

(1984). *From Hunters to Farmers: ^{The} Causes and Consequences of Food Production in Africa*
eds. J. Desmond Clark + Stephen A. Brandt
Berkeley: U of Calif. Press. pp. 293-310

27

Food Production and Culture Change among the !Kung San: Implications for Prehistoric Research

ALISON S. BROOKS,
DIANE E. GELBURD, AND
JOHN E. YELLEN



The spread of farming and herding over vast areas of eastern and southern Africa once occupied exclusively by hunters and gatherers probably encompassed a large number of different culture-contact situations, with varying outcomes for the hunting and gathering populations. Some populations were annihilated through intentional policies of extermination or through the unintentional spread of disease (Elphick, 1977: 125, 172, 229), especially in situations involving Europeans. Others were totally assimilated into the societies of the expanding

The research on which this paper is based was supported in large part by the National Science Foundation (SOC75-14227, BNS 76-19633). Earlier work was funded by the National Institutes of Mental Health, the Wenner Gren Foundation, and the National Geographic Society. For all this support, we express our gratitude. We would also like to acknowledge our deep appreciation to the government of Botswana, which permitted us to work in the Dobe region, to Alec Campbell, Aron L. Crowell, Robert K. Hitchcock, and Pauline Wiessner for ideas and assistance, and to our informants, especially the people of Dobe. We owe a particular debt to Thomas Hargrove, whose Master's thesis provides part of the underlying data for this paper.

farmer/herders, leaving no living traces of their existence other than in the gene pools (e.g., Zulus) or languages (e.g., !Xhosa) of the assimilators (Bleek, 1927; Elphick, 1977: 199–200; Harpending and Jenkins, 1973; Jenkins, n.d.). Particularly in areas less desirable for farming and herding, a small minority of hunting-and-gathering populations preserved a distinct identity through many years of contact, often relating to farmer/herder societies as a distinct caste of traders, hunters, or smiths or as a lower class of permanent or intermittent serfs or servants. Indeed, the existence of this lower class may have been crucial to the survival of farmer/herder societies in marginal lands, consuming surplus production and providing additional labor in good times when the herds or fields were expanding, and allowing a rapid reduction of both dependents and the labor force when surplus food was not available.

The contact situation was certainly complicated by the potential for marginal farmer/herders themselves to lose their herds or fields through disease, environmental fluctuation, conquest, or raiding, and to move into a serf or servant status vis-à-vis other farmer/herders. Most recently, in southern Africa, the Herero, who were driven from their lands and deprived of their cattle by the Germans in 1904–1906, became servants to the dominant Tswana groups of Botswana. Through the *mafisa*, or cattle-loaning system, they were able to rebuild their herds and regain their independent status. With dates in the second century A.D. (Deacon et al., 1976) for domesticated sheep at Boomplaas Cave at the southern tip of the continent, the shifting interrelationships of hunter/gatherers and farmer/herders may be assumed to have had a considerable antiquity over the entire continent.

The remaining hunting and gathering societies of Africa, largely concentrated in southern Africa and in the Congo Basin, may be of questionable relevance to specific reconstructions of the past. This has been pointed out at some length in the recent literature (Wobst, 1978; Binford, 1968a; Freeman, 1968; Schrire, n.d.). It is debatable to what extent the northern San ("Bushmen"), in particular, may be regarded as pristine or "uncontaminated" by contact with more technologically advanced societies. Although the linguistic evidence

suggests that the Khoikhoi herders of the early European contact period in the Cape were derived from central Bush speakers who border the !Kung San to the south, archaeological, linguistic, ethnohistorical, and genetic data imply a relatively slight degree of subsequent contact between the !Kung and the later migrations of Bantu populations to the east and the west. The southeastern part of the !Kung area is characterized by low and variable rainfall and by few permanent water sources. It is surrounded by large areas with no permanent water sources and thus is at best a marginal environment for livestock-herding or cultivation. As a result, the major migration routes of both the Khoi and the western and eastern Bantu may have skirted this region (Elphick, 1977: 14–22). With the exception of a possible *Bos taurus* radius and four maxillary bone fragments of indeterminate date 63 cm below the present surface at /Ai/ai (Wilmsen, 1979), no archaeological evidence of domestic stock or settled villages in the Dobe-/Ai/ai¹ area prior to the ethnographic and ethnohistoric present has been uncovered, despite extensive surveys and excavations in the area by Yellen and then by Wilmsen (1979). At the stratified Later Stone Age/Middle Stone Age site of #Gi, 7 km south of Dobe, Botswana, very limited contact with technologically more advanced people is suggested by the presence of iron beads in the topmost level (Brooks and Yellen, 1977; Brooks et al., 1980). This level is probably less than 500 years old, and contains a mixture from the ethnographic present. Although Wilmsen's /Ai/ai survey recovered small amounts of both pottery and metal from depths of up to one meter below the surface in a loose, sandy matrix, he also concludes that "there is no evidence . . . to suggest that pastoralism was the principal subsistence mode at any time until the present" (1979: 19). Certainly the trade goods suggest at least a

1. The Dobe-/Ai/ai area is located in Botswana at latitude 19°20' to 20°30' S and 20°45' to 21°20' E longitude on the border with Namibia and about 100 miles south of the Caprivi Strip. It is classed as semiarid and is surrounded by broad areas with heavy sand-cover and no permanent water points. Today, livestock may enter or leave the area only during the height of the rainy season, and even then the journey can be hazardous for both people and animals.

remote contact with farmer/herders over 500 years ago.

Even if the Dobe area !Kung San survived as a relict population that had somehow been bypassed by the movements of more technologically advanced Khoi and Bantu speakers, one may question the value of this limited ethnographic example in providing direct analogies for interpretation of Stone Age archaeological remains in the more varied and complex environments utilized by hunters and gatherers in the past.

A different approach to the utility of hunter/gatherer studies in archaeology involves the testing of dynamic models of cultural systems that are equally applicable across a wide range of technological levels, social organizations, and ecological situations. The study of cultural dynamics is increasingly possible in view of the changes observed during the expanded period of the ethnographic present, which now, in the case of many hunter/gatherer groups, spans thirty or more years. If hunters and gatherers of today are poor examples of Stone Age hunters, they are excellent examples of functioning cultural systems that are changing from a way of life, however ancient, based exclusively on hunting and gathering to one based on other technoeconomic states. While these changes have been discussed at great length in the theoretical literature (e.g., Binford, 1968b; Flannery, 1968, 1969, 1972, 1973; Redman, 1978; White, 1959: 286), we have rarely had a chance to observe them in action over a considerable period of time. The record of the Dobe area !Kung, from the mid-1940s to the mid-1970s, affords just such an opportunity.

Theoretical Models

Whether the change is pristine or secondary, most present and past theories that view culture as a dynamic system postulate the existence of a prime mover that initiates the transition to a new cultural state marked by dependence on domesticated foods. Candidates for the position of prime mover within or outside the cultural system include: environmental change (Childe, 1951a, b; Kenyon,

1956, 1959); technological invention or diffusion (Braidwood, 1952, 1960; White, 1959); a change in values or religion (G. L. Isaac, 1978); and new social or organizational developments such as demographic change (Smith and Young, 1972), political pressure from a neighboring or conquering society, or population shifts resulting from sedentariness, environmental variation, or population increase (Binford, 1968b). The vitalistic theories of cultural evolution prevalent in the nineteenth century have largely been rejected in favor of either continuous feedback models of gradual change set in motion long ago as part of the fundamental human adaptive system (e.g., Higgs and Jarman, 1972), or stepwise models of punctuated equilibrium or abrupt change in which each stage is initiated by a new prime mover and is characterized by eventual achievement of a new and stable equilibrium state.

