Agricultural Territories in a Dispersed Settlement System

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Agriculture, writes P. M. Blakie [1971:4], "can be regarded as a series of movements." Because movements have time, energy, and opportunity costs, movement minimization affects the spatial organization of human economies. Minimizing of movement cost or effort plays a pivotal role in the theory of land use (von Thünen 1966, Chisholm 1962) and figures in models of market town and entrepôt location [Christaller 1966 [1933], Paynter 1982], hunter-gatherer strategies [Binford 1980], and agricultural origins and sedentarization [Johnson 1977:489; Flannery 1986].

The archaeological concept of exploitation territory is grounded in studies of movement cost [Roper 1979, Salle and Braun 1982]. Chisholm’s [1979 [1962]] Rural Settlement and Land Use, based on von Thünen’s [1966 [1826]] model of the effects of transport cost on land use, is the classic study of how far people will travel to farm, and archaeological analyses often rely on Chisholm’s findings that agricultural activity is concentrated within a 1-2-km radius from settlement—activities beyond this being strongly affected by travel time and often terminating at around 5 km [e.g., Vita-Finzi and Higgs 1970; Roper 1979; Jarman, Bailey, and Jarman 1982; Sargent 1983; Kintigh 1985:105; Nicholas et al. 1986]. These generalizations have been vital to analyses of agricultural productivity [Nicholas et al. 1986] and of site location [Zarky 1976] and abandonment [Pauketat 1989].

Despite the breadth of material he draws on and the rigor with which he builds his case, Chisholm’s conclusions suffer from the dearth of actual measurements of farmers’ movements in the conduct of agriculture. His findings certainly demonstrate the general decline of labor inputs and agricultural outputs with distance from the residence, but as a foundation for reconstructing prehistoric land use they have turned out to be ambiguous. Whereas virtually all territorial analyses cite Chisholm, assumed territorial radii range from the 5 km popularized by Vita-Finzi and Higgs [e.g., Jarman, Bailey, and Jarman 1982; Damp 1984; Gorenflo and Gale 1986] through 2 km [Stoqonaitis 1981, Gaffney and Gaffney 1988] and 1.5 km [Kintigh 1985] to 0.5 km [Zarky 1976:22]. Sherd scatters at Middle Eastern sites suggest radii of intensive cultivation ranging from 200 m for farmsteads to 6 km for cities [Wilkinson 1982, 1989]. "If the concept [of site territorial analysis] is to continue in use," writes Wagstaff [1988:69], "then the questions of suitable thresholds must be settled." Resolution of this issue requires, ideally, measurements of the spatial dynamics of low-technology agricultural systems, which are a logistic nightmare to obtain [Chisholm 1979:34].

Like most geographers writing on this issue [e.g., Blakie 1971, Richardson 1974], Chisholm is primarily concerned with explaining land use rather than settlement patterns. Thus he retains von Thünen’s assumptions of an “isolated” settlement even as he explores the effects of movement cost on small settlements and farmsteads. Movement in the model is movement between the settlement and its fields; movement between settlements is considered nonagricultural and outside the scope of the model [Chisholm 1979:103].

Analysis of archaeological site territories also requires assumptions about catchment shape. Researchers have assumed territories to be [1] square, which is convenient for regional analyses [Nicholas et al. 1986; Gorenflo and

1. © 1991 by The Wenner-Gren Foundation for Anthropological Research. All rights reserved 0011-3204(91)3203-00006520.00. This analysis is based on data collected in collaboration with Robert McC. Netting and M. Priscilla Stone in 1984-85. Fieldwork was sponsored by National Science Foundation grants to G. D. Stone and M. P. Stone [BNS-8306133] and to R. McC. Netting [BNS-8318569], by the Wenner-Gren Foundation, and by the University of Arizona Educational Fund for Archaeology. Some of the analysis was done while I was a Weatherhead Fellow at the School of American Research in Santa Fe. I am grateful to Bob, Priscilla, and the anonymous referees for comments.

2. Territorial is “the area habitually exploited from a single site” [Higgs and Vita-Finzi 1972:30]; in contrast, catchment is the entire area from which a site’s resources are derived [Jarman, Bailey, and Jarman 1982]. The former concept is more closely linked to agricultural-location theory and empirical studies of agricultural movement.

3. Most of the data marshalled by Chisholm pertain to agricultural production per hectare and average distance to plots rather than farmers’ movements to plots at various distances. Richardson [1974] estimates inputs at various distances on the basis of farmers’ recall of how many days they worked particular plots. Blakie’s [1971] analysis of agriculture in North Indian villages involves measurements of the locations of agricultural operations, but the usefulness of this case for territorial analysis in archaeology is limited by the villagers’ reliance on camels and oxcarts for transportation.
Gale 1986, Davidson and Green 1989], (2) circular, which is most appropriate for an analysis of simple distance [Kintigh 1985; Pauketat 1989:304], and (3) isochronic, which is appropriate for the analysis of time and effort expenditures [Bailey and Davidson 1983, Jarman, Bailey, and Jarman 1982]. On the hypothetical isotropic plain, the result of distance or time expenditure should be the concentric ring pattern described by von Thünen. In reality, social factors can override the effects of sheer distance, although this process is not easy to isolate.

The data reported here open a window onto the spatial dynamics of a dispersed settlement system. The Nigerian Kofyar live in contiguous farmsteads under 10 ha in size, with boundaries rarely over 400 m from the residence. This is a pattern much smaller in scale than that at which movement costs usually generate concentric land-use zonation [Grove 1961, Morgan 1969]. However, Kofyar agriculture relies heavily on suