1600–1700 (from Fish et al. 1994: fig. 7.9).*

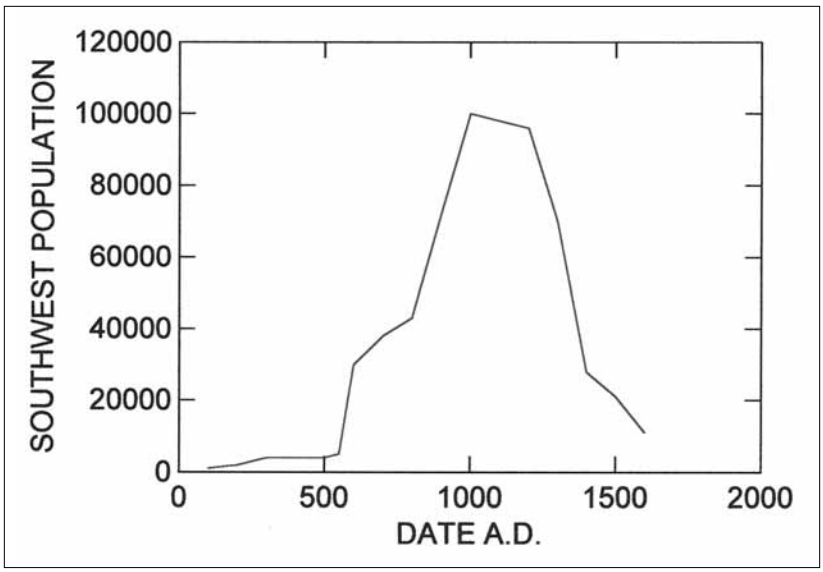

Figure 3.3

Regional population trends in the Southwest, A.D. 1 to 1600 (from Dean, Doelle, and Orcutt 1994:74).

dented size, such as Arroyo Hondo Pueblo, sprang up throughout the northern Rio Grande Valley and along the Little Colorado River drainage. Why did conditions of regional agricultural failure give rise to explosive growth in agricultural villages?

The widely held interpretation of this pattern is socioeconomic "reorganization," a contrived transfer of agricultural groups to new locations in response to altered local conditions for cultivation (Cordell 1997). Researchers interpret temporal trends in this way because the villages established after A.D. 1300 were not just the largest and most architecturally dense agricultural settlements in Southwest prehistory, but also because they give evidence for elaborate ritual organization, craft specialization, and extensive trade (Spielmann, ed. 1998). Indeed, for some archaeologists the centuries immediately prior to European contact were the "Golden Age" of Southwest prehistory, and for most scholars these villages established the basis for historical Pueblo communities that have been resilient through four

centuries of cultural oppression. It appears that in order to reconcile large, ritually dense villages with evidence for faltering farming economies, archaeologists have emphasized the possible advantages to agriculture of population aggregates, such as labor sharing, resource control, or the creation of competition-free buffer zones, thus shifting the focus from a truly spectacular regional failure to impressive local accomplishments, without examining the potential dynamic between the two processes (for example, Gumerman, ed. 1994).

But evolutionary success is measured in population persistence and growth, not aggregation, and these measures do not reflect well on indigenous Southwestern farmers at the brink of European contact, while these same measures do reflect well on non-agricultural populations that were expanding rapidly after A.D. 1300 (Upham 1994; Madsen and Rhode, eds. 1994). The empirical demographic synchronicity between farmers and foragers would seem to imply a relationship, but except for Upham (1994), most Southwestern archaeologists recently have dismissed any causal effect on farming patterns by foragers, inferring instead that hunter-gatherers opportunistically occupied abandoned agricultural territory, merely trailing into the region from elsewhere behind farmer diasporas (Fish et al. 1994; Cordell 1997; LeBlanc 1998).

This autochthonal view of agricultural trends in late prehistory is certainly plausible, but it seems increasingly uncertain. Although there were frequent climatic episodes in the past when food production was difficult, researchers have yet to identify external environmental developments or forcing events that can explain agricultural abandonment over so wide a latitudinal zone, or account for the near extinction of farming populations (K. Adams and Bowyer 2002; Fish et al. 1994; Dean 1996; Dean and Van West 2002; Kohler 2000; Waters and Ravesloot 2001; Van West 1996). This suggests that the relationship between farmers and foragers during late prehistory is worth a closer look.

If we take that look from the familiar angle of farmers *versus* foragers, we will probably see little, because it is almost impossible to distinguish the foraging component of farming societies from the archaeological record of hunter-gatherers when land-use systems overlap. However, if we frame the problem as the persistence and relative frequency of economic variants within a circumscribed space, which is

one way to monitor selection for the most efficient organizational forms through time (for example, Redding 1988; Madsen and Simms 1998), then we may have an archaeological approach that can help explain why farming villages became so large and socially complex as the number and health of farmers declined.

In this chapter I present an exploratory outline of such an approach by examining the historical pathways leading to that seeming paradox. I adopt Clifford Geertz's concept of "agricultural involution" for the historical process that I believe transpired, with "involution" referring to "the overdriving of an established form in such a way that it becomes rigid through an inward overelaboration of detail" (1963:82). Geertz was looking for a way to describe the increasing internal complexity within static socioeconomic forms in historical Indonesia, but I think involution is also a compelling metaphor for the economies of the last precontact farmers. The large farming villages of late prehistory were committed to a form of socioeconomic organization that became extremely complex but inefficient, not because farming was unproductive but because other kinds of organization were more competitive.

HISTORICAL PATHWAYS IN SOUTHWESTERN AGRICULTURE

The first step in this examination is to delineate the historical particulars of the processes that need explaining. To begin with, is it reasonable to assume that foragers had a dynamic role in the evolution of Southwestern agricultural economies? A large number of thoughtful scholars do not think so, and therefore this issue must be addressed. For another thing, most reconstructions of Southwest agriculture ignore the record of farming populations in adjacent regions, as if the Southwest were culturally and biologically isolated, a view that has deep roots in culture historical preoccupations with the "origins" of Southwestern traditions such as the Anasazi or Hohokam, but makes little anthropological sense. In order to address the final phases of precontact agriculture in the western United States, when Arroyo Hondo and other massive settlements were established, I start with an outline of the historical relationships that includes hunter-gatherers and a much broader geographical perspective.