Once the system has been set in motion, change proceeds through the interrelationship of various cultural subsystems. In the materialist models of change (e.g., White, 1959: 286; Sahlins and Service, 1960; Binford, 1968b; Cohen, 1977: 279; M. Harris, 1979: 333), changes in the sociological or ideological subsystems of culture are seen as secondary to or dependent upon changes in the amount of energy extracted from the environment through the technoeconomic subsystems of culture. Although a shift in values has been seen as fundamental to the *beginning* of the human hunting and gathering way of life (G. L. Isaac, 1978; Lancaster, 1975: 4), the role of a similar shift in the transition from hunting and gathering to another way of life has been largely ignored by archaeologists, for whom ideologically based theories present the problem of non-testability.

Finally, few theories attempting to explain the spread of domestication have dealt with the reversibility of a shift from hunting and gathering to agriculture or herding (but see Ingold, 1980). Complex models of positive feedback, where each change requires a shift in other cultural subsystems, do not encompass the mechanisms for a return to an earlier state. In addition, punctuated equilibrium models imply that intermediate states are inherently unstable and that a society must either be based primarily upon hunting and gathering or

upon domestication, since each requires proper socialization, the acquisition of appropriate knowledge, and a specific social organization and value system. On the analogy of an intermediate stage between bipedalism and quadrupedalism, the long-term viability of a society that oscillates between hunting and gathering and farming is in some doubt.

In the body of this paper, we present three main arguments against the above characteristics of traditional models. First, we suggest that the cause of a shift to a domesticated economy is inherently multifactorial and that it is the exigencies of the archaeological record which have favored materialistic, environmental, or demographic explanations. When such shifts are observed by anthropologists rather than deduced from the archaeological record, the shift is rarely attributable to a single cause, even in cases of direct intervention by an outside agency of change. Second, we emphasize the importance of a shift in values in this transition, as in other major transitions or revolutions in human history and prehistory. Finally, we argue, from the ethnographic and ethnohistoric record of Africa, against the idea of punctuated equilibrium and the existence, after the introduction of domestication, of stable adaptations totally dependent on either hunting and gathering or domestication.

We shall also examine, for the !Kung data, the validity of two hypotheses drawn from the theoretical literature. The first hypothesis, derived from models of the operation of *cultural* systems, suggests that a change in the technoeconomic base from hunting and gathering to mixed pastoralism should be associated with rapid shifts in other cultural subsystems such as material culture and patterns of differential access to goods, settlement patterns, social structure, socialization patterns, and values or ideals. The second hypothesis is derived from certain classes of models of the operation of *biological* systems (biogeography), and argues that, due to the regional, seasonal, short- and long-term variability and unpredictability of the Dobe environment, the optimum subsistence strategy for both pastoralists and hunter/gatherers is a generalist strategy rather than a specialist one (J. M. Diamond, 1977; Slobodkin and Sanders, 1969; Yellen, 1977a).

The Changing Economy of the Dobe !Kung San

As was suggested in the introduction to this paper, the archaeological and linguistic evidence suggests that the !Kung are long-term residents of the Dobe area, broadly defined, and have not migrated there in the recent past as refugees from less "marginal" habitats. The presence of iron beads and coarse, poorly fired pottery in the upper deposits of several Later Stone Age sites suggests pre-twentieth-century direct or indirect contact with technologically more advanced peoples. At this time we cannot place an absolute date on the antiquity of this trade, except to suggest that at \neq Gi, evidence of iron and pottery is limited to a dark upper level, provisionally dated to 110 ± 50 B.P. (SI-4098, charcoal). Although no one at Dobe has any knowledge of chipped-stone tools, most men in the 1960s still made bone arrowheads of the type found at \neq Gi, and one older man remembers the manufacture of stone axes (now entirely replaced by metal ones). The fact that the middle-aged sons of this man had never before heard their father mention or describe this technology indicates the rapidity with which technological knowledge, as opposed to environmental knowledge, may pass out of the cultural inventory. That the contact with Bantu, Khoikhoi, or Europeans was limited to a sporadic exchange of trade goods is suggested by the absence of strong evidence of either domesticated stock or village settlement in the Dobe area prior to the ethnographic or ethnohistoric present.

Lee (1979: 76-87) has described in some detail the increasing contacts between Bantu groups and the Dobe San, beginning about 1870. This relationship proceeded rapidly from an initial trading relationship to one in which Dobe area San worked as servants on seasonally occupied Tswana cattle-posts. Since, according to Lee's description, San servants did not acquire rights in the offspring of the cattle they tended, the relationship was not a *mafisa* relationship in the traditional sense and would not have led to the acquisition of livestock by the San.

The Hereros passed through the Dobe area in large numbers during the German-Herero wars of 1905-1906 but did not return to establish perma-

nent villages until the mid-1920s. By the mid-1930s, several permanent Herero villages with live-stock and small fields were established throughout the Dobe area, although not at Dobe itself. In the 1940s, when our ethnographic record begins, a small group of San at Dobe subsisted entirely by hunting and gathering. During the subsequent decade, all these individuals moved to Bantu (Herero and Tswana) villages a few kilometers to the east (especially Mahopa and !Kabe) to work as herders. During this period, they lived primarily on food provided by their employers. The establishment of a permanent Tswana headman resident in 1948 and a major influx of Hereros from the Okavango Delta region in the 1950s may have been instrumental in this shift. In 1963, a group that included most of the original Dobe inhabitants from the 1940s returned to Dobe, where it has formed the core of the Dobe group in the 1970s. A second large group of San, distantly related to the original group, moved to Dobe in the early 1970s. The population rose from 35 in 1964 (Lee, 1979: 53) to ca. 125 in 1976, and from one group in 1963 to four in 1976.

In 1963 and 1964, when Lee carried out his initial study of the Dobe San, he described them as living exclusively by hunting and gathering. Despite the fact that all the adults involved had spent much of the previous decade in herding cattle and consuming domesticated foods, the pattern of individual movement, of fluid band composition, of daily foraging, of house construction, of ownership and sharing of material goods, of socialization, and of values described by Lee were seen as highly logical and adaptive for a hunting and gathering way of life and not related to a way of life based on pastoralism. By 1967, the Dobe San had begun to accumulate a small herd of goats, partly from their exchange or *hxaro* networks with Bantu or with San servants in Bantu villages and partly from anthropologists, who themselves were drawn into exchange networks with the Bantu involving goats and medicine, clothing, and other Western amenities.

During the rains of early 1968 and early 1969, about half the Dobe families attempted to establish fields, which they cleared, fenced with thornbrush, and planted with maize, melons, sorghum, tobacco,

cucurbits, beans, and sugarcane (Lee, 1979: 409–412). Lee estimates only a 10 to 40 percent success rate for these years. As of the early 1970s, no Dobe resident had been an established farmer or live-stock owner. The number of animals and the intensity of agricultural effort continued to increase throughout the early 1970s, aided by very heavy rainfall from 1973 to 1977, so that by 1976 most Dobe San had access to domesticated foods produced by themselves well into the hot dry season (September).

