

Seeking a Richer Harvest

*The Archaeology of Subsistence Intensification,
Innovation, and Change*

STUDIES IN HUMAN ECOLOGY AND ADAPTATION

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Tina L. Thurston and Christopher T. Fisher (Editors)

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Intensification, Innovation, and Change*

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SEEKING A RICHER HARVEST:

An introduction to the archaeology of subsistence intensification, innovation, and change

Tina L. Thurston and Christopher T. Fisher*

INTRODUCTION

Plowed ground smells of earthworms and empires. – Justin Isherwood

In current times, intensification is most often discussed in terms of feeding the world's poor, counteracting globalization, or improving the balance of trade, issues earnestly debated by economists, geographers, development experts, and agricultural soil scientists, chemists, and the like (i. e. Bashaasha et al. 2001, Bebbington 1997, Byerlee et al. 1997, FitzSimmons 1986, Pingali 1989, Smith et al. 1994). When one speaks to current farmers, the voices are more immediate, if sometimes ambivalent (Bennett and Warrington 2003a). Some praise intensification and the coming of the “new” while others damn it, still others point out both successes and failures with the introduction of ‘scientific’ farming.

For the historically documented past, one finds many illustrations of experimentation with subsistence methods and their relative intensity (Bassett 1988, Jacobs 1996, Koval'chenko and Borodkin 1988, Rhode 1995). Some past processes are described as driven by a need for more food or to supply markets; others as attempts to

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prop up states and empires; usually, there is a substantial distance between the historian's voice and the reality of fields, pastures, and high seas.

In some ways, traditional archaeological approaches to the study of subsistence change have been akin to historic voices - distant, omniscient, and mostly about *outcomes* - or perceived outcomes - this volume seeks to consider the conditions of past farmers, herders, and other producers more directly, taking cues from ethnographers and NGOs, as opposed to historians and demographers, to learn not only about structures and institutions, but also about experience, intention, and process.

With this volume, we attempt a fresh look at an old topic - the intensification of food production - long cited as an important indicator or engine of cultural evolution in the archaeological record. Intensification of subsistence generally refers to productivity increases generated through changes in the methods of agricultural or pastoral production (see discussion Morrison, 1994:115) - a seemingly simple concept that has proved surprisingly difficult to apply. In archaeology, intensification itself is almost always imagined in similar ways: explanations typically focus on "how agriculture intensifies, who benefits, and who (or what) pays the price" (Dove 1997:399), referring to the technologies and features of agricultural systems.

Intensification has been invoked as both a cause and outcome of state development, population growth, climatic or environmental change, and centralization, and in addition, often forms the basis for explanations centered on the evolution of subsistence systems (R. McC Adams, 1966; Blanton, et al., 1982; Boserup, 1965, 1981; Brumfiel, 1983; Butzer, 1977; Erickson, 1993; Flannery, 1972; Haas, 1982; Kolata, 1996; Parsons, 1991; Parsons et al., 1985; Sanders, 1976; Sanders et al., 1979; Steward, 1949, 1955; Wittfogel, 1957; Wright, 1986).

Given the centrality of intensification to seminal archaeological explanation, and the major shifts in archaeological thought over the past two decades, it is remarkable that more has not been written on the subject in recent years (though there are exceptions - i.e. Hastorf 1983, 1993; Hastorf and Earle 1985, Kirch 1985, 1994; Lidefoged et al. 1995, Leach 1999; Morrison 1994, 1996; Nichols 1987; Stahl 1995; Stone and Downum 1999). Even fewer have attempted to study other processes of subsistence change, such as specialization, diversification, or disintensification.

As some have noted, archaeologists working in a variety of contexts "routinely and incorrectly label virtually any kind of subsistence change... 'intensification.' They conflate intensification with more extensive use of some resource rather than employing the term to refer to increased *per capita* labor expenditure for a specific resource or for overall subsistence (Arnold et al 2004:1)." Many consider the conditions of agrarian production and neglect discussion of large-scale marine exploitation, or the complex connections between livestock and cereal strategies (Bencherifa and Johnson 1991, Blowfield and Donaldson 1994, Bourne and Wint 1994) and the multiplicity of mixed processes adopted by farmers to exploit niches and short-term opportunities. Others fail to imagine that conflicting local needs and state demands form a complex matrix of pressures, resulting in a simultaneous combination of strategies (Potter 2001). There is also a tendency to forget that "processes of intensification and innovation that are implicated in change to agricultural systems are, similarly, instances of more general processes of adaptation and transformation

which underwrite change in complex systems (Minnegal and Dwyer 2001)” (see also Blanton, this volume).