Economic Competition and Agricultural Involution

The standard history of precontact agriculture in the Southwest envisions a linear transformation from preceramic-period hunting and gathering to the development of "fully agricultural" societies in the ceramic period (for example, Matson 1991; Cordell 1997). The defining point in the linear model is the introduction of maize from Mesoamerica around 2000 BC, along a fairly wide geographic corridor stretching from southern Arizona to the Colorado Plateau, followed by the adoption of other nonindigenous domesticates at later times. Farming spread over most of the region by 1000 BC, followed by a long period of spatial stability, then a second wave of expansion into the Great Basin and southern High Plains around A.D. 100 to 400 during the early portion of the ceramic period.[1] Throughout the ceramic period, farming techniques became more complex, crop variability increased, and production strategies supported larger, more sedentary communities. Widespread drought and altered climatic patterns were part of the dramatic reduction in farming after A.D. 1300 (Dean 1996; Larson et al. 1996), although, as already noted, climate change alone cannot account for the nearly total reduction in area occupied by farmers, or almost complete population demise.

Foraging has a stunted role in this unidirectional model. Foragers were either transformed into farmers (upon receipt of domesticates) in the preceramic period, or displaced by advancing farming settlements, leaving no legacy worth mention in textbooks. In the former case, hunter-gatherers became farmers when presented with foods that had greater return rates than available wild resources, or conversely, turned to domesticates when return rates from wild resources fell below that obtainable from plant cultivation. In either case, the subsequent evolution of farming is almost universally perceived by scholars as driven initially by declining return rates from the foraging component of local economies, such that farmers ratcheted up food production to compensate for lower returns elsewhere, and then turned to intensification in the agricultural component alone as communities became dependent on farming for essentially all their fundamental nutrition. The kinds of social phenomena that dominate archaeological reconstructions, such as the formation of villages or elaborate craft manufacture, are associated with this shift to fully agricultural economies in the ceramic period.

However, recent data suggest a more complex picture of agricultural development—certainly a less linear history, beginning with a challenge to the assumption that the appearance of maize marks the beginning of plant cultivation, and hence "agriculture." For example, the introduction of maize was preceded by intensive economic use of plants with hard seeds based on grinding stone technology (J. L. Adams 1999). One of these indigenous plants, *Chenopodium*, was likely cultivated by foragers prior to the appearance of maize (Wills 1995); thus, maize production involved a new resource but not a completely novel activity. Although maize cultivation necessarily entailed a range of human behaviors, including planting, harvesting and seed storage, it is not clear that the mere presence of maize signifies an entirely new set of behaviors.

Thanks to extensive and systematic archaeological field studies, the spatial distribution of early maize-producing sites can be described with much greater confidence than was possible just a few years ago. Nevertheless, preceramic maize sites remain strikingly rare. For example, Mabry's (2002) recent survey of the Southwest notes just ten maize-producing sites in six locations that date between 2000 and 1000 BC Chronometric and stratigraphic data from the limited corpus of excavated preceramic agricultural sites indicate that occupations were typically intermittent, both seasonally and interannually, and site locations were often utilized episodically for periods of a few generations (Hard et al. 1999; Huber and Van West 2005; Smiley 1994; Wills 1996; Roth and Wellman 2001). In the middle Santa Cruz River Valley, near Tucson, preceramic maize-producing sites with hundreds of small dwellings and storage pits are interpreted as the cumulative product of repeated, short-term occupation over many centuries by small family groups in "seasonal homesteads" (Schurr and Gregory 2002:294), a pattern compounded by shifting residential locales in response to changing hydrological conditions (Huckell 1995; Roth and Wellman 2001:73–74). These spatial and temporal patterns point to highly mobile adaptations, seasonally tethered to agricultural plots, but wide ranging and flexible at interannual time scales. They seem better fitted to an image of widely separated flickering lights in a vast darkness than a wave of farming groups flowing across and filling in the region (fig. 3.4).

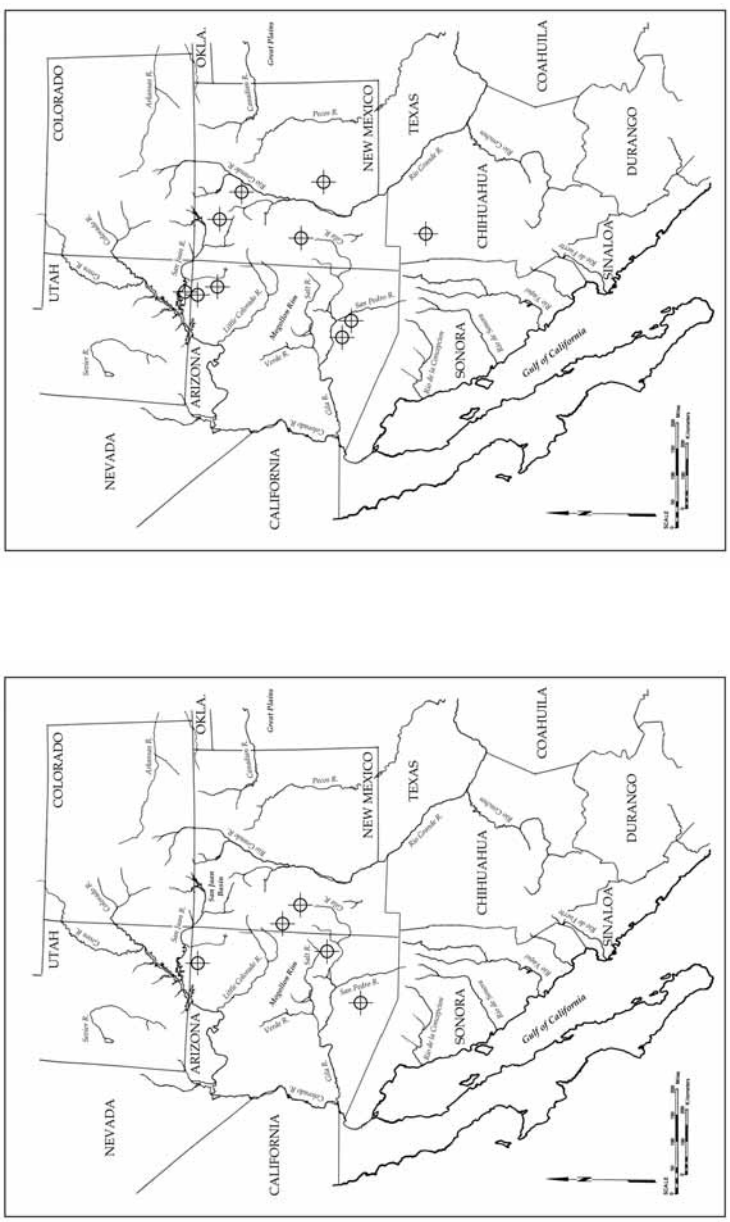

Figure 3.4
(a) *Distribution of archaeological sites with AMS dates on maize with conventional radiocarbon ages in the range of 2000 ± 200 years* BP *(from Mabry 2002; Huber and Van West 2005).* (b) *Distribution of archaeological sites with AMS dates on maize with conventional radiocarbon ages in the range of 1000 ± 200 years* BP *(from Mabry 2002; Huber and Van West 2005).*

The patchy distribution of preceramic maize sites corresponds generally to areas with earlier hunter-gatherer occupation, and there is substantial evidence for continuity between pre-maize and early maize periods in overall subsistence, food processing technology, and settlement characteristics (J. L. Adams 1999; Wills 2001). What distinguishes agricultural sites from non-agricultural sites is primarily a higher density of the same material, plus maize, which suggests the effects of prolonged seasonal occupation rather than fundamental economic differences. With the possible exception of locations like the Santa Cruz drainage, patterns of food production in the preceramic are consistent with intensification of local subsistence strategies rather than an influx of new people or modes of production (Halbirt and Henderson 1993; Roth 1995; Wills and Huckell 1994; Wills 1995; but see Matson 1991 or J. H. Hill 2002 for alternative views based on other criteria).

Similarities in technology and subsistence, coupled with patchy maize distribution, raise the possibility of episodic and/or repeated adoption of farming by foragers, instead of an irreversible commitment to agriculture. Such shifts have been described in a variety of ethnographic and archaeological contexts as "episodic," "switching," "cycling," and "ecological fine-tuning" (O'Shea 1989; Netting 1990; Upham 1994; Zevebil 1995). Identifying such fine-tuning directly in the archaeological record is probably impossible, especially if it occurs within ethnic groups (thus negating use of population markers), but some researchers have inferred such behavior on the basis of relative frequencies of agricultural and non-agricultural sites in defined time periods and areas (Upham 1994; Madsen and Simms 1998; Barlow 2002). In contexts of low organizational variability (or broad similarities), tactical adjustments such as low-intensity plant cultivation were probably easy to make, whereas in contexts of high variability (many different kinds of economic organization), such adjustments may have been quite difficult (Redding 1988). The archaeological record of broad organizational similarity across the entire region during the preceramic period, combined with the patchiness of agricultural sites, suggests oscillations in agricultural involvement rather than systemic transformation.

We can think about this economic variability in structural terms relevant to competition. Raymond Kelly (2000:44–46) makes the useful, if grammatically awkward distinction between *unsegmented* and *seg-*

mented societies; the former are "characterized by the minimal complement of social groups," while the latter contain equivalent social units combined "into progressively more inclusive groups within a segmentary hierarchy." Unsegmented societies are based on small, local groups that occupy relatively large territories determined largely by fluid demographics; they shift residence frequently between dispersed settlements, aggregate in large groups only periodically in response to temporary resource abundance, and practice relatively unrestricted sharing. In economic terms, unsegmented societies are risk-averse, based on predictable but low return strategies. Segmentary societies, in contrast, have cohesive social identities typically linked to physical places through persistent group identity such as lineages founded on local resource control. Segmentary systems are inherently about collective activity, with well-defined households, and are especially suited to overt competition that involves intergroup conflict through the structuring of defense and aggression in hierarchical allegiances (Sahlins 1961).

Cross-cultural studies by Flannery (1972b, 2002) provide a series of archaeological indicators that can be associated with Kelly's broad distinctions. Unsegmented or weakly segmented societies are typically associated with "circular hut compounds" occupied by nuclear families, communal sharing of labor and food, and limited storage, while segmentary systems are usually found with "rectangular-house villages" characterized by permanent family dwellings, distinct household production strategies involving control of land and food, and cross-cutting sodalities for group-level competition. Physical demarcation of land for ownership purposes is a common feature of segmentary systems that rely on labor pooling (rather than food sharing) and technological innovation to maintain productivity in what are fundamentally risk-seeking economies; episodes of low returns are offset by periods of high return (see G. D. Stone and Downum 1999; Winterhalder 1989). These distinctions do not correspond to the presence or absence of agriculture, but to an economy's capacity to sustain a group in one location for prolonged periods of time.

All of the current archaeological evidence from the Southwest preceramic period points to unsegmented, or at most very weakly segmented societies, regardless of the presence of cultigens, and therefore implies the central importance of risk-averse strategies and a limited

dependence on resource control through household organization. The persistence of residentially fluid organization during the perceramic was probably a function of the relatively low return rates associated with prehistoric maize production in the arid Southwest. Maize can be more productive than many native nondomesticates, but those species are mostly low-ranked seed-bearing annuals with high processing costs (Diehl 1999; Barlow 2002). The principal advantage of maize, at least in the first two millennia, was in the control that cultivators exercised over collection locations, timing of maturation, and long-term availability through storage. Interannual variance in yield was probably high due to limited production technology, lack of fertilizer, small plots, and climate stress, even in cases where small irrigation ditches were constructed (see Mabry 2002; Damp, Hall, and Smith 2002). High residential mobility is commonplace in arid land agriculture, an economic technique for maintaining acceptable levels of marginal return without resorting to expensive forms of intensification (Netting 1990; G. D. Stone 1991; M. Graham 1993; Wills and Huckell 1994); thus, it should not be surprising to find it prevalent among early Southwestern farmers.

The beginning of pottery manufacturing (circa A.D. 100–400) marks the first widespread development of segmentary societies based on household organization of production and agriculture. The evidence for a shift to household organization across the ceramic time boundary is revealed primarily in settlement patterns. Average house size increased from an average of less than 10 square meters to nearly double in riverine settlements of southern Arizona, and to more than five times in the montane zones of central New Mexico and southern Colorado (Rocek 1998; Wills 1996, 2001). These large dwellings were subdivided functionally, contained specialized food storage and processing facilities, and could easily house extended families. Most on-site storage shifted to dwelling interiors, and burials associated with individual houses or cemeteries became common, reflecting likely place-based affiliations tied to discrete social segments. Midden accumulation patterns suggest that year-round occupation was probable in many of these sites, but settlement use-lives were typically less than fifteen years, reflecting strategies of periodic movement to new locations similar to mobility patterns found among ethnographic farmers in arid

environments with long-fallow cultivation cycles (Cameron 1990; G. D. Stone 1993; Varien 2002).

Technological changes and biological indicators suggest that economic intensification associated with household organization was largely based on heavier workloads for women. Chief among these is the adoption of ceramic containers, which conveyed important advantages in food storage and nutritional gain through boiling, but added to female workloads through manufacturing and fuel procurement costs (Crown and Wills 1995). Likewise, changes in milling technology facilitated the amount of grain processed per unit of time but greatly increased the amount of energy expended during grinding (J. L. Adams 1999; Hard, Mauldin, and Raymond 1996). Ogilvie (2000) found evidence of repetitive stress markers in the upper arms of female skeletons during the early ceramic period, which she attributed to increased grinding time, as well as indicators of reduced locomotion associated with greater sedentism. These technologies for reducing work time by expending more energy point to heavier female workloads and time allocation problems, which is consistent with the expectation that female sedentism leads to reduced birth spacing and consequently more childcare responsibilities.

Intensification efforts indicate that household-based economies were experiencing at least moderate resource competition, almost certainly due to increasing population density in some areas. The striking expansion of household cultivation into areas occupied by nonfarmers was either due to the advantage that even weakly segmented societies have in mobilizing labor compared with unsegmented populations, or the ease with which indigenous foragers were able to incorporate cultivation into their economies. Researchers in the Great Basin favor the latter model, which implies a lack of fundamental organizational differences between foragers and farmers (Barlow 2002; Madsen and Simms 1998).

Isotopic data for diet based on human skeletal remains from several portions of the Southwest indicate diets did not change through the ceramic period (fig. 3.5). Heavy dietary input from small-seed, low-return plants (due to high handling costs) is evident even before the introduction of maize and continued through the precontact period. It is therefore likely that economic intensification associated with

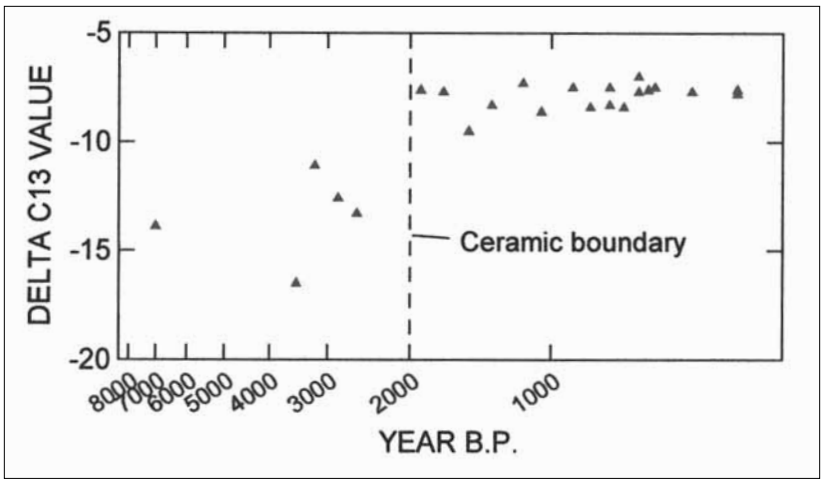

Figure 3.5

Stable isotope ratios from human bone collagen in Southwestern archaeological contexts (from Hard, Mauldin, and Raymond 1996).

household formation in the early ceramic period was *preceded* in the late preceramic by dietary dependence on agriculture, meaning that factors promoting households were more likely about resource competition than declining return rates from food production.

After A.D. 800, agriculture in the Southwest supported two type types of settlement patterns that corresponded to differences in the socioeconomic organization of production. The more common pattern is found in small, dispersed family-level settlements, the other in large population aggregates consistent with village organization. Some villages predating A.D. 1000 may have had several hundred residents, but these aggregates were not numerous, clustering mainly in the Salt-Gila river drainage in southern Arizona and the San Juan River system in southwest Colorado and southeast Utah. Large settlements in the Salt-Gila system (the "Hohokam" cultural tradition) formed around massive irrigation systems, with substantial evidence for hierarchical political systems,and long-term sedentism, yet substantial reliance on household production and autonomy (Bayman 2001).

There are fewer indications of political complexity among the smaller San Juan villages, almost no evidence for intensification in agri-

cultural strategies, and a continued dependence on residential mobility expressed in complex temporal ways. On the one hand, individual households or families apparently moved frequently and easily between local aggregates that may have been communities whose persistence as social entities spanned several generations (Varien 2002). On the other hand, these communities periodically abandoned large subregions, moving en mass to areas with few or no resident farmers. Between A.D. 800 and 1200, these intraregional migrations took place as a series of at least three shifts between northern and southern portions of the San Juan system (Duff and Wilshusen 2000). Similar residential cycling is apparent among farming groups in other portions of the Southwest, which makes it clear that periodic resettlement was a critical element in sustaining agricultural adaptations, almost certainly because of the limited potential for intensification.

The Salt-Gila and San Juan drainage systems saw the emergence of a new kind of aggregated settlement after A.D. 1000, characterized by features that include isomorphism between residential groups of multiple extended households and single large buildings, intensive labor investment in architecture generally and elaborate architectural details, indications of attached households, segregated cemeteries, extensive exchange relationships, and hierarchical organization of production. In Arizona, these settlements characterize the Hohokam Classic period (A.D. 1150 to 1450); in northwest New Mexico, they mark the Bonito phase or "great house" period (circa 900 to 1140) centered on Chaco Canyon (Crown and Judge, eds. 1991; R. G. Vivian 1990). Both cases appear to be examples of a particular type of segmentary organization that anthropologists refer to as "house societies," which are property-owning groups whose members share a social identity closely tied to architecture, place, and property (Carsten and Hugh-Jones, eds. 1995; Joyce and Gillespie, eds. 2000). Membership in house societies is kin-like, which overcomes the political limitations of rigid descent or marriage rules, allowing a more efficient recruitment of labor and secure control of land and other resources (which may be intangible, such as ritual knowledge). Individual houses often comprise a core set of households, together with affiliates of lower status or power within the house. Affiliated households provide an important source of labor, but these may be expendable during periods of

economic stress. Houses may also be ranked within large villages, and competition can occur among them for wealth and power; if the emergence of corporate groups comes from a "moderate to highly competitive environment for restricted or highly desired resources," as Hayden and Cannon (1982:151) argued, then the appearance of house societies—or at least something quite similar in the Hohokam and Chaco sequences—surely indicates extremely competitive local conditions. In both contexts, the agricultural systems stand out against regional patterns by virtue of large-scale, expensive, and technically elaborate communal irrigation systems (Crown and Judge, eds. 1991; R. G. Vivian 1990), and thus arable land and surface water were undoubtedly the primary resources contested by these corporate groups.