Outside Influences

The role of outsiders to the Dobe area in promoting the change now taking place is certainly part of the answer to the question of why this transition had not taken place earlier. Since independence in 1966, the government of Botswana has taken an increasingly active role in the lives of rural and extra-rural dwellers. Seed for San agricultural experiments was provided by the government as early as 1967, and a resident Botswana agricultural officer has been assisting the San of the area since 1976. A school was opened 40 km east of Dobe in 1973, and another school was opened ca. 40 km to the south in 1977. A parastatal organization for the international marketing of native crafts began sending a regular buyer to the area in 1974, creating a cash influx and stimulating a market economy in both livestock and consumer goods. This market was also stimulated by the opening in 1967 of a store 40 km to the east of Dobe. In 1975 a Catholic missionary began working in the area to help the San dig wells and claim legal rights to their traditional land under the new tribal land-use policies being promulgated by the government. In 1977 the government sent a group of adult men from Dobe to the government agricultural school near Maun, 210 km to the east, for a three-week crash course in modern agricultural methods. The Kalahari People's Fund, working in cooperation with the government, sponsored development initiatives to send children to school, register land, and make a successful transition to peasant farming in a modern state. Finally, the Dobe area is strongly influenced by the policies and practices of South Africa

in the administration of Namibia, whose border with Botswana is only 1 km west of Dobe. In order to keep track of "nationalist" movements into and out of Namibia across the sparsely populated border, the South African administration built higher and higher fences along the border, dug boreholes along the border in the traditional rainy-season camping areas of the Dobe group (see Yellen, 1977b), and established permanent camps of San derived from elsewhere in Namibia to watch over the border area and report the movements of strangers. The individuals in these camps are not closely related to the Dobe people (Lee, 1979: 430-431), and their presence in these areas strongly inhibits traditional land-utilization patterns of the Dobe residents. The Dobe group, swollen to record numbers due to in-migration, is thus experiencing a *de facto* crowding as they are forced to draw their livelihood from decreasing amounts of land.

The most striking characteristic from the history of contacts between the Dobe San and more technologically advanced peoples is that until very recently, members of industrial societies (Europeans) have had little or no influence on the process of economic transition. Even today, the change is taking place largely under pressures imposed by an independent black African government. The history of contact and the observed changes, therefore, are much closer to proposed reconstructions of the spread of agriculture in African prehistory than is the case for Inuit or Australian aborigines, whose transition from hunting and gathering to other economic states was largely brought about through European contact.

The model that we propose in order to describe the economic shifts in the Dobe area takes the form of a triangle within which individual !Kung families can be placed as points in one moment in time and within which these individual points shift through time. One corner of the triangle represents a 100 percent independent hunting/gathering way of life. Another corner represents a 100 percent independent mixed-pastoral existence, and the apex represents a way of life based on economic dependence and a master-servant relationship with local Bantu groups (Fig. 1).

For our purposes, the 100 percent independent

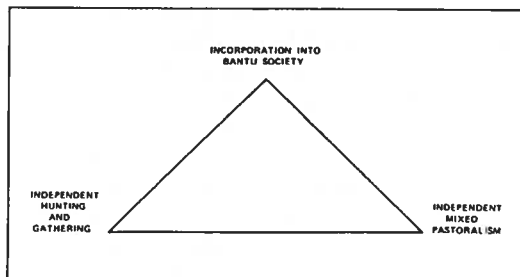


Figure 1. Dynamics of culture contact and change.

hunting/gathering way of life is defined according to Lee and DeVore (1968a: 11-12) and others (for example, Yellen, 1977b: 46-48; Wilmsen, 1973; Friedl, 1975: 38-39; Flannery, 1972; Draper, 1975). Lee and DeVore's basic hunter/gatherer model includes the following characteristics:

1. . . . the amount of personal property has to be kept at a very low level. Constraints on the possession of personal property also serve to keep wealth differences between individuals to a minimum and we postulate a general egalitarian system for the hunters. . . .
2. . . . the nature of the food supply keeps the living groups small, usually under fifty people. . . .
3. . . . the local groups as groups do not ordinarily maintain exclusive rights to resources. . . .
4. . . . food surpluses are not a prominent feature of the small-scale society. . . .
5. . . . frequent visiting between resource areas prevents any one group from becoming too strongly attached to any single area. . . . Individuals and groups can change residence without relinquishing vital interests in lands or goods. (Lee and DeVore, 1968a: 11-12)

In addition, specific correlates of this general model that relate to settlement patterns, social structure, and ideology are:

1. Houses tend to be relatively impermanent: they are easily erected and often leave little evidence behind after their collapse or removal.

2. Camp plans tend to be relatively intimate, roughly circular in shape (Flannery, 1972) and flexible in the addition or modification of house structures (Turnbull, 1963).

3. The camp tends to be composed of consanguinal and affinal kin (Lee, 1968). While strictly lineal inheritance may operate in the acquisition of rights and affiliations, it would not maintain optimum flexibility for such ties to determine the *economic* unit (local residence group) at any particular time.

4. Storage structures are minimal.

5. Child-rearing is egalitarian with regard to family and sex differences (Draper, 1975, 1976).

6. The status of women is relatively high, especially in those groups where the basic food supply is controlled by women (Friedl, 1975: 39).

7. Formal political and legal structures are minimal. Disputes are usually settled by fission, and egalitarianism is strongly supported by the economic system (Lee, 1972c).

8. Sharing and generosity are strongly encouraged values which serve to reduce tension (Marshall, 1961, 1976) and to strengthen the network of ties which ensure survival in difficult times (Wiessner, n.d.). Differential accumulation of wealth is discouraged by these values and by the restrictions that accumulated wealth of any sort places on individual mobility in the absence of domesticated animals.

9. Demographic and epidemiological correlates include a low birthrate and long birth-spacing (N. Howell, 1979: 133), and low rates of microbial diseases (Nurse and Jenkins, 1977) such as tuberculosis and of some parasitic diseases such as malaria.

The characteristics of a society whose economy is based entirely on mixed pastoralism should include:

1. Greater expenditure of energy on house construction and the use of sturdier building materials and/or fencing to discourage damage to the house by livestock.

2. Longer occupation times and fewer changes in intra-camp patterning during a particular occupation. These follow from the greater labor involved in the construction of more durable housing.

Camp plans would be expanded to accommodate livestock.

3. Cooperative herding of animals or even corporate ownership and lineal inheritance because of a need to maintain optimum herd size (Spooner, 1973) and to care for and protect the herd.

4. Accumulation and storage of agricultural products, following a limited growth season, to cushion the stresses of the dry or non-growing season for both animals and humans.

5. Increased value of children's labor as herders, fieldworkers, baby-sitters, and food-processors.

6. A reduction in free access to particular areas, since many resources now derive from human improvements to the land such as wells and cleared fields (Meillassoux, 1972, 1973; Ingold, 1980).

7. Formal political and legal mechanisms for the resolution of conflict and for governing the pooling or sharing of group resources, since individuals would no longer be free to shift their group affiliations from year to year (Lee, 1973).

8. The emergence of material accumulation and differential wealth, together with values that favor this accumulation, even if only in the form of livestock and seed grains.

9. An increased birthrate and increased rates of infectious diseases (Lee, 1972b; N. Howell, 1979: 363).

It is logical to suggest that the third corner of the triangle, which involves living with mixed pastoralists in a dependent master-servant relationship, does not impose the same stresses on hunters and gatherers as owning their own fields and herds. Our observations have shown that traditional settlement patterns are less changed and that traditional patterns of mobility are maintained to a greater degree among these dependent !Kung groups. These groups also readily set their disputes and disagreements before Bantu headmen for arbitration, so that they do not experience a pressing need to develop internal mechanisms of formal political control. The master-servant corner of the model, therefore, should be characterized by:

1. Settlement of hunters and gatherers within or adjacent to the mixed-pastoralist camp, with

maximum choice in both house form and camp plan, including maintenance of the traditional ones.

2. Incorporation into the economic unit of the employer, with subsistence provided in direct or indirect exchange for labor.

3. The possible retention of most organizational and ideological features of the traditional hunter/gatherer culture, although hunter/gatherers do have the opportunity, under many variants of this arrangement, to acquire livestock and material goods and/or to marry into the families of the employers, thereby moving toward a different corner of the triangle.

1975-1976 Study of the Dobe !Kung

During a total of twelve months in 1975-1976, we attempted to describe and measure the effects of some of the changes that had been observed by us and others since the first study of the Dobe group in 1963. In the course of this study, we collected data on the changing settlement plan and archaeologically recoverable remains from a series of dry-season camps at Dobe occupied from ca. 1947 to 1976. We also made an inventory of the material goods owned in 1976 by a representative group (Gelburd, n.d., 1978), together with data on the economic practices of the Dobe group in terms of traditional versus modern subsistence practices (Hargrove, n.d.) and in terms of sources of outside income and of the ownership of fields and livestock (Gelburd, n.d., 1978). In addition, by means of information gathered through interviews and questionnaires, we attempted to correlate these changes with degree of exposure to the outside world and changes in traditional values and cultural practices (Gelburd, n.d., 1978).