This lacuna is keenly felt at a time when many contemporary archaeologists have begun to question the utility of the intensification concept (Leach 1999) and re-examine long-held concepts of general cultural change: deep-rooted assumptions regarding the causal primacies of population pressure, elite control, and ecological limiting factors have also come under scrutiny. New renderings of the intensification concept emphasize the role of inequality rather than population pressure, human ingenuity in dealing with climatic or environmental conditions rather than as limiting factors, and the power and agency of non-elites and subaltern groups.

While there are a wide variety of works describing the origins of subsistence systems, and their consequent spread and adoption by foragers, a compendium of both theoretical and case-specific treatments on intensification and other processes of subsistence transformation is lacking. We hope this volume will help fill this gap, and add other voices and perspectives to the discussion.

A BRIEF HISTORY OF SUBSISTENCE INTENSIFICATION STUDIES

“...small landholders are the most precious part of a state.” – Thomas Jefferson

“Agriculture not only gives riches to a nation, but the only riches she can call her own” – Samuel Johnson

“Whoever could make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before, would...do more essential service to his country than the whole race of politicians put together.” – Jonathan Swift

It is not surprising that the views of these famous Enlightenment figures regarding the farmer and the state reflect the preoccupation of classic 20th century processualism with its ‘surplus producers’ and their ‘ruling elites’; both are rooted in a concept of class and power situated firmly in Modernity. It is safe to say that contributors to this volume generally argue against the materialist and ahistorical tenor of such systemic and normative views. Such perspectives originate in the longstanding debate linking demography to intensification that is usually traced to the 19th century economist, Thomas Malthus, whose dismal view of humanity squeezed between population pressure and intensity of production was based on the idea that higher levels of production would lead to higher populations without the resources to support or even feed themselves. For these poor souls, he predicted a downward spiral of disease, famine and warfare (Malthus 1798), mitigated only temporarily by social controls on population and innovations in food-producing technology. These improvements, however, would only lead to higher populations, beginning the cycle of misery once more.

A little more than one hundred and fifty years later, Ester Boserup, a Danish economist, was among the first to intelligently argue against this view, by suggesting that population growth and the resultant population pressure successively acted as

‘tipping points’ toward increased inputs of labor: prime movers for the adoption of new agricultural technologies or strategies, such as shortening fallow periods, raising productivity, and even constructing features such as terraces and irrigation canals. Such improvement, if continual, could keep human groups a step ahead of starvation. Yet she also saw a downside, envisioning that while yields per unit of land would increase, the labor input necessary was so high that labor efficiency per unit of land would eventually drop. People would be working too hard for the food they were getting, and thus would be unlikely to adopt or continue such strategies under normal conditions.

Boserup’s more optimistic view on demography and population (1965, 1970a, 1981) was readily embraced by many New Archaeologists, as part of their avid adoption of ideas from other social science disciplines. One of the first and most influential works in this vein was the volume edited by Brian Spooner, entitled *Population growth: anthropological implications* (1972), with contributions from numerous archaeologists including Adams, Bronson, Carneiro, Sanders, Smith and Young, and Wailes – for all intents and purposes covering every major world area. The volume thus provided a key point of dissemination for Boserupian demographic/labor oriented intensification theory into world archaeology. In the same year, *Annual Reviews* brought out an article which unquestioningly supported these assumptions (Baker and Sanders 1972).

In answer to this, the edited volume entitled *Population Studies in Archaeology and Biological Anthropology: a Symposium* (Swedlund 1975) appeared, a publication of the Society for American Archaeology, in which the Boserupian line was debated by more of the era’s greatest names, several of whom wrote vehemently *against* the idea of population driven subsistence shifts (i.e. Blanton 1975, Cowgill 1975b). Dissent from the ever-broadening application of Boserup to the archaeological record was also a key ingredient in Cowgill’s (1975a) “On Causes and Consequences of Ancient and Modern Population Changes” – an influential piece still read in many a graduate seminar.

Boserup’s work was an especially useful framework for the newly empiricist-inspired studies of the 1970s and 1980s, as it identified archaeologically visible features as evidence of subsistence systems and changes. Throughout the 1970s, those who called themselves New Archaeologists rejected earlier notions that each culture was generally normative in time and space, an assumption that had allowed the previous generation of archaeologists to presume past “mental templates” for accepted behavior and attitudes. New (later ‘processual’) Archaeologists replaced this with the more measurable, and thus supposedly testable, concept of society as a set of subsystems within a system of culture, which might be recognized archaeologically through material remains - in other words, instead of attempting to model what ancient people were thinking or planning, which was seen as fruitless, they attempted to limit their work to what could be observed materially, conceptualized primarily as external reactions to the environment. As general systems theory and other materially focused concepts were adopted by New Archaeologists, the concept of population pressure, linked to need for a greater food supply, observable through a set of possibly visible and quantifiable “subsistence strategies” fit in well with then-current paradigms.