The house societies of the Hohokam Classic period and the Bonito phase in Chaco were not typical of contemporaneous segmentary societies at this time in the Southwest, and they were certainly not equivalent; the Hohokam evidently had greater internal differentiation and social ranking (Bayman 2001). The house-like segmentation in Chaco appeared in associated with a population buildup in areas of previous low density; the population seems to have included a mix of groups with different geographic and perhaps ethnic and linguistic origins (R. G. Vivian 1990; Wills 2000). Population growth in the Chaco core during the Bonito phase was paralleled by lowered densities of farmers in adjacent regions, a process that would have left those "abandoned" zones open to exploitation by foragers or small-scale cultivators (see Upham 1994). Indeed, for most of the ceramic period, farming settlements outside the high-density zones associated with major river systems were small, widely dispersed, and almost certainly employed shifting residential strategies rather than agricultural intensification (Tainter and Plog 1994). These dispersed farmers were not very segmentary, and their archaeological signatures are correspondingly indistinct.

By A.D. 1000, Numic foragers were expanding out of the southern Great Basin and into the Colorado Plateau (Madsen and Rhode, eds. 1994), while hunter-gatherer populations ranged widely along the eastern and southeastern margins of the Rio Grande Valley. Although the house societies were spectacular social developments during this period, the cultural and economic landscape of the Southwest as a whole

was diverse, with ample room and opportunity for less segmentary adaptations.

Those opportunities increased tremendously when farmers abandoned the Colorado Plateau in the late thirteenth century, an "event" that marks a pivotal point in the declining commitment to agriculture that began earlier. By A.D. 1150, small farming groups through the Great Basin had largely shifted to full-time foraging, a process that was complete by the late 1200s (Barlow 2002; Coltrain and Leavitt 2002; Madsen and Simms 1998). This move from farming to foraging is thought to have been a response to a decline in growing-season moisture that rendered crop production unreliable, indicating that returns to farming were close enough to those of foraging that the shift was not difficult (Barlow 2002). These erstwhile farmers of the eastern Great Basin presumably joined, as least geographically, the expanding population of foragers moving into the region from the southern Great Basin. The area occupied by farmers west of the Rio Grande declined by at least 75 percent in the interval between A.D. 1150 and 1300.

At the same time, farming communities in the San Juan River system and adjoining areas to the south were experiencing a wide range of violent conflict. Skeletal evidence for head and limb traumas consistent with battering and arrow wounds is widespread after A.D. 1000 (D. Martin et al. 2001), reflecting low-level conflict commonly associated with ambush events. Moreover, by the twelfth century, mass killings were taking place throughout the region, producing distinctive archaeological deposits of disarticulated and intentionally fragmented human remains that some researchers interpret as byproducts of cannibalism (Billman, Lambert, and Leonard 2000). Defensible cliff-dwellings and other nucleated settlements were prominent during these two centuries, suggesting that the social costs of competition were considerable.

Various researchers have argued that this violence took place between farming groups (for example, LeBlanc 1998; Wilcox and Haas 1994), but there are signs of "others" in these data. For example, in the La Plata River Valley, an area ranked high in natural resources and well-watered arable land, a pattern of trauma in female skeletons led researchers to conclude that local populations included a substratum of battered women whose natal origins were outside the area (Martin et al. 2001). At Castle Rock Pueblo, in southwest Colorado, at least

forty-one people were killed in a single event in approximately A.D. 1280, including two adult females who appear to have been non-Puebloan and therefore may have been captives or in-married residents (Kuckelman, Lightfoot, and Martin 2002:505).

These small glimpses into a complicated set of biological relationships prevent us from dismissing forager populations categorically from this violence simply on the grounds that we lack archaeological indications that foragers were responsible for *killing* farmers. The presence of hunter-gatherers in the hinterlands of farming groups could easily have had a significant negative impact on overall economic productivity by depleting critical wild resources, or by making foraging trips by small farming groups a dangerous activity. Historic Apache and Navajo bands had exactly this deleterious effect on Pueblo and Hispanic communities in the eighteenth and nineteenth centuries, but left almost no direct archaeological record of their activities. Since farming economies in the region were both marginally productive and a source of significant local wild resource depression (K. Adams and Bowyer 2002; Kohler 1992; Kohler and Van West 1996), any additional external competition could well have been a source of great economic stress; this stress would manifest archaeologically only as violence among farmers because the agricultural part of these relationships is what we can "see." The common suggestion that mobile foragers would have been militarily inferior to massed farming populations and thus unlikely competitors assumes that the conflict would necessarily entail direct predation upon farmers, while in fact, ethnohistorical records for the Southwest point to less direct but indisputably severe negative economic impacts on Pueblo communities by hunter-gatherer groups (Vehik 2002).

The escalating violence of the thirteenth century was a prelude to massive demographic changes that swept through farming populations in the next two centuries. The entire San Juan River drainage was abandoned by farmers after A.D. 1300, irrigation communities in the Salt-Gila system collapsed around A.D. 1450 (J. B. Hill et al. 2004), as did the regional centers of Paquime and La Quemada in northern Mexico (B. A. Nelson 1995; Whalen and Minnis 2001; Waters and Ravesloot 2001), and dispersed farmers in the southern Plains shifted strategies to become full-time bison hunters. New farming communities were

founded throughout the northern Rio Grande Valley and in the drainage of the Little Colorado River, apparently by cohesive groups moving into these areas from abandoned regions (Crown, Orcutt, and Kohler 1996). There are indications of ethnic mixing in some of these communities, and a pan-regional religious cult seems to have formed as an integrative force for these unprecedentedly large communities (Crown 1994). Warfare imagery is prominent in the rock art from this period, suggesting that aggregation did not eliminate competition. And sometime in this interval—perhaps more toward the end than the beginning, but certainly by A.D. 1400—Athapaskan hunter-gatherers moved into the northern Colorado Plateau as the leading edge of a migration from western Canada (Towner, ed. 1996).

The arrival of Athapaskan groups (ancestors of the Navajo, Apache, and Comanche) marked the resurgence of unsegmented societies as the dominant organizational form in the region. Widespread disruption of seasonal precipitation patterns between A.D. 1340 and 1500 (Dean 1996) created spatio-temporal variability in natural resources that favored the flexibility characteristic of mobile hunter-gatherers, while drastically reducing the places suitable for sustained food production. The combination of immigrating foragers (both Numic and Athapaskan) and widespread switching of small-scale farmers to hunting and gathering left the remaining segmentary farmers as distantly separated isolates (see Fig. 3.2). These surviving agricultural communities were wholly unlike their surrounding neighbors, being highly segmentary and dependent on extremely intensive agricultural production. The differences between farmers and foragers in the Southwest at this time were so great as to suggest to some researchers that farmers may have drawn foragers into exchange relationships that essentially converted foragers into highly specialized procurement specialists for farmers (for example, Spielmann, Schoeninger, and Moore 1990). Other scholars are not as sure that relationships were so asymmetrical, and suggest instead that foragers may have had little real need for farming products and engaged in trade for political as much as economic reasons (Vehik 2002).

In either case, the Athapaskan groups that first entered the Southwest were organized for expansion into new areas, with flexible organizations and economies oriented toward high-return resources

such as big game that did not require detailed knowledge of local environments (compare R. L. Kelly and Todd 1988). Historic-period Athapaskans were extremely adept at moving into or through areas occupied by farmers, and there is no reason to assume their ancestors did not present a serious competitive challenge for farmers operating on small marginal returns and consequently dependent on surrounding hinterlands for critical wild resources.

Although dispersed, small-scale farming groups persisted in southern Arizona and northern Mexico after A.D. 1450, agricultural villages were confined to the Rio Grande and Little Colorado drainages. Pueblo villages in these river systems were dramatically larger than anything before, with rooms and resident populations counted in the hundreds and thousands, respectively (fig. 3.6). The agricultural foundation for these communities may have involved some irrigation (although the evidence is scant and ambiguous), but primary field locations must have been in high water table contexts such as alluvial bottoms. These farmers also employed an impressive array of dry-farming features, including check dams, grid fields, cobble-mulch fields, terracing, linear wall alignments, and reservoirs. These efforts indicate heavy labor investment and mobilization, although some of these features may have been designed for the production of specialized crops, such as cotton for textiles, and thus more indicative of overall economic complexity than subsistence productivity (see Herhahn and Hill 1999).

Despite this investment in agricultural facilities, the large farming villages in the Rio Grande Valley continued to move locations relatively often, as in earlier time periods. Chronometric data are limited (Adler and Johnson 1996) but nevertheless suggest that smaller sites (fewer than 100 rooms) generally had shorter occupation spans (one or two generations) than larger settlements (up to 1500 rooms), which span typically in the range of 150 to 300 years, comparable to periodicities of interregional movements in the San Juan River system. However, extensive stratigraphic excavations at Arroyo Hondo (one of the very few large pueblos excavated by modern methods) revealed a punctuated occupational history characterized by fast growth and complex patterns of subsequent abandonment and reoccupation (Creamer 1993), meaning that total span of use indicated by ceramics

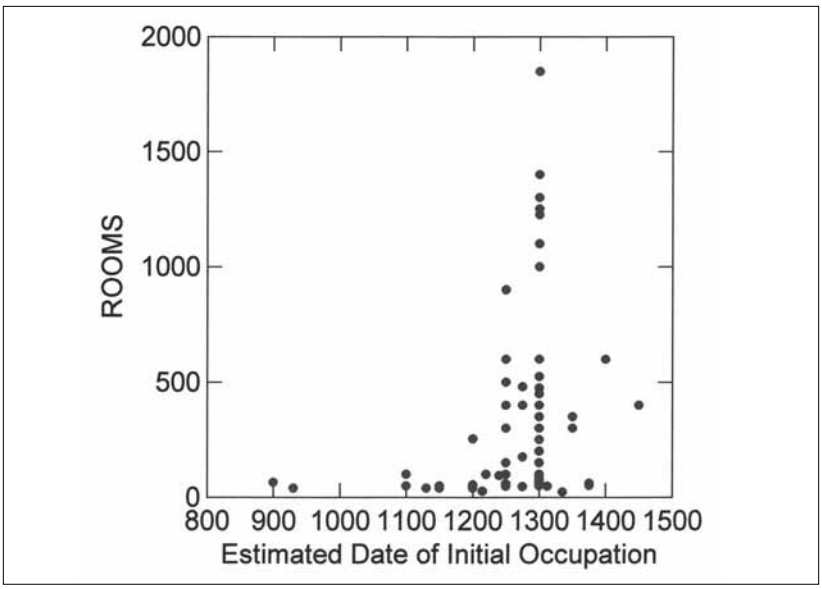

Figure 3.6

Settlement size through time for northern Rio Grande Valley pueblos (from Adler and Johnson 1996).

may mask shorter habitation episodes (see also Crown 1991).

Settlement relocation was obviously a central economic feature in late prehistoric farming villages, consistent with the pervasive emphasis on movement in modern Pueblo oral traditions. Parenthetically, oral histories describe frequent resettlement in prescribed terms dictated by cosmological requirements, rather than driven by environmental crises (Dongoske et al. 1997). In other words, modern Pueblo histories view relocation as a process divorced from external influences on economic production. However, these traditional histories clearly establish the central place of residential mobility in defining modern Pueblo identity.

