Section II
Dynamics of Local Food Procurement Systems

Section Overview

With exception of the first two chapters, all the studies in this collection address some aspect of the dynamics of local food production. The five chapters selected here are chosen not to illustrate what are usually termed “modes of production” but rather to draw attention to important issues faced by people who are producing or procuring food. We will elaborate further below, but briefly: Stiner and Kuhn, archeologists, document a much overlooked dynamic, namely that for at least the last 500,000 years hominids have been a permanent presence over most of the globe that and have historically heavily impacted their habitats and continue to do so. Bird, Bird, and Parker, working with a foraging population in Western Australia, examine how even without relying on a market economy, people they manage common property and build incentives for individuals to invest in delayed returns and to defend community control of resources. Yasuoka, a Japanese ethnologist with a formidable talent for collecting detailed dietary data, documents how foragers can build a solid nutritional base using widely dispersed food sources as long as they can manage a key species – in this case, wild yams in the Congo Basin of Cameroon. Boyd, building on long field experience, demonstrates how people make decisions at the individual level which can change, against all expectations, the fundamentals of land use and animal husbandry. Norwegian geographers Pedersen and Benjaminsen describe some of the organizational imperatives that select for specialization in food production in the Sahel, and show that attempts to combine specialized farming with animal husbandry (a strategy frequently advocated by international aid agencies; see also Fratkin et al. 2004) generally fail to provide improved food security.

Clearly, human ecological research focuses on a wide range of issues and problems – population dynamics, health, nutrition, sustainable production, and risk management to name a few. But with the exception of urban studies, most involve seeing human decision-making and behavior in a context in which the major parameters are set by food procurement concerns. When ecologists note, in only semi-jest, that “you are what you eat,” they mean that the sources, variety, and reliability of foods used by a population are critical to its maintenance. While food production practices vary hugely throughout the world, it is possible to identify some common, although not
exclusive, sources of important production variables. One cannot assign an a priori order of significance as this depends entirely on context.

1. The extent to which domesticated crops and animals are utilized as opposed to nondomesticates, which greatly influences the deployment of labor and the significance of seasonality.
2. The degree of spatial mobility required to secure resources and procure food.
3. The accessibility of external and internal energy and material inputs including, very importantly, water.
4. The organization, relative importance and costs of human labor, animal traction, and mechanized processing.
5. The nature of storage technology.
6. The form and degree of market integration and the role of external political institutions in determining local production.

In considering these factors it is common to use various groupings or typologies, such as irrigated versus dry farming, tropical forest and savannah-based swidden or slash and burn agriculture, various forms of specialized animal husbandry, market-centered production as opposed to household directed or “peasant” farming, small-scale versus industrialized agriculture. Here, we present a familiar short typology of procurement strategies that is widely used in anthropology, cultural geography, and environmental sociology:

- **Hunting and gathering**: the collection of wild vegetable foods, hunting of game, and fishing, generally assumed to be the mainstay of hominids until the Old and New World Neolithic periods, about 12,000 years B.P. and 10,000 years B.P., respectively. This involves, in most instances, a high degree of spatial mobility and, until more recently, a high degree of local self sufficiency. While it used to be assumed that such procurement systems had limited environmental impacts due to limited storage technology, it is now recognized that this is not the case.

- **Horticulture**: a simple form of agriculture (sometimes called extensive agriculture, long fallow agriculture, swidden, or slash and burn) based on the working of small plots of land without much reliance on draft animals, plows, or irrigation. In contrast to hunters and gatherers, horticulturists produce food by managing domesticated plants and animals and, in comparison with most foragers, maintain larger, more permanent settlements and higher population densities. Today horticulture is associated with tropical zones, although historically is was also practiced in temperate zones. With very few exceptions, such farming is closely integrated into market economies.

- **Pastoralism**: an economy based on herding livestock. Pastoralists maintain herds of animals and use their products and by-products (milk, curds, whey, butterfat, meat, blood, hides, and bones) both to maintain themselves directly and to utilize in exchange with other, carbohydrate-producing populations. The nature of animal production includes the potential, if not the necessity, for a high degree of mobility, an inherent capacity for rapid growth in capital as well as high risk of decline. Specialized pastoralism may have developed in tandem with agricultural
intensification since most pastoralist diets are grain based (the Masaii of East Africa being a major exception).

- **Intensive agriculture**: a form of agriculture that involves the use of draft animals or tractors, plows, and often some form of irrigation. Intensive agriculture produces far greater yields per acre of land, although labor requirements may be very high. Settlement size and population densities are also high and intensive agriculture is universally associated with high levels of market integration and political centralization. Markets effectively increase local storage capabilities exponentially, thus increasing the value of production in excess of immediate household needs.

- **Industrial agriculture**: food production and manufacturing through the use of machines powered largely by fossil fuels and today often focused on commodity production with a global reach. The actual owners or controllers of production are usually at a remove from the land itself, a fact that frequently has implications for long-term sustainability.