A flurry of intense interest in such topics followed: *Annual Reviews* surveys of ‘demographic methods’ in archaeology, a code-name for Boserupian interpretations, were spaced rather closely; in the first, Baker and Sanders (1972) staunchly supported Boserupian principles of subsistence change and intensification with only the slightest of nods to possible alternatives (1972:162). Not long after, Weiss (1976:366) noted that while the Boserupian view of intensification and other subsistence change is pervasive, there were many challenges to such notions with which he agreed. Another review appeared in 1978, authored by previous dissenter Swedlund, in which he argues against the intensification model based on demographics and instead suggests that subsistence pressures occur on a “resource-specific basis” – sometime at levels far below ‘carrying capacity’ (Swedlund 1978:153) – and that stress may or may not occur when supply and demand for fixed and renewable resources oscillate in different ways. Supply is limited by both the desire and the ability of producers to increase production. He detects a clear difference between the causes and mechanisms of fluctuations in both population and subsistence products (1978:156) and further suggests that decisions to change subsistence methods may be made at various levels: the family or household forming one possibility, with others found among class factions, gender groups, or political parties, depending on the case study and the questions being asked (Swedlund 1978:160).

Hassan (1979), in yet another *Annual Reviews* piece on the same topic, notes arguments both for and against population pressure-driven intensification, pointing out that other causes may lie behind subsistence changes, yet he offers as alternatives mainly the external: “changes in the yield, quality, aggregation, association, seasonal predictability, and spacing of resources as a result of natural or man-made climatic-environmental changes”...“fires, overgrazing, overkill, salinization, erosion, and soil depletion (Hassan 1979:147)” while somewhat cryptically offering “man’s [sic] propensity to accept innovations that may better satisfy his needs, lower his subsistence effort, or increase the yield at lower or the same levels of effort (Hassan 1979:147).”

Boserup’s then-recent book was described contemporaneously as an important ingredient in many arguments for intensification under conditions of social or natural circumscription (Cowgill 1975a:507), as well as “socio-cultural complexity and accumulations of wealth and power” that follow. Carneiro (1970, 1972), Sanders and Price (1968), and Smith (1972), among many others, relied heavily on the implication that exponential population growth was endemic or at least typical in prehistoric societies of all types, and that it could be assumed when constructing archaeological models. After the late 1970s, despite a record of substantial, if limited, dissent, there was clearly a ubiquitous adoption of Boserup’s ideas into the archaeological study of subsistence choices. Remarkably, ten years later, Howell’s *Annual Reviews* piece (1986:234) tacitly concedes victory to the Boserupian model, with no references to any opposing views.

The next important influence on archaeological subsistence change theory was the work of ethnographer Robert Netting, which strongly reflected and built upon Boserup’s concepts, and also became a model for processual archaeologists, perhaps because many of his arguments are rooted in an assumption of functionalism, which was perceived as well-suited to the difficulties of the incomplete and materially-based archaeological record. Assumptions of a “universal” functionalist set of mo-

tives and rationales behind agricultural and pastoral decisions permitted the modeling of past societies based on observations of the present. Netting, a protégé of Julian Steward, reinforced this perspective. His extensive studies of the Kofyar people of Nigeria formed the model for many archaeological hypotheses about intensification, especially through arguments connecting population growth with social change. He typically described social behaviors as adaptations to the problems of farming, highlighting the adaptive advantages of smallholder households in the intensification process.

In addition to its functionalist perspective, Netting's earlier work also mainly focused on external pressures and their effects on farming and ranching: war, disease vectors, and population increase or decrease (Netting 1973) although he also attempted some examination of internal, ideational issues (Netting 1972). He continued throughout his career to argue for economic rationalism as the root of most decision-making among farmers (Netting 1993).

The paradox of Netting's work is that despite what might be seen as flaws by many archaeologists today, he also offered valuable insights that run deeply in many of this volume's contributions: unpacking the notion of inherent links between intensification and degradation (Netting 1993), instead suggesting that degradation occurs in the absence of intense land management, or due to sudden drops in its presence (Fisher, this volume, van der Leeuw 2005), a position which led him to question whether population growth was to blame for many current environmental problems. He also was ahead of his time in suggesting that the concept of inherent "sustainability" among indigenous peoples may be spurious: smallholders may be better adapted to manage intensive farming than "elites" (1993:100), but their management could be substantially flawed. Another important perspective he pioneered was that indigenous corporate management of institutions are not "survivals" of quaint but outmoded institutions, but dynamic, contemporary strategies (Netting 1993:185), and form a vital and successful "indigenous solution" to subsistence problems (1993:20), directly arguing against the typical notion of top-down imposition of land tenure rights on common people by their rulers. Finally, he reminded his readers that the timeline for the outcome – success or failure – of many observable subsistence decisions is a long one, perhaps best showcased through archaeological frameworks (1993:145).

Another important figure in the agricultural transformation debate is Harold Brookfield, an economic geographer upon whom archaeologists have drawn for decades. Although an early proponent of Boserupian ideas (i.e. Brookfield and Hart 1971), as early as 1972 he recognized the existence of what he termed *social production*, as contrasted with subsistence production, where "inputs may be wildly uneconomic when measured in calorific returns yet wholly reasonable when measured against social returns (Brookfield 1972)." By the 1980s, he had developed further concepts that find utility in current archaeology: agricultural "innovations" defined as strategies that introduce qualitative changes to the production system and can increase the productivity of labor (Brookfield 1984) – departing steeply from Boserup who stated that "higher labour requirements would make cultivators reluctant to innovate (Allen and Ballard 2001:159)." Another important modification was his notion that if a society was forced to deal with environmental constraints on agricul-

ture, that it could well mandate a “more technologically elaborate agricultural system” – a concept missing from Boserup and the focus of many critiques (Allen and Ballard 2002:159). Perhaps most influential was his the concept of *landesque capital* (Brookfield 1984) discussed below and elsewhere in this volume (i. e. Fisher).

Thus, over time, the original Boserup model and its later incarnations were critiqued on several fronts. Even in his consideration of her original publication, Cowgill (1975a) was strongly skeptical of the concept, readily adopted from Boserup, that human groups have trouble internally regulating their own growth, thus leading to overpopulation, noting that if this were so, the planet would have had a billion human residents after only several thousand years. (1975a:508-10). However, he notes that some of the best-known theorists of the era had already substantially bought into the concept. Cowgill rightly noted that in many cases these ideas were implicit, rather than explicit: the authors’ data revealed the flaws, but they did not seem to acknowledge this: they ‘know’ it, but don’t ‘realize’ it, in Cowgill’s words (1975a:509). This lack of explicit discussion was one of the insidious pathways through which such critically flawed hypotheses seemed to have been “tested” and supported. The privileging of the importance of external pressures (such as uncontrolled demographic increase) in the processes of social change was one of the prime motivations for both moderate and radical critiques of processual archaeology.

Other critiques went the opposite way: some argued (e.g., Lee 1986, Richerson & Boyd 1998, Turner & Ali 1996, Wood 1998) that Boserup and Malthus were both wrong, but primarily because their visions should be expanded to the degree that they are seen as complementary, representing negative and positive phases of more long-term cycles within the dynamics of population and environment. This view in itself has been critiqued as lacking any consideration of the cultural contexts of both agriculture and population dynamics (i.e. Cowgill 1998). Stone and Downum (1999) argue that Boserup is correct under certain conditions, but not under others. Many might state that a substantially modified Boserupian perspective is now the norm among many ethnographers, geographers, and the like, that takes into account the complex dynamics of agrarian change (Clarke 2001).

Some have rejected Boserup entirely, as reductionist, unilineal, and facile (Brookfield 2001, Hunt 2000, van der Veen 2005), with recent criticism focusing on the proposed “one-way” course of intensification from simple to complex agrotechnologies, the lack of consideration for inputs other than labor, and the ‘law’ of diminishing returns – the concept that increased labor is essentially fruitless, as it results in diminishing returns for the effort. The concept of *landesque capital* (Brookfield 1984, Blakie and Brookfield 1987), a type of technology which does not require constant labor inputs, is an important contribution in this area.

Others ask us to move “beyond” Malthus and Boserup entirely (Stone 2001, Brookfield 2001) and unpack the concepts of demography and subsistence strategies, instead urging us to consider more internal engines of choice, related to human experience. Long ago, Cowgill (1974) and others had already recognized that intensification and other subsistence shifts may more logically be tied to “new opportunities” as equally as they are to stress or “threat of hardship” (Cowgill 1974:514). As it happens, one of the most vociferous proponents of this sea change is the early Boserupian Brookfield himself, who, through remarkable self-critique now advocates that

important determinants of subsistence change include a producer's management (in contrast to purely technical) skills, their diversification efforts and production investment, and their ability to find new ways of organizing resources – and finally, the livelihood opportunities to which they are exposed (Brookfield 2001). Expanding upon his early idea of 'social production', he argues that "adaptation, innovation, and the seizing of opportunity can take place within a wide range of social, demographic and environmental conditions (Allen and Ballard 2001:159)." This is reflected in recent archaeological critiques that indicate intensification often involves non-food crops or luxury foods, that have social rather than economic meaning (Hayden 2003), or to surplus production for trade (see Leach 1999, Morrison 1994, 1996 for a review).

Boserup herself had great interest in gender issues, proposing that hoe-based intensive farming was a female activity, while plow-based farming was generally male (Boserup 1970b) with implications for more generalized gender roles. The role of women in indigenous agriculture worldwide continues to be avidly studied by ethnographers, economists, development experts and others. In anthropology, the argument that women's decision-making role in agriculture lessens with intensification, perhaps through cooption by male work organization modes and mobility, resulting women's withdrawal into more domestic roles has been made for some time (i.e. Ember 1983, Burton and White 1984). Others contend that this is an oversimplification, and that women's role in intensification is varied, and is determined more by historical context than technology or environment (Stone et al. 1995) and that women, despite their roles in procreation and householding, remain actively engaged in performing and managing intensive agriculture (Cleveland 1985, Cohen 1984). A neglected area of study remains the use of children as a valuable labor pool (Kramer and Boone 2002).