Indigenous farming populations continued to decline after the Spanish colonial entry to the region in the late sixteenth century, although scholars generally attribute this decline to the well-documented effects of disease, enforced labor, slavery, and starvation resulting from economic disruption by the Spanish; the overall Pueblo

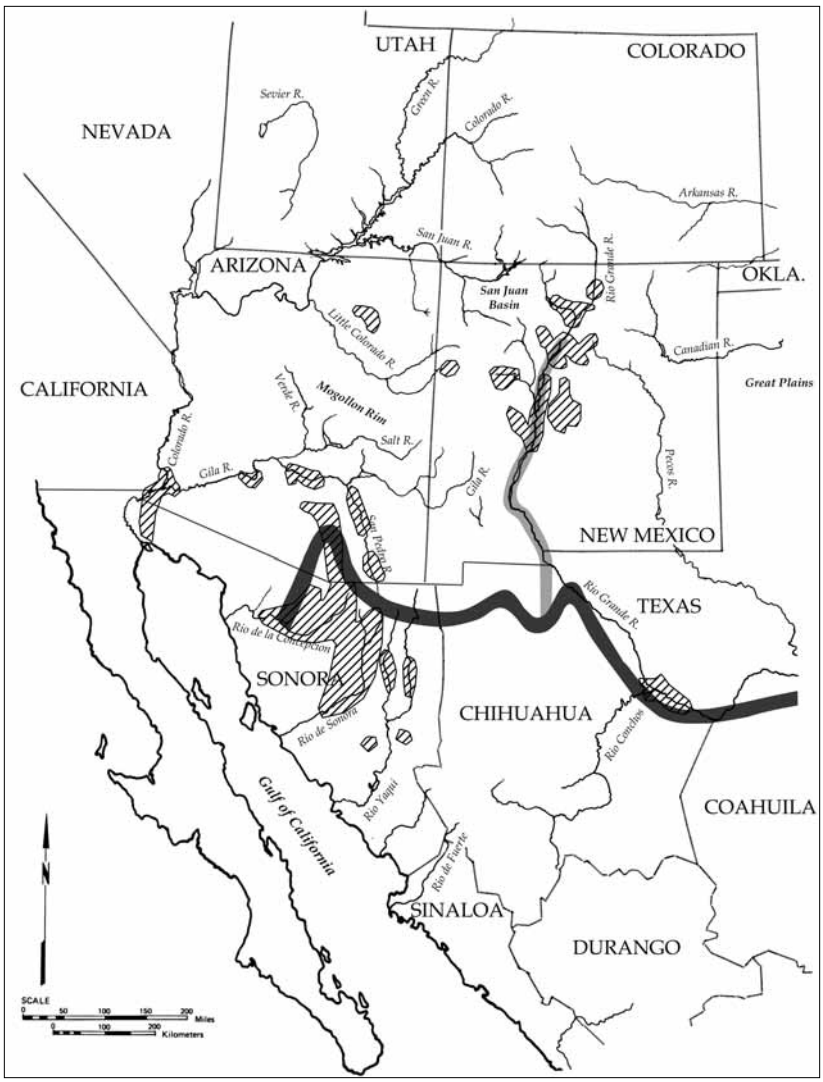

Figure 3.7

In the 1770s, the Spanish government attempted to establish a "Presidial Line" linking military garrisons across northern Mexico to protect the internal provinces from raiding by non-Pueblo tribes. The heavy dark line represents the Presidial Line, while the lighter line traces the course of the Camino Real connecting the Spanish settlements in New Mexico with central Mexico (from Kessell 2002:310).

population nearly became extinct in the late eighteenth century, making a significant recovery only in the twentieth century. Nonetheless, from a regional perspective, the Colonial period (A.D. 1598–1821) reflects a basic continuation of agricultural reduction that began as early as A.D. 1150; despite the introduction of new crops and livestock, the colonial population established a precarious settlement pattern lacking in large towns or productive agricultural systems. By the early 1800s, land grants and small settlements were under tremendous pressure from raids by indigenous non-agricultural groups, and many were abandoned. Agricultural communities were not secure and hence were unable to occupy lands beyond the core Rio Grande Valley until the US territorial period (1842–1912) in the late nineteenth century (fig. 3.7). On this historical basis, it is fair to say that Spanish colonialism did not staunch the decline in Southwestern agriculture that began centuries earlier.

In sum, the history of Southwestern agriculture describes anything but a simple linear transformation of foragers into farmers. Instead, it began with more than a thousand years during which food production (primarily maize cultivation) was embedded within weakly segmented social structures, followed by a thousand years of gradual growth in segmentary systems (paralleled by the continuation of weakly segmented populations), and then a resurgence of foraging accompanied by the rapid decline and near extinction of farming communities. It is difficult to imagine a convincing evolutionary explanation for agricultural development unless it can account for interaction among these economic variants.

ARROYO HONDO AND THE CASE FOR AGRICULTURAL INVOLUTION

Arroyo Hondo and other large contemporaneous villages practiced extreme residential communalism, with hundreds or thousands of residents living in single buildings constructed as modules of linked room-blocks surrounding enclosed plazas. Residential forms varied little within these massive structures, which were usually perched in high, defensible settings or sited on strategic river terraces. The trend toward larger and fewer villages grouped in widely separated clusters was accompanied by the emergence of nearly universal similarities in

socioeconomic structure, including religious and ritual organization that facilitated the exchange of goods, information, and people between communities (Crown 1994; Spielmann, ed. 1998). This striking organizational uniformity predicated on increasingly complex expressions of social life suggests Geertz's concept of involution. And the question it raises is how such a development, which presumably denotes the highly competitive environments in which corporate groups evolve, might be related to the broader economic milieu of expansionist foragers and weakly segmented social systems.

Part of an answer lies in the degree of dissimilarity between late prehistoric farming villages and the burgeoning population of weakly segmented societies. Whereas in early time periods these two organizational forms might have represented ends of a continuum, by late prehistory they were more like opposites, with no intermediate economic forms between them. Being highly dissimilar, these forms were thus inherently resistant to the sort of switching or cycling that probably characterized most of the preceding agricultural period. Mobile foragers could not shift into sedentary villages at the scale of an Arroyo Hondo, and the intensive farming inhabitants of Arroyo Hondo could not simply become hunter-gatherers. It is possible that segments of either population could be drawn into the other, but only on the others' terms and probably in an affiliated, lower status.

Despite their large size, we recognize the features of long-term fallowing systems in the relocation patterns of late farming villages that are traceable to the earliest emergence of household economies. But simple prolonged fallowing does not explain the pattern of larger but fewer villages. When farmers with shifting residential strategies make a move, they acquire an infusion of new resources (land, water, access to non-agricultural resources) that results in initial high return rates (fig. 3.8). Eventually these returns diminish (as a consequence, for example, of soil depletion), triggering a new move, which shifts a community back along its production curve to a segment with high returns; settlement histories can be read as continued efforts to stay in this part of the curve. Farmers moving into new areas may initially recruit other immigrants in order to reach the maximum return rates in the shortest amount of time, but then adopt exclusionary policies when returns decline (for example, G. D. Stone 1991, 1993). Pressure to achieve

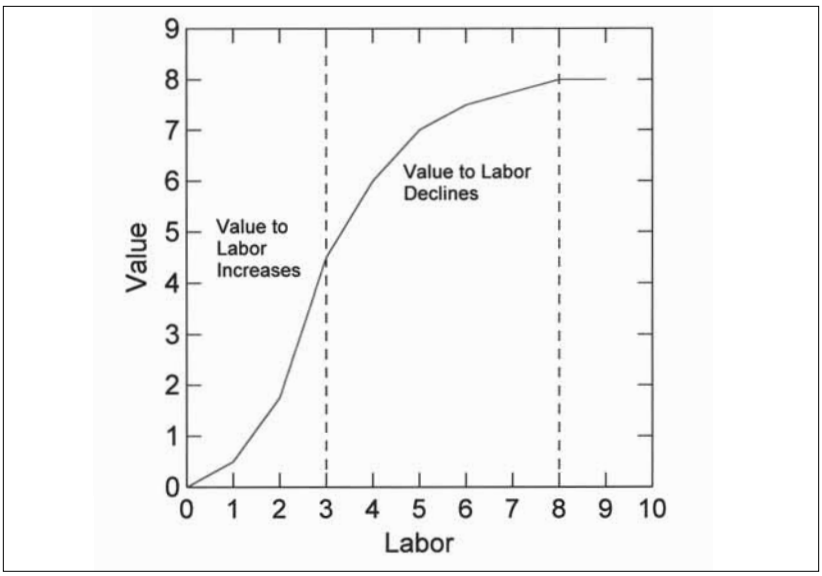

Figure 3.8

A hypothetical production curve for an agricultural village showing diminishing returns to labor. The highest value occurs before the inflection point on the curve.

maximum rates quickly may be greatest when the economy is least diversified, or when it has few resource inputs beyond cultivation. That is, an economy forced to meet all its caloric and nutritional demands through food production is likely to aggressively seek high returns, putting a premium on large founding group size.

However, a consequence of achieving high returns through large initial group size is that declining returns are also reached more quickly, setting in motion efforts to exclude or even evict residents, and eventually relocate. These expendable members of the community are likely to be affiliates of the core social units, and if excluded will either establish dispersed small groups or seek to attach themselves to other larger aggregates. Either response by evicted affiliates would indicate that agricultural subsistence was still possible. In the case of late Southwestern prehistory, however, declining agricultural populations and growing village size were not associated with dispersed small farmers. Rather, the loss of affiliated social units corresponds to a loss from

the overall population of farmers. And this is the archaeological pattern that points convincingly to the competitive presence of forager populations, since in the absence of such competition we would expect dispersed household farms to remain a viable subsistence option, as it had through the entire previous four millennia of Southwestern agriculture.

In such a competitive social environment, the strategy of maintaining high return rates through large founding group size can lead to catastrophic positive feedback. That is, if the constraining population of weakly segmented societies was growing (in part from the addition of small social units sloughed off from farming villages), then with each episode of agricultural resettlement, the only economic intensification opportunity would derive from the increased size of the labor force, which in turn would enhance the value of large groups, thus accelerating the drive toward diminished returns and new movement. Similarly, if each "iteration" of the relocation process eliminated lower-status social groups from the succeeding new villages,[2] then those new communities would be increasingly characterized by core or high-status groups, probably linked by marriage and shared identity. Thus the process leads to large, socially uniform and agriculturally intensive villages not from greater production from agriculture, but from interaction effects with non-agricultural populations.

In this scenario, the farming villages reach their largest size and most complex agricultural economies as they approach the productive limits of long-fallowing and labor recruitment; their immense physical scale masks a tipping point at which economic stability is precarious. Many large seventeenth-century Rio Grande Valley pueblos were destroyed by mobile hunter-gatherers; some of these pueblos were the most powerful encountered by the Spanish at contact. While scholars attribute this loss to the combined effects of colonial oppression and the introduction of the horse to raiding groups, the fact remains that weakly segmented societies were expanding and displacing both Pueblo and Hispanic farmers. In the last centuries of Southwestern prehistory, agriculture supported impressive cultural achievements, but those material expressions should not be mistaken for competitive success with other economic strategies.

There are less evocative ways to describe this proposed develop-

mental relationship than "involution," but I like involution's sense of elaboration within a confined structure that provides limited stability, much like roots of large tree bunched and intertwined instead of spreading laterally. Weakly segmented societies were present throughout the "agricultural period" in precontact western North America, commonly based on foraging alone, and these societies were expanding rapidly during the period when farming was in decline. It is possible that the evolution of agricultural economies in the Southwest was somehow unaffected by the presence of competing social groups organized differently, but we need to demonstrate such isolation first because it is such an unlikely situation. I am confident that farming was never the sole economic variant in Southwestern prehistory, and I am equally confident our success in accounting for agricultural development will have to include a dynamic role for competition among variants, rather than simply monitoring the size or complexity of farming settlements.

Notes

1. The end of the preceramic period (circa 10,000 BC to A.D. 100–400) marked many significant changes in the archaeological record, foremost among them the adoption of ceramic manufacture but also the emergence of more substantial housing, long-term sedentism, and indications in stylistic markers of increasingly localized population aggregates. Thus, the beginning of the ceramic period is an important temporal marker, and for that reason I have tended to present the discussion of early agricultural developments with reference to this boundary. Some archaeologists argue that the earliest ceramics in the Southwest date to 1000–800 BC in southeastern Arizona (Heidike 1999), but the sample is small and may be explained by trade rather than manufacture. While acknowledging these data, I use the period of circa A.D. 100 to 400 as the ceramic boundary because this is the common range throughout the rest of the Southwest.

2. J. E. Levy's (1992) analysis of community factionalism and migration at Hopi villages indicates that migrants came from low-ranking families within clans, rather than simply from low-ranking clans. In other words, the migrants reproduced the hierarchy of the original village from the lower-status members of each clan.