The attraction of typologies of this sort is that they draw attention to globally shared features; for example, foragers often do experience similar problems, as do people practicing large animal husbandry in arid zones, or tropical forest horticulturalists. While conceptually tidy and seemingly offering a rough fit with historical progression from a total reliance on nondomesticates to the industrial food production practices of today, our typology can be misleading for a number of reasons. Most communities, let alone regions or local populations, do not fall neatly into one or another of these patterns; people typically combine several food procurement methods and frequently alter them. As during the politically induced famine in the Ukraine in the 1920s or in many regions of the Caucasus and Central Asia following the collapse of the Soviet Union in 1991, people may appear to have reverted to a “domestic mode” of production geared at self-sufficiency, leaving fields uncultivated and labor underutilized, whereas in reality they are simply coping with lost market connections. Researchers today find an “actor-oriented” perspective more productive than dealing with social or economic categories. Our typology also may obscure the degree to which people actually shape their habitats: foragers or hunter–gatherers in precolonial Australia may have actually invested more labor and skill in shaping their landscapes through fire management, selective hunting and harvesting practices, and water diversion than agriculturalists in many other parts of the world (see Bird et al., this volume). Horticultural production, generally regarded as small-scale, may entail more labor inputs than what is often described as intensive farming. The perhaps misleadingly termed “blue revolution” has led to more fish being farmed than are caught in the wild, with increasingly dubious environmental impacts. And the return of home gardening in industrial societies highlights growing concerns at the costs, both financial and environmental, of food transportation, and a new emphasis on local production and consumption.

However diverse the strategies employed in food production, people have to contend with some of the same basic challenges. Within any localized system, some resources needed to sustain the population are less abundant than others. Those which are least abundant (most notably water) establish the limits to the growth
and/or dispersal of a population – sometimes called Liebig’s law of the minimum. As a consequence, a large number of historically discrete populations share quite similar settlement patterns; for example, seasons of settlement nucleation followed by dispersal in search of water, grazing, game, or other resources. Resource fluctuation is a major problem almost everywhere: rainfall may deviate from expected patterns or arrive sooner or later than anticipated by planting schedules. A harsh winter may decimate livestock or lead to a shortened growing season. Producers usually have to “hedge” against a number of possible threats usually by diversification of livelihood strategies, for example, keeping livestock in addition to farming, storage, trading partnerships, and social alliances (sometimes called social storage), and “backup” strategies such as preparing for rapid movement and resettlement, venturing into raiding or crime\(^1\), selling household labor, or even shedding members. International waves of “illegal” migration are partially the result of households having too many mouths to feed. Finally, whatever the mode of production, members of every population must adjust to the presence and activities of neighboring peoples, be they cooperative or aggressively competitive. Often, the outcomes of such relationships have to be looked at on a global level, as even production at a subsistence level often requires inputs from distant sources or sales to distant markets; not to mention the fact that local resources themselves may be owned by corporations based outside the district, and frequently even outside the country or the continent.

Turning once more to the five chapters in this section, Mary C. Stiner and Steven L. Kuhn take a long perspective in showing how Paleolithic societies in the Mediterranean Basin changed their social organization and their habitat. It is now understood that foraging or hunting populations profoundly affect their habitats, perhaps as much in terms of total landscape architecture as preindustrial farmers. Stiner and Kuhn conclude from their archeological analysis of the long Paleolithic period in Europe and the Mediterranean Basin that this may also true for early \textit{Homo}. Hominids established a permanent presence in northern habitats by 500,000 years ago. This adaptive radiation required specific technological and economic prerequisites such as, probably crucially, fire (see also Wrangham 2009). But these early populations also had to survive long Eurasian winters, when foraged food is limited or difficult to gather and process, and to do that their biggest challenge was to cooperate in hunting the large animals necessary for survival. The long archeological record they examine here indicates long-term adaptive changes by humans as they cope with their own impact on the prey populations by shifting hunting strategies from large animals to small game and increased foraging approaching the Neolithic period, when the shift to agriculture dramatically changed the cultural and physical landscape. The focus here, as in the study of contemporary populations, is on demographic changes, niche shifts, dietary and nutritional issues, and intraspecific competition and conflict as modern humans replaced earlier hominid populations. Our modern ecological crises, the authors suggest, have roots in the

\(^{1}\text{For example, the current spate of piracy by Somali fishermen who claim their livelihoods have been negatively impacted by commercial fishing fleets operating in their traditional fishing grounds.}\)
ancient history of foragers. The methods and models employed here include optimal foraging assumptions and systems processes, such as positive feedback relationships which may affect predator–prey interactions, ecological resilience and stability.