Questions about the gendering of agriculture and subsistence choice have in recent decades become a consideration in archaeological study as well. Some archaeologists have published on the role of women in the development of farming, and the gendering of decision-making and labor inputs involved in subsistence, and have begun to study of the role of gender in intensification and other strategies of change. A few have pursued Boserup's ideas on the impact of changing economic circumstances and subsistence strategies on gender roles and relations such as is seen in recent times (i.e. Galle 1999, Guyer 1991, Prezzano 1997, Rautman 1997, Williams and Bendremer 1997, Watson and Kennedy 1991). Women may have continued to be major contributors to decision-making with the advent of subsistence intensification and change, as they are in current times, and 'intensive gardeners' may have been the "locus where ecological knowledge was learned, controlled, and transferred (van der Veen 2005:159). Small but highly labor-intensive, staple-producing gardens figure importantly in both simple and complex intensification processes (Jones 2005), reflecting the ethnographic observation that in many cases "garden money buys grain (Becker 2000)." The concept of the current worldwide "feminization" of agriculture (i.e. Bencherifa 1990, Besteman 1995, Jha 2004, Pala-Okeyo 1979, 1980) due to the absence of males who migrate for warfare, work, and other opportunities, is mirrored in archaeological inferences about the causes of periodic female assumption of duties in typically male domains (i.e. Arnold 1996).

Thus, over the last decades, the concept of intensification has undergone evolution along several critical threads originating within anthropology, geography, development and elsewhere (see Brookfield 2001:199, Kirch, 1994:15-20, Morrison 1994), yet despite critiques both mild (Lee 1986, Wood 1998) and harsh (Leach 1999, Morrison 1996) for many archaeologists, the entrenched “classic” Boserupian model has remained fairly static. While some current ‘anti-Boserupian’ archaeologists like to believe that these long-popular arguments are essentially dead, this is clearly wishful thinking on the part of her critics. As recently as 2001, Asia Pacific Viewpoints committed an entire two-issue special publication discussing Boserup and post-Boserupian ideas on intensification in Asia, and many archaeologists still consider her ideas an entrenched force to be contended with (Arnold, Walsh and Hollimon 2004, Erickson 1998, Morrison 1996, Stone 1996, van der Veen 2005). Yet others continue to use Boserup quite uncritically in their work (i.e. Sagona 2004).

In the continuing *melée*, it is easy to forget that Boserup should get her due: she was a revolutionary thinker, whose own work and ideas evolved substantially during her long lifetime (1910-1999), even while those who adopted and used her original concepts did not. She conducted fieldwork around the globe, published prodigiously, and brought social science insight to issues where false and detrimental ideas had been entrenched through inference and implicit acceptance since the 18th century and before. Born and raised in an era when white, western males (including anthropologists) believed that all others were inferior, she brought issues of inequality, gender, race, land tenure, development, and food supply and to the attention of both the academic and non-academic spheres: perhaps her most important contribution. Her current proponents and critics typically acknowledge this fact.

CURRENT MODELS FOR SUBSISTENCE CHOICES

“Happy he who far from business, like the primitive are of mortals, cultivates with his own oxen the fields of his fathers, free from all anxieties of gain” – Horace

“Farming looks mighty easy when your plow is a pencil, and you're a thousand miles from the corn field” – Dwight D. Eisenhower

Brookfield (1972), a geographer, sparked by shortcomings in the Boserup model and informed by his own research in the Pacific, contributed one of the most detailed intensification definitions, which has been taken as a starting point by critics (see Leach 1999, Morrison 1994). Brookfield’s formal economic definition stated that when

“Strictly defined, intensification of production describes the addition of inputs up to the economic margin, and is logically linked to the concept of efficiency through consideration of marginal and average productivity obtained by such additional inputs. In regard to land, or to any natural resource complex, intensification must be measured by inputs only of capital, labour and skills against constant land. The primary purpose of intensification is the substitution of these inputs for land, so as

to gain more production from a given area, use it more frequently, and hence make possible a greater concentration of production (Brookfield, 1972:31).”

Brookfield provides two accompanying caveats that, as argued by Leach (1999), are often ignored in archaeology. The first notes that agricultural technologies with similar labor inputs (i.e. permanent field mounding and simple swiddening) have distinct social implications and, by considering only labor, critical differences in organization and productivity are missed. One analogy drawn from the Americas would be differences in terrace and raised field agriculture: both require similar labor inputs (see Fisher this volume) but, because the output of wetland agriculture is much higher, it potentially yields surplus used to finance power. Distinct theoretical implications are associated with two contemporary techniques. As a solution, Brookfield suggests an additional measure of skill and complexity (Brookfield 1972).