SETTLEMENT PATTERNS

During 1976, Yellen located, mapped, and excavated a number of old Dobe campsites dating from the late 1940s to the present and interviewed informants about the activities that occurred at

those camps. He analyzed the changes over time by comparing camp arrangements and the percentage of wild/domestic faunal remains. He found that hunting and gathering camps were characterized by a roughly circular camp-plan and little evidence of any of the following: (1) houses, except for the hearth area; (2) kraals; (3) storage structures; or (4) domesticated faunal remains.

Settlement-pattern changes due to domesticated livestock subsistence are characterized by increasing similarities to modern local Bantu villages (Fig. 2). Increased dependency on domesticated animals correlates with: (1) permanent houses; (2) fences around the houses; (3) a kraal within the camp circle; (4) storage structures; and (5) a large percentage of domesticated faunal remains.

The changing settlement patterns can be illustrated by five camps. In the 1947 camp (Fig. 3), huts were constructed of grass and arranged in a circle. Excavations yielded faunal remains of wild species only. The plan of a 1963/64 camp (Fig. 4) is similar to that of the 1947 camp except that 17 percent of the faunal remains were of domesticated species. Goats were first herded in 1968/69, an activity that is indicated in the camp plan by a kraal off to one side (Fig. 5). A 1970/71 excavated camp had a kraal and fences (Fig. 6) and 70 percent of the faunal remains were of domesticated species. From the most recent camp plan, mapped while the site was still occupied in 1975/76 (Fig. 7), it can be seen for the first time that the kraal is included within the camp circle. Semipermanent mud huts and storage facilities were also built. At this camp, occupied over four months, the same people built a series of sequentially occupied houses within the camp area. This indication of increased sedentaryness probably would not have been revealed by excavation but, rather, would have led archaeologists greatly to overestimate the population. Only 16 percent of the bones from this camp are from wild animals. Between 1968 and 1969 the Dobe population had a turnover of about 50 percent; between 1975 and 1976 the population turnover was only about four percent.

The study of camp plans documented the following Dobe San settlement pattern changes that had occurred since the 1940s: (1) a change in

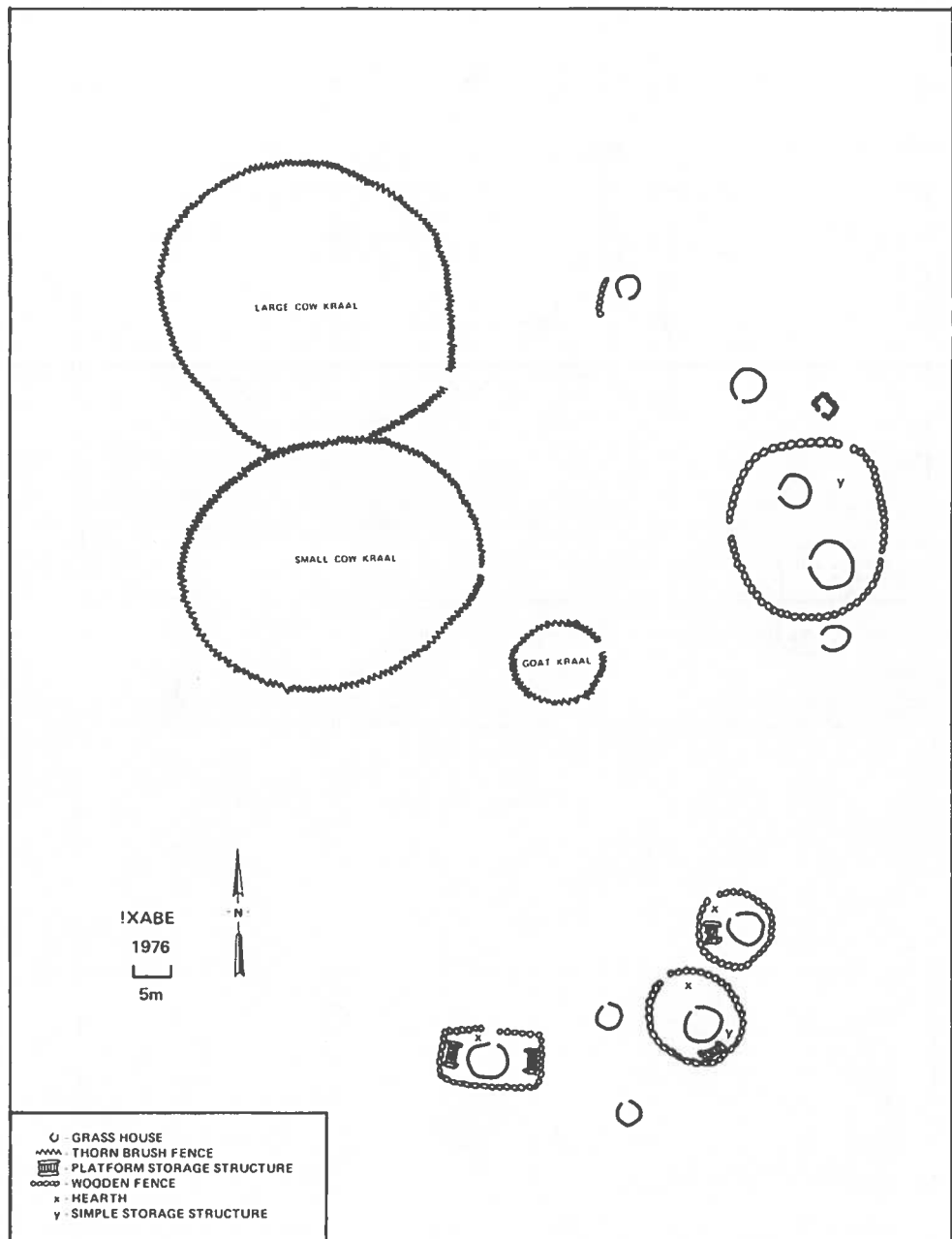


Figure 2. Modern local Bantu village plan.

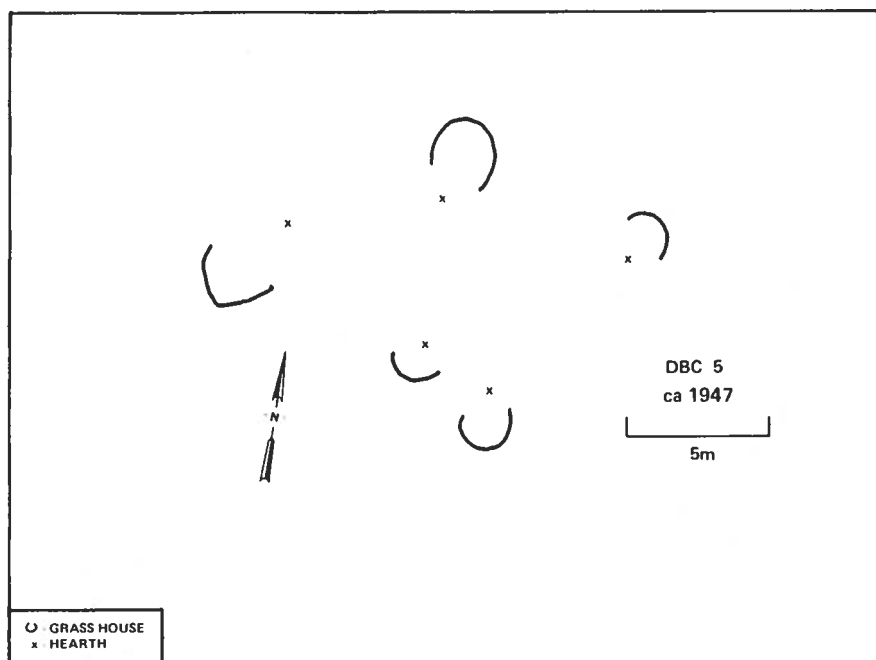


Figure 3. Dobe !Kung base-camp plan, 1947.

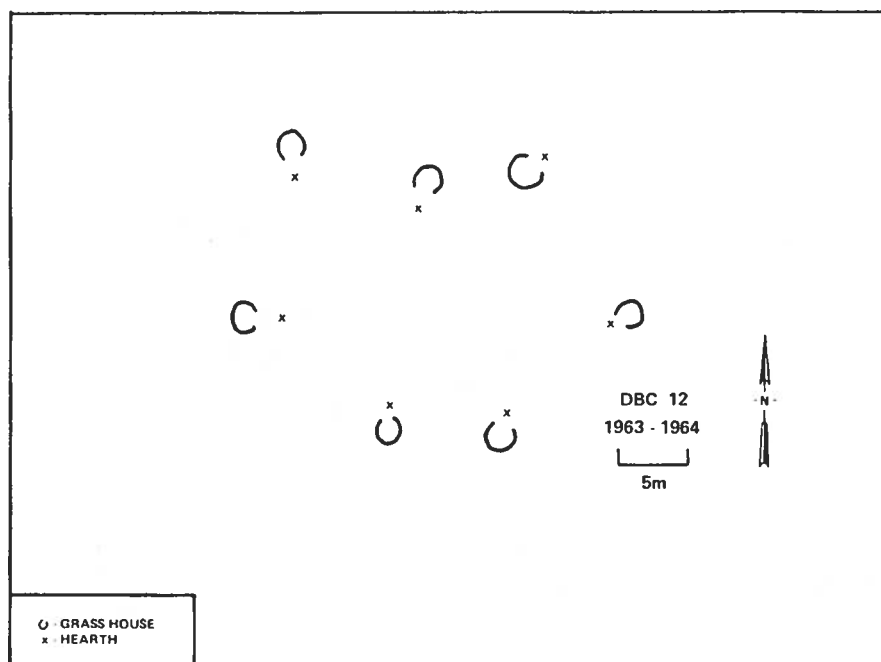


Figure 4. Dobe !Kung base-camp plan, 1963-1964.

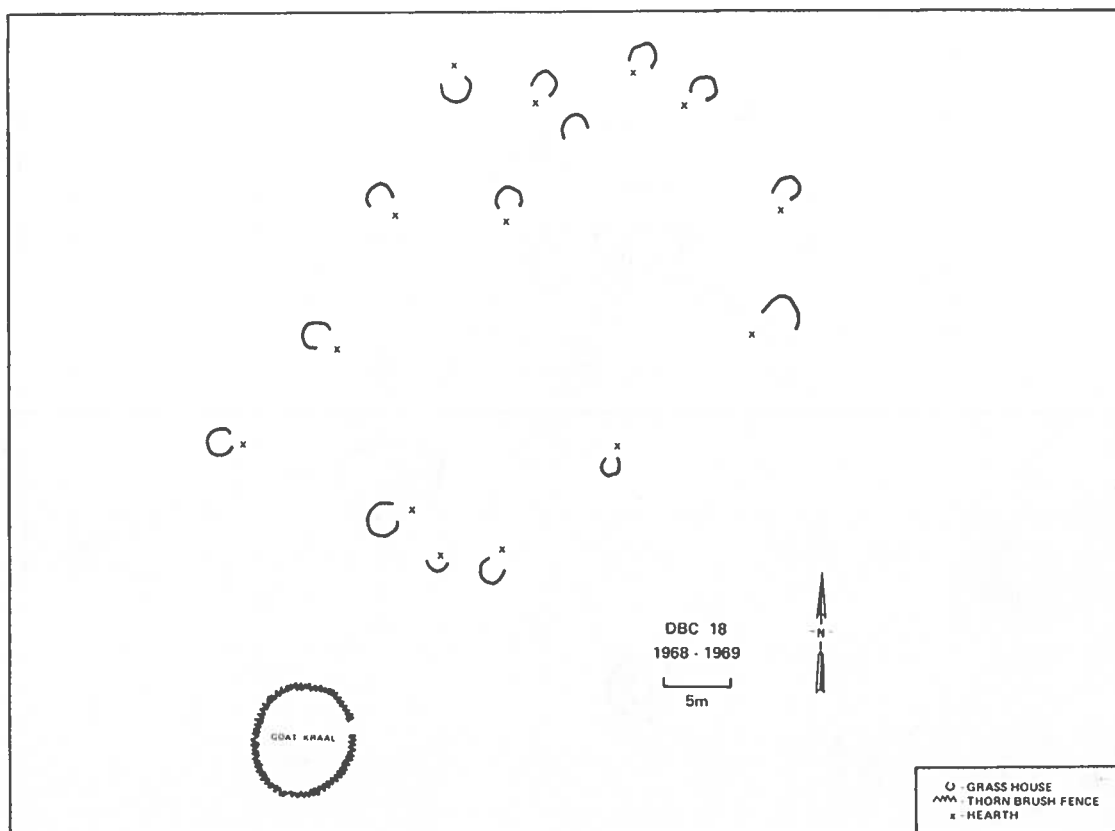


Figure 5. Dobe !Kung base-camp plan, 1968-1969.

camp-plan layout to accommodate domesticated animals; (2) a change in house architecture to accommodate increased storage and longer occupation times, and to protect against destruction by livestock; (3) the addition of fencing and doors to increase private space; (4) the use of separate storage structures; and (5) more permanent residences (camps established on a yearly or multiyear basis rather than a temporary seasonal one).

ECONOMIC CHANGE

Economic change was measured in four ways: (1) daily interviews to determine the types of food consumed by basically the same group of people

studied by Lee (1968, 1979) in 1963; (2) excavated samples of bone remains from all dry-season camps occupied by the Dobe group between 1962 and 1976; (3) interviews and questionnaires concerning individual participation in various economic activities and employment histories; and (4) determination of degree of participation in a cash economy and accumulation of wealth, as measured by material culture.

In the subsistence study (Hargrove, n.d.) we tried to replicate the qualitative results of Lee's 1968 food-study with the same people. Lee recorded the types of food consumed by the Dobe group during a four-week study in June and July of 1964. He found that over 99 percent of the foods consumed by the Dobe group were derived from