As with many field studies, the one carried out by Douglas W. Bird, Rebecca Bliege Bird, and Christopher H. Parker in the Western Desert of Australia is rich in insight at more than one level. Primarily, they field test the popular hypothesis that Aboriginal cultural knowledge and use of fire functions to increase the efficiency of hunting large, highly mobile prey. It is widely held that during the 45,000 years of human activity in Australia, human-managed fire played a central role in that continent’s biodiversity. This study attempts provide an explanation of aboriginal burning practices without simply assuming that they are part of long-term habitat maintenance. In addition to a fine-grained analysis of observations of 422 forager days among the Martu documenting their burning, hunting, and foraging activities, the authors delve into the larger realms of land management, collective action, future discounting, and the ever bothersome problem of freeloaders. The crux is how to account for collective actions where the costs, for example, here the effort required for systematic burning, are borne individually but the benefits are shared more widely. They also address the issue of an individual’s incentive to invest in a future benefit that he or she may never fully realize. In other words, precisely the central issues of the current global economic crisis and much disputed “bailouts” for nonperforming banks and industries are very visible shapers of decisions at the local group level here. We will return to the issues of common property management and conservation in later sections, but this study provides insights into how sex and gender roles affect motivation, how access and rewards are structured, and offers a graphic look at how a potentially marginalized population decided to retain community control of their own territory and how they went about it.

Hirokazu Yasuoka also looks at a population which, until recently at least, were hunter–gatherers in the Congo Basin, and who still incorporate a great deal of foraging and hunting into their annual round of food procurement activities. Given the millennia of human existence as hunter–gatherers, it is understandable that populations pursuing this now disappearing way of life have been somewhat over-represented in the research literature. Still, the question persists of how representative present-day hunter–gatherers may be of prehistoric societies, since all are affected and usually marginalized by the influences of industrial socioeconomic systems. The San of the Kalahari have been used to model prehistoric societies of the African Savanna, but a major question has been whether or not foragers could fully exploit the world’s vast tropical forests without access to at least Neolithic levels of agricultural production. Yasuoka’s study, while not attempting to conclusively settle this issue, does show that foragers in the Cameroon region of the Congo Basin can survive the difficult dry season by utilizing a key species of wild yam. The unique accomplishment of this study is the fine attention to nutritional detail as Yasuoka accompanied a long-term foraging expedition (molongo) by members of a Baka village. While exciting data in themselves, this study still leaves open the larger question of to what extent the composition of the Congo Basin rainforest and adjacent savanna is the result of human activities, including a long history of cultivation.
One hallmark of ecological field research by anthropologists and geographers in general is that the researcher and members of the study population develop close relationships, often spanning generations. David Boyd has had more than 30 years experience with the Papua New Guinea people he describes here and close academic relationships with some of the pioneers of ecological study in anthropology, notably S. Lindenbaum, R. A. Rappaport, and A.P. Vayda. Highland societies in New Guinea have practiced various forms of subsistence horticulture or gardening in conjunction with domestic pig husbandry for at least 6,000 years and possibly for as long as 9,000 years. The social and ceremonial aspects of pig feasts and pig meat exchange systems are as much studied as the direct utilitarian value of the animals as a source of protein in a diet based mainly on carbohydrates. In short, pigs could be seen as a “keystone species” either in the biological sense of a population which has profound impacts on the structure of other species in an ecosystem or as a cultural complex central to a host of other institutions and behaviors. So it was something of a surprise to Boyd when young Irakia Awa men told him in the 1980s that they were actively planning to do away with village pigs altogether. Under the influence of Christian missionary activities in the region as well as time spent as wage laborers on the coast, they wanted a total break with the past in order to revitalize their community. Illustrated in this case is something that is often overlooked in environments of centrally planned change: individuals can and often do undertake radical changes in how they manage their subsistence production. Human adaptations are inherently subject to rapid change no matter how conservative they may appear at any given time. This illuminating case study also illustrates how outside ideologies, here Christian religious belief, can play a major role in shaping important local changes.

Arid zone nomadic pastoralism may well be the most highly specialized mode of food production to have developed following the Neolithic. With very few exceptions, nomadic herders rely for the bulk of their diet on carbohydrates, specifically grains, which they acquire through trade or tribute from settled agriculturalists. In many respects, as Jon Pedersen and Tor A. Benjaminsen suggest, animal husbandry is the underestimated (and undervalued) component of economies in the Sahel region of Africa. The ambivalent attitude of local and national authorities towards nomadic populations is understandable. Not only throughout Africa north of the equator, but in the vast arid reaches of the Middle East and Central Asia, armed and mobile groups can and historically often did threaten central regimes, raid neighboring populations for plunder and slaves, and seek control of transcontinental trade routes. Less understandable is the almost knee-jerk reaction of international development agencies which regard the settlement of nomadic peoples as key to economic diversification and hence improved food security and better health. This research carried out among the Tuareg of northern Mali found those Tuareg who persisted with their nomadic lifestyle enjoyed both better nutrition and better food security and health than their settled counterparts. Labor is a scarce resource, as studies of pastoralists elsewhere have consistently shown. This study is unusual in its detailing of the overall social division of labor among the Tuareg and its examination of the individual household as a unit of production. Pedersen and Benjaminsen’s
analysis details how the organization of labor within and among the hierarchically organized Tuareg households is critical to subsistence production, and makes it very inefficient for households to combine both herding and effective cultivation. In fact, they show that the diversification invariably advocated by development agents not only does not yield greater food security, but also frequently contributes to decreased food security and thus poorer health.