The second caveat provided by Brookfield (1972) suggests that intensification may also cause social and organizational changes not physically apparent but having profound production implications (mirrored in Blakie and Brookfield’s definition of *landesque capital*, see discussion below). For prehistory, such transformations are reflected in elite culture predicated on transforming surplus into power. This mirrors recent work that considers the social implications inherent in various agricultural methods. More recently, ethnographers and archaeologists alike have stressed the importance of several other “inputs” – such as knowledge, information, and technology, “inputs” that are completely left out of Boserup’s (1965) definition of intensification, the jumping-off point for so many past and recent studies of subsistence change.

Recently there has also been a new mandate for studying the impetus behind intensification beyond mere subsistence production increases. Extreme efforts may be put in to producing small quantities of highly valued but limited-use resources such as religious or prestige-related items. People who are pressed to produce more for elite consumption may be worked to death for meager increases in production. Finally, producers may not realize that their attempts are unlikely to raise yields: we recognize that the object of our studies is not agronomy, but social organization, inequality and power, along with numerous other issues; thus, the study of *failed* or *abandoned* attempts at intensification should be considered to be as important as the documentation of successful ones (Morrison, this volume).

Another important consideration is that different types of intensification produce either short-term or long-term benefits, which can be conceptualized as lying along a continuum where we can place different strategies. Some groups favor one or the other end of the spectrum almost exclusively, while others utilize both short-term and long-term strategies at the same time. Depending on what other conditions arise or vanish, these choices and combinations can change over time.

For example, in some circumstances, cattle production can be intensified fairly quickly and easily, and disintensified just as rapidly when economic opportunities diminish (Bencherifa & Johnson 1990). On the other end of the spectrum, we can refer to the concept of *landesque capital* developed by Brookfield (1984) and Blakie and Brookfield (1987) to distinguish landscape investment designed for long term gain (see also Kirch, 1994). *Landesque capital* refers to labor that has been environ-

mentally ‘banked’ through the construction of stone walls, terraces, drainage systems, irrigation systems, raised fields or other intensive features. This “built” capital provides benefits for generations – if maintained. Thus, the social capital created by these long-term investments is quite different than what is gained by the rapid and opportunistic intensification that might in some instances be achieved with livestock or methods which require constant and high labor inputs, such as manuring.

Some authors make a finer distinction, distinguishing between *innovation* and *intensification* (Bender, 1978; Brookfield, 1984; Blakie and Brookfield, 1987; Kirch, 1994). Both result in higher output, but with innovation this is achieved through increased productivity while techniques of intensification require higher labor costs. Thus, by the law of least effort, intensification is sometimes associated with coercion while innovation is adopted to gain “advantage” (Bender, 1978; Brookfield, 1984; Kirch, 1984 – see also Leach, 1999). However, it is not unusual ethnographically to see local groups self-organize to “gain advantage” in paying taxes or tribute, an indirect coercion, rather than for their own improved life-style or leisure time, leading us to another continuum of strategies.

Kirch (1994) created a “working taxonomy of agricultural change” to distinguish between intensification and innovation in the archaeological record. Intensification is defined, as noted, by more inputs of labor or skill into standard units of land, but two *types* of intensification are identified. The first, *cropping cycle*, is the classic sequence of long to short fallow systems implied by Boserup (1965). This refers to sequences where, for example, a system where half the land is fallow while half is cultivated shifts to a system where only one third is left fallow, thus increasing land under production at any given time. The second category of intensification is that of the above-described landesque capital, meant to include landscape modification serving as infrastructure.

Innovation, as defined by Kirch, involves increased productivity without increased labor: new tools, planting methods, mulching, water control devices, and erosion control classified as *agronomic – technologic* innovation. *Genetic* innovation, encompassing biological changes in crop assemblages, forms a second, often missed category (but see Kirkby, 1973).

This division between innovation and intensification is useful, but presents its own problems, as it can in fact be argued that landesque capital is also innovation, since after initial construction labor, labor diminishes while returns rise. Must we thus declassify such systems as terraces, raised fields, and canals from the roster of intensive strategies? Not necessarily – one can argue that as long as farmers are aware that their methods remain more productive than other methods, i.e. that ceasing to maintain the system would lead to lower returns – the investment of initial labor is still a part of the system. In addition, while maintaining canal systems and other landesque capital systems may require less labor than building them, maintenance itself may require *more* labor than some extensive forms that might precede such infrastructure (but see Fisher, this volume).