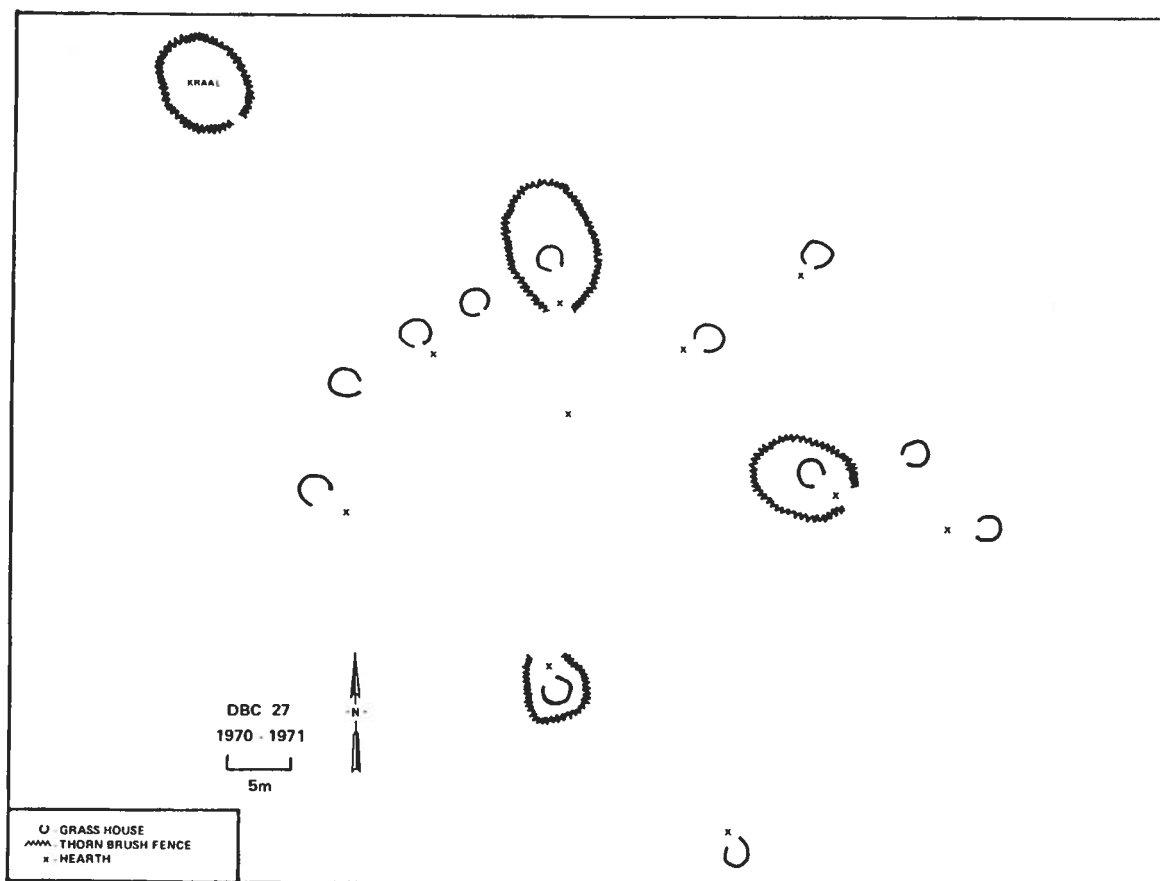


Figure 6. Dobe !Kung base-camp plan, 1970-1971.

wild sources: 60-80 percent vegetable foods and the remainder hunted, snared, or captured game. Less than 1 percent of the meat and less than 0.03 percent of the total calories were derived from domesticated foods acquired through gift exchanges (Lee, 1979: 250-280). In June and July of 1976, 13 adults (5 families) from Lee's original group of 28 individuals were interviewed over a six-week period. Even though 3 of the families had fields and 4 owned livestock, slightly over half of their food was still derived from wild sources. Vegetable foods were particularly important, especially the mangetti (mongongo) nut. Even families who owned livestock and had successfully cultivated fields that

year continued to depend on gathered foods for daily subsistence. Wild foods included many species of roots and berries, mangetti nuts, baobab fruits, and some wild meat (gemsbok, duiker, kudu, porcupine, and guinea fowl). The domesticated foods were acquired through self-production, *bxaro* (gift) exchanges, or purchases using wages. Purchases could be made at a store in Tsum!kwe, Namibia, 60 km west of Dobe, or a store at !Kangwa, 40 km to the east. Food purchases, carried back to Dobe on donkeys or on passing trucks, included maize, maize meal, melons, cucurbits, sugar, tea, beer, soured cow's milk, goat's milk, beef, and goat meat. Maize, melon, sorghum, millet, cucurbits,

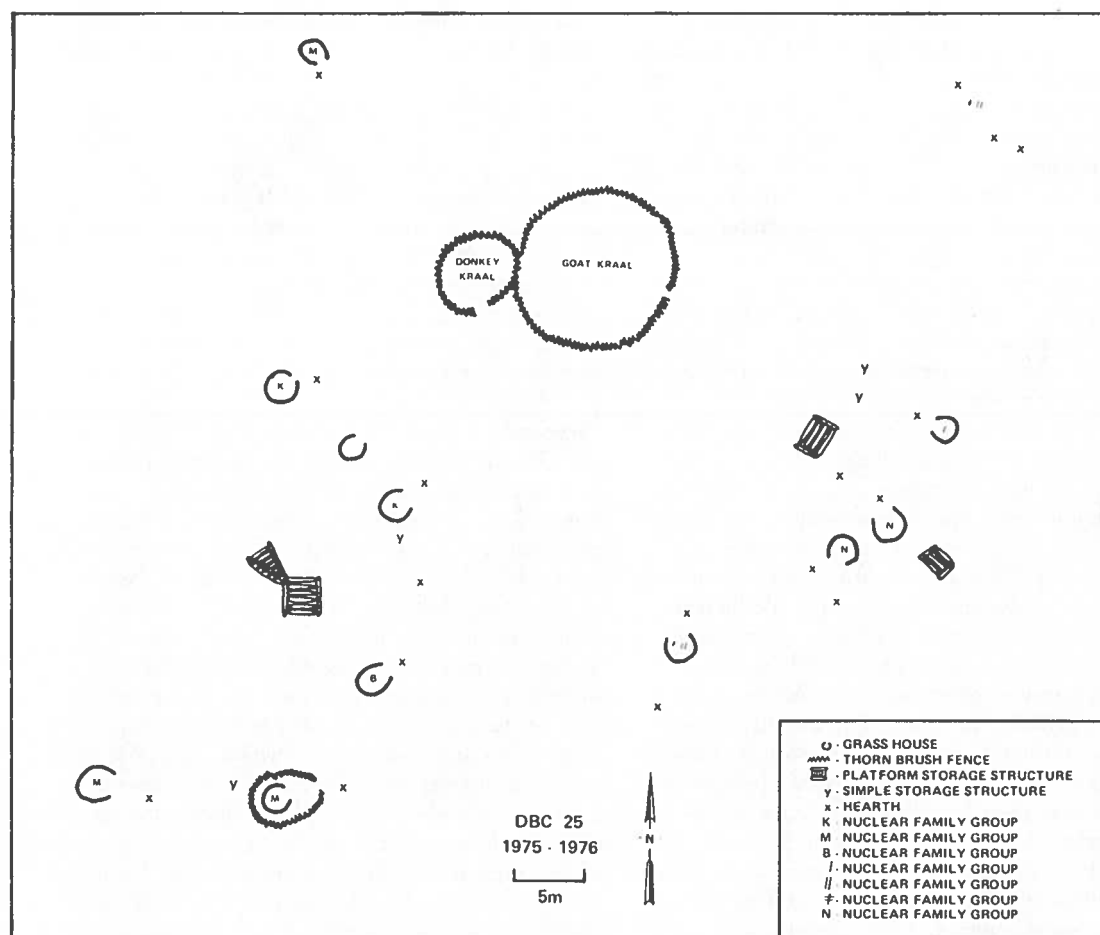


Figure 7. Dobe !Kung base-camp plan, 1975-1976.

and goats were also raised both by San and by their Herero neighbors. Beer was occasionally made by the San, using brown sugar, *grewia* spp. berries or grain, and other ingredients such as hops, honey, and spices. Beef, beer, and soured cow's milk were purchased from Hereros. The increasing dependence on domesticated foods correlated with the results of the camp-plan study, where the excavated domesticated faunal remains increased from none in 1947 to 84 percent in 1976.

Also in 1976, interviews and questionnaires were used in a study of the culture-change pro-

cesses of the Dobe !Kung San (Gelburd, 1978, n.d.) to determine the extent to which changes in Dobe San material culture could be used as indicators of change in other !Kung San cultural subsystems. Initial hypotheses were: (1) that a change in subsistence techniques (economic subsystem) would be correlated with changes of other kinds; (2) that the most obvious indicator of change would be the presence of a conspicuous level of material wealth (especially non-traditional San items) in a household, and that this would be inter-related with culture change, broader economic

access, and a high level of exposure beyond the community; and (3) that there would be a positive correlation between cultural and material modernity among the younger San population and that this correlation would prove less strong among the older San age-groups. The hypotheses were derived, in part, from a similar study of the relationship between artifactual and cultural modernity among the Buganda (Robbins and Pollnac, 1977).