Another factor confounding the concept of dividing intensification and innovation is the adoption of new methods during an availability phase: a group may know of and be familiar with new crops, new tools, and new methods used by neighbors, yet choose not to adopt them. When circumstances, either social, environmental, or

both, invite eventual adoption, can we really call this “innovation?” Rather, it provokes the question “why did they wait, postpone, and finally adopt” these already familiar, but unused methods.

If anything, we conclude that there is no constraint to adhere to Boserup’s conceptualization of intensification. So much about the theory, as initially set forth, has proved problematic, that the narrow definition of labor as the only intensifying “input” into land may be judged overly rigid. Nor should we seek to decouple intensification from so-called innovation so strongly that we fail to connect them as parts of the suite of strategies available for the management of production.

EXPLANATORY MODELS FOR INTENSIFICATION

“Our traditional agriculture was fully self-reliant. The seeds, the manure and the bullock, everything was personal. Only seeds were exchanged by farmers. But the farmer today is totally dependent on the government machinery. It would not be an exaggeration to say that he has become a slave to multinational seeds and fertilizer.” – Vijay, Male. 41, activist/farmer, India (Bennett and Warrington 2003b)

Intensification explanations can be broken down into elements falling along two axes. Each is a continuum defined at the poles by the differing core assumptions inherent to each interpretation. More than one interpretation is often seen when different researchers consider the same case study, which might be viewed as misinterpretation by one or the other. On the other hand, this can represent actual change in agro-economic practice and strategy: cultures can, in reality, move along these continua depending on what conditions are extant, what impetus they have, and what outcomes are sought.

The first continua, characterized as the ‘top down’ and the ‘bottom up’ (Chambers, 1980; Scarborough, 1991; Erickson, 1993) encapsulates debate over who, and with what resources, constructed or organized intensification features, innovations, or other planned changes. The more traditional ‘top down’ approach, following the ‘hydraulic hypothesis’ (Steward, 1949, 1955; Wittfogel, 1957), suggests that the complexity, large scale, technological sophistication, and massive labor required for intensive agriculture demands coordination, planning, management, and possibly coercion by a centralized entity; most often a state (Kolata, 1991, 1993, 1996; Matheny and Garr, 1983; Sanders et al., 1979; Stanish, 1994). This moves intensive features beyond the purview of kinship group, community, or small polity-based sociopolitical entities with such systems dependant on regional scale mechanisms of socioeconomic integration. In this model, only state level societies are capable of absorbing presupposed high labor, capital, and administrative costs.

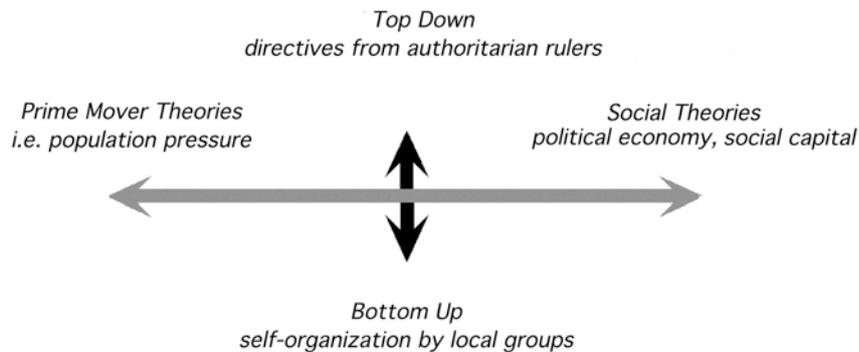


Figure 1. Continua along which intensification explanations can be theorized.

Recent archaeological research has re-examined the ‘top down’ approach. In several cases, what appear to be state-mandated and planned schemes have turned out to be of local origin, design and maintenance. Some authors have argued, for example, that raised fields and associated settlements appeared before and after the Tiwanaku state’s rise and fall, and thus can not have been organized by the state. (Erickson, 1993, 1999; Graffam, 1992). Raised field and canal systems also appear before regional integration in other areas of Latin America (see Denevan 2000; Doolittle, 1990; Sluyter, 1994; Whitmore and Turner 2002). Recently Erickson has proposed a ‘top down’ alternative arguing that

“Various sources of evidence strongly indicate that raised field farming was organized, at least initially and probably throughout its history, at the local level. These pre-Columbian agricultural works are the accumulation of the activities of many generations of farmers producing a totally human made landscape (1993:371).”

To summarize, a ‘top down’ view sees the scale and complexity of intensive landscapes as requiring planning, coordination, and management accomplished by centralized control. In contrast the ‘bottom up’ perspective emphasizes an accretionary mode of agricultural system growth (Doolittle, 1984; Scarborough, 1991) based on family and kin organizations providing planning and labor for intensification. In the middle of this continuum lies the probability that the state sometimes exploits and manipulates already extant intensification methods for its own support.

The second axis is composed of explanations promoting different causal mechanisms for intensification adoption. Perspectives explaining intensification by either prime mover (push) or political economy (pull) based mechanisms form the poles of this continuum (Morrison 1996).

In the push-based mode farmers only participate in a labor-intensive mode of subsistence because they are responding to resource imbalance, most often demographic. This ‘prime mover’ oriented approach makes population pressure (Boserup, 1965, 1981; Sanders et al., 1979; Turner et al., 1977) an evolutionary mechanism seen as a prerequisite for intensification.

As has been noted, for some decades, the literature has critically examined the systemic relationship between population growth and agricultural intensification first proposed by Boserup (1965), and implicit in the prime mover approach (e.g. Blanton, 1975; Cowgill, 1975a, 1975b; Feinman and Nicholas, 1990a, 1990b:104-5, 1992; Feinman et al. 1985; Kowalewski et al. 1980). This growing body of archaeological literature demonstrates that the causal link between demographic stress and agricultural intensification is absent (e.g. Blanton et al., 1981, 1982; Brumfiel, 1976; Feinman et al., 1985; Kowalewski et al., 1989). Part of this rejection is linked to the eventual abandonment of “systems theory” by the social sciences which in archaeology meant that the concept of culture as a set of systems style relationships was discarded (see Zimmerer, 1994, 2000).

‘Political economy’ explanations form an alternative, modeling intensification as a means of predictable surplus that can be used to facilitate systems of exchange, risk management, craft specialization, and tribute or taxes. This may be observed in both kinship-based societies and in states (Arnold, 1995; Blanton, 1995; Brumfiel and Earle, 1987; D’Altroy and Earle, 1985; Earle 1991; Feinman, 1995; Gilman, 1991; Hayden, 1995; Plog, 1995; Wright, 1984).

The difference between ‘prime mover’ and ‘political economy’ perspectives is the emphasis placed on either external or internal mechanisms of evolution. For ‘prime movers’ expanding populations move causation outside the socio-economic sphere of human control. In contrast, political economy models see intensification resulting from human-driven strategies for agricultural surplus promoted by elites financing power acquisition.

INTENSIFICATION AS PROCESS

“Yes, in the first year I thought [chemical fertilizer] was really wonderful. But in the second year the yield began to fall, and in the third year it fell even lower. In the fourth year it was exactly where it was before I started using fertilizer. The money that I spent on buying the fertilizer is a separate matter. Our land was harmed in exactly the same way that a man's body harmed when he drinks liquor. That was the effect the fertilizer had upon my land...” – Sudesha, Female, 50s, activist/farmer, India (Bennett and Warrington 2003b)

Distinguishing between an intensive form of agriculture and the process of intensification requires distinct archaeological evidence (see Leach’s critique of Kirch, 1999:315). The former is accomplished (following Kirch, 1994) by identifying intensive features (landesque capital) permanently modifying the landscape. In contrast, the intensification process is identified by studying changing parameters and increasing investments. Following the process, as best we can, from start to denouement, is the key to answering many important questions. What was the impetus for intensification, for example – increasing the food supply or solving the problem of higher governing costs with a tax increase? Who plans and organizes intensification – central elites, or hard-pressed locals? What is the result of the attempt? Success or failure? Compliance or resistance? Why? Is it possible to tease out combinations of the above strategies and motives? Some geographers have approached agricultural change as a process with some success (i.e. Doolittle 1984, 1988).

Our new concern with both successful and failed attempts at intensification falls into this area of study. While we advocate a new focus on intensification, studies of intensification should, perhaps, also include the study of failed attempts to increase productivity (Morrison, this volume). A number of authors interested in the behavioral ecology of foragers have recently adapted these perspectives to food production strategies (i.e. Russell 1988, Hawkes et al 1982, Keegan 1986), viewing higher returns (more energy) as a Darwinian reproductive advantage. However, many attempts at intensification of both plants and animals have been highly maladaptive, leading to overgrazing, deforestation, and subsequent erosion and degradation - yet these societies did not become extinct - they learned to live in self-created, less optimal conditions. Focusing on the intent of prehistoric people to minimize risk and improve gains is clearly not enough to explain many archaeological sequences. Studying intensification's unplanned consequences and failures sheds a great deal of light on this issue.

CONCLUSIONS

The authors collected here agree that the driving forces behind the wide spectrum of observable subsistence strategies and their subsequent changes through time lie within social groups, and are not externally determined. While climate, population trends, and other external conditions can constitute important factors, human choices, combined with circumstances lying in the economic, political, social, and ideological realms, play important roles.

Reductionist approaches to human subsistence behavior employed by earlier theorists required anthropological archaeologists to discard culture as ancillary. This mechanistic view eliminated or diminished the importance of human actors. This volume attempts to view past people as social agents making decisions on a human level. We collectively urge those working within similar frameworks to consider evidence for past subsistence choices within their sociopolitical and economic contexts, further impacted by the availability of labor, age, gender, skill, and other categories that we acknowledge as vital structuring principles within human societies.

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