In 1976, the Dobe population consisted of about 125 individuals organized into twenty-three households in four "villages," or camps. The population had almost quadrupled from the 1968 population of 35 individuals in twelve households of one village. This increase was mainly due to the influx of San from nearby Bantu villages. The study involved 65 individuals, comprising all the members of fifteen households and three villages. All the adults who had lived at Dobe in 1963 and in 1968 were included in the study in order that information on material wealth and subsistence could be compared. Inventories were compiled of the material possessions of 52 individuals; 22 of these people were also interviewed extensively concerning their economic practices, employment histories, exposure beyond their community, and attitudes toward social practices, traditional rituals, and beliefs. Individuals were tested on their knowledge of languages other than Zu/wasi (Herero, Setswana, Afrikaans, English), on their perceptions of the nation and the outside world, and on their ability to recognize pictures of common, nontraditional objects. In addition, lengthy interviews were conducted with informants concerning their present adherence to traditional values and practices in the areas of socialization, ritual, and medical practices. A total of 38 individual cases were used in the final analysis, consisting of all individuals who had agreed to the inventory of their material possessions and who had also completed at least one of the other three types of interviews. These cases represented a good cross-section of the community in terms of age, sex, and levels of material wealth.

The results of the study showed a correlation between nontraditional subsistence pursuits and accumulation of material wealth (especially of non-traditional San items), indicating that many Dobe

San were beginning to move toward a mixed-pastoralist lifestyle. For example, in 1963 no Dobe San owned livestock or cultivated fields. In 1976, 12 people cultivated fields and 24 people owned livestock. The total number of animals owned by the sample population was 9 cows, 113 goats, 10 chickens, 9 donkeys, and 4 horses. Of the people who practiced agriculture, 83.3 percent of them also owned livestock, 91.7 percent had previous employment experience, and 83.3 percent were presently employed. Only people who had fields, livestock, and employment experience owned large trunks (5 individuals, 13.21 percent of the sample population) in which to store possessions, and only these individuals had built storage structures.

Greater material wealth was definitely evident in the possessions of those individuals involved in nontraditional San subsistence pursuits. This was especially significant among San who were cultivating fields and had employment experience. People who had fields had, on the average, 1.5 times as many total manufactured (European) possessions as those who did not own fields (26.5 for field owners; 17.96 for non-field owners). Livestock owners also averaged 1.5 times as many European possessions as non-livestock owners (24.21 for livestock owners; 16.71 for non-livestock owners). Those people who were employed during the time of the study averaged 26.48 European possessions, while people not employed averaged 15.24 European possessions. People with previous work experience owned an average of 1.7 times the number of European possessions as those who had no previous work experience.

An increasing amount of differential wealth with economic modernization was also evident. In almost all cases, the range of material wealth was much greater for those people with fields, livestock, and work experience, and in some cases the range was almost twice as great. The range for those people not exhibiting these characteristics is much more restrictive. For example, the range of European possessions owned by the 21 people (presently) employed was 7 to 50, while for those 17 people not (presently) employed it was 0 to 30.

As the San move toward a mixed-pastoralist lifestyle, the emphasis on traditional subsistence

pursuits has decreased. No women went on *overnight* gathering trips during 1976, and few men hunted successfully. This interview data correlates with the results of the subsistence study, which showed no overnight gathering trips and only about a dozen wild animals killed, over half of them guinea-fowl caught in snares. Only one large game animal, an oryx, was recorded (Hargrove, n.d.). Despite increasing dependence on domesticated foods, however, the Dobe San are actively pursuing a number of different subsistence techniques rather than specializing in one.

Further analysis of the data suggested that one effect of economic change among the Dobe !Kung is the emergence of a large and growing inequality between men and women, as well as among different age groups. Ownership, mobility, and knowledge of the outside world is concentrated among the men. Men in the 30–50 age group own most of the wealth, and these goods are not being exchanged through the *hxaro* system to the same extent as before (Wiessner, n.d.). Out of a sample population of 20 men and 18 women (ranging in age from 15 to 65 years), 85 percent (17) of the men but only 38.9 percent (7) of the women owned livestock.

The sexual differences in the extent of economic (subsistence) cultural change are very significant and will probably lead to an eventual modification of sexual roles that could have a major impact on the Dobe !Kung San culture. As hunter/gatherers, the !Kung San are basically egalitarian (Lee and DeVore, 1968a: 12). The women have an important economic role, providing 60 to 80 percent of the subsistence base. But the women appear to have a very minor economic role in Dobe San mixed-pastoralist society.

Women also have much more limited access to wage employment than men. Selling crafts is the only opportunity open to men and women equally. It is not a reliable means of obtaining cash, since it is totally dependent on the sporadic visits of a crafts buyer. Men have almost sole access to employment by the Namibian and Botswana governments. Since women have little access to wage employment, they have difficulty buying livestock. Thus, most women have only obtained livestock

and other forms of material wealth as gifts.

It is interesting to note, however, that while female hunter/gatherers provided the gathered vegetable foods, women do not seem to be turning to agriculture. Only 2, or 11.1 percent, of the women had fields, while 10, or 50 percent, of the men did. Perhaps this is due to the specific organization of both Tswana and Herero mixed pastoralism, in which women do not usually work in the fields or herd cattle. It is significant that five times as many men as women have fields, more than twice as many men as women own livestock, and the average number of work experiences is 3.05 for men but only 0.89 for women.

The study also revealed changing correlations between cultural and material modernity among different age groups, in contrast to the correlations suggested by Robbins and Pollnac's study (1977). San between the ages of 30 and 50 are the most heavily involved in nontraditional subsistence pursuits: the age category 30–50 consistently had the highest percentage of people practicing agriculture, owning livestock, and involved in wage employment. The people in this age group also had the highest average number of material items (except for clothing) and the widest range. The youngest (15–20) and the oldest (over 50) age categories had the smallest percentages of people owning livestock or practicing agriculture. In most cases they also owned the smallest percentage of material items. Although no one in the youngest age category had a field, 50 percent of them owned livestock and 33.3 percent were presently employed. It is significant that the highest percentage of nontraditional subsistence pursuits and material wealth is among those people between the ages of 30 and 50. In traditional !Kung society (Lee, 1979; Wiessner, n.d.) this is the age group most involved in the subsistence support of the youngest and oldest age groups and is therefore most economically important. The Dobe results are in contrast with Robbins and Pollnac's study, which found the material wealth concentrated in Buganda's ruling elders.

Although people between the ages of 30 and 50 averaged 35 percent more European possessions than any other age group, and were the only

ones owning large trunks and storage structures, they also owned the highest average number of traditional items and maintained a more traditional ideology than the younger age groups. This indicates a developing conflict between the values and the economic imperatives of those men who have most of the goods but are also the most conservative. They still profess beliefs and behave in the traditional ways, especially in gift-giving (*hxaro*) and exchange. This conflict creates problems that this most influential decision-making part of the group cannot solve.

While the younger San (15 to 20 years old) expressed the strongest nontraditional ideology and reflected a greater exposure to the world outside Dobe, they had little material wealth. This is probably due to the fact that they have not yet had the opportunities that would allow them to accumulate material possessions. There will probably be a significant increase in the positive correlation between cultural and material modernity as the young San assume an adult role in Dobe !Kung San society.

Discussion

The observed change in the Dobe group from subsistence based on hunting and gathering to a combination of hunting and gathering with independent mixed-pastoralism is an extremely unusual occurrence in the ethnographic present. While many San in Botswana are being drawn into the modern state, virtually all of them are entering the economy as a permanent underclass of servants with no independent rights in land or livestock (Hitchcock, in press; Hitchcock and Ebert, this volume). The owners of these resources are most often Bantu but also include Europeans (in the case of the farms at Ghanzi). The few settlement schemes for San that exist in southern Africa are inherently fragile and would most certainly collapse if the government involved withdrew its direct support and intervention. It is this pattern of an underclass ultimately assimilated into the overlord society through intermarriage which probably characterized most of the prehistoric contact situa-

tions between African hunter/gatherers and Bantu pastoralists and farmers. Only rarely has a hunter/gatherer society moved toward the other corner of the triangle in our model.

Even though the changes at Dobe have been continuously observed by anthropologists, no single factor can be considered responsible for the economic and other changes. The existence of an extremely strong-willed and individualistic group of interrelated families, political pressures from outside causing increasing population concentration and limited mobility, the greater willingness of Bantu groups to sell or dispose of their cattle in exchange for cash or labor, the influence of a growing cash economy, and extensive support from the government and outside groups are all important factors, as is the favorable rainfall of the 1970s. As a result, *all* the causes usually given as prime movers in the development of or transition to domestication, i.e., environment, technology, demography, social organization, and ideology, are operating in this situation. If single-factor explanations do not work in the ethnographic present, how likely is it that they operated in the archaeological past? Perhaps it is only this combination of many factors which is finally tipping the balance away from an independent hunting/gathering way of life. Hargrove (n.d.) compared the San transition at Dobe to that described for the Sandawe of Tanzania by Newman (1970). Like the San, the Sandawe were in contact with the Bantu farmers over a long period but have only become food producers themselves within the last century.

A second major point of this paper concerns the observation that, in the Dobe case, changes in values are occurring last and are most crucial to the success of the new adaptation. There is currently among the Dobe !Kung a notable lack of fit between differential wealth and year-round fixed residence, on the one hand, and, on the other hand, the continuing stated emphasis on *hxaro* (gift-giving, egalitarian relationships) and refusal to accept one person as leader and arbiter. The system as it now stands is fragile. It could easily disintegrate, given its inherent internal contradictions and the pressures thus generated. If such a possibility comes to pass, the most likely result is that the Dobe group will throw in the towel, so to speak, and cast their

lot with the Bantu in what might roughly be described as a master-servant relationship; in other words, they will be assimilated. When one looks at the original movement of Bantu peoples over much of sub-Saharan Africa, it is clear that this original expansion was relatively rapid and the subsequent cultural domination nearly complete. One need only point to a linguistic map to underline this fact. What happened to all those hunters and gatherers? By what mechanism or process did their culture, in most instances, dissolve? This question has long interested students of African prehistory and is reflected, for example, in the 1950s and 1960s by the argument that iron spears made effective weapons for subjugation. We would tentatively speculate that what provided a major, if not the most important, factor in the rapid assimilation of hunting and gathering populations was a form of "cultural dissolution," if one wants to call it that. It was caused not so much by forces external to the group but, rather, by internal stresses that led eventually to increased dependence and assimilation to dominant groups that followed an agricultural or mixed-pastoral way of life—in terms of the triangle model proposed earlier, groups would move rapidly toward the apex.

Further examples of the strain that old values can impose on a new economic venture are provided by Lee (1979: 413) and by M. Bieseke (pers. comm.). Lee describes one individual who had acquired a substantial herd of goats through *hxaro* and who husbanded this reserve carefully. In economic terms he was very successful. His sons, however, were unable to acquire or maintain wives, because their father was not perceived as adequately generous to their in-laws in proportion to his wealth. In social terms, therefore, the man was a failure. He eventually gave away his herd and moved to a settlement where he became dependent on government handouts. In a second example, Bieseke became involved in a San agricultural experiment on the edge of the Okavango delta. San who were living on the periphery of the grazing territory of a Bantu village were encouraged to plant fields. The experiment foundered, owing to the inability of the group to appoint and accept the judgments of a leader as settlement of disputes over allocation of scarce resources such as a plow. In

both cases, the individuals involved moved into a dependent relationship with more technologically advanced peoples rather than back to independent hunting and gathering.

Our third point concerns the fluidity of groups within the triangular model in the arid and semiarid regions of southern and, perhaps, eastern Africa. At first we had to assume that as we followed the Dobe group through their changes, they would eventually come to lie almost completely at the mixed-pastoralist end of the scale and that as of 1977 they simply had not had the time to reach that point. Now we are not so sure. Given the extremely variable and unpredictable nature of the northern Kalahari Desert rainfall—and this is typical of semiarid regions—a "generalist strategy" (as a biogeographer would term it) makes a good deal of sense. In effect, one would want to maintain a broad subsistence base and not put all one's eggs in a single basket. Therefore, we suggest that the process of subsistence change may have almost played itself through and that the balance, in which women still invest a good deal of effort in gathering and men in hunting, may have been struck.

The question that then arises is why Bantu groups who live in the same environment do not adopt the same approach. The answer is that in fact they do. Data on the Hereros indicate that a substantial portion of their diet consists of hunted and gathered food (Murdock, 1967: 62). For eastern Botswana, Grivetti (1979) published a study showing that the Tlokwa, a Tswana group in southeastern Botswana, the most densely populated and overgrazed part of the country, utilized 126 species of wild plant food and 100 different categories of wild animal foods. This is considerably in excess of the similar figures of the !Kung, which are 105 and 54, respectively. Similarly high figures for wild food usage by farmer/herders in Africa have been published for the Lamba (84 plants, 145 animals [Doke, 1931]), the Bemba (98 plants, 131 animals [Richards, 1939]), the Ila (46 plants, 115 animals [Smith and Dale, 1920]), the Pedi (50 plants, 95 animals [Quin, 1959]), the Lovedu (145 + plants, no data on animals [Krige and Krige, 1943]) and the Tonga (139 plants, no data on animals [Scudder, 1962]). Among the Natal Zulu, twelve wild plants are used to supplement the basic cornmeal

diet, thereby supplying essential niacin and increasing the amount of available protein (Shanley and Lewis, 1969: 256; Hennessey and Lewis, 1971). In Zambia, Marks (1976) has described the economic pursuits of the Valley Bisa who, although farmers, rely extensively on hunted game meat, spending much time at this activity. For East Africa, Fleuret has described the considerable reliance on plant foods as a supplement to a monotonous starchy diet among the Shambaa of Tanzania (1979: 89). Her research suggests that this practice is widespread in East Africa.

In this paper, we have documented the close relationship between changes in the technoeconomic subsystem and changes in other cultural subsystems. The Dobe !Kung example also supports our hypothesis (Yellen, 1977a) that in a variable and unpredictable environment, narrowly defined equilibrium states based on a narrow range of resources will be less successful in the long run than broadly based adaptations that depend on the widest possible range of resources. In this sense, the technology of domestication may be an addition, rather than an alternative, to hunting and gathering. Yet the evidence also suggests that once the

technology is introduced, it is rare for a group to return exclusively to hunting and gathering.² The more common occurrence, for a group that does not succeed in becoming an independent food-producing community, is a shift toward a master-servant relationship and, ultimately, assimilation.

2. One factor we have not considered here is the role of environmental degradation resulting from the introduction of foreign domesticates into a fragile environment. While we have anecdotal evidence to confirm the hypothesis that this introduction restricts hunting and gathering, our observations are qualitative rather than quantitative. Wilmsen (pers. comm.) has suggested that the overgrazing evident at /Ai/ai, 50 km south of Dobe, has suppressed the growth of new mongongo trees from young shoots and is in the process of eliminating this major wild food staple from the area's resources. This process was evident long before the establishment of a borehole at /Ai/ai in 1977 (see also Lee, 1979). Just to the south of Dobe, in areas that are accessible to Herero cattle and goats, a clear difference may be observed between the vegetation on the Botswana side of the border fence and that on the Namibian side, where livestock are prohibited. In particular, the overgrazed side has more acacia at the expense of open, grassy areas. The effect of this difference on San wild food species other than the mongongo has not been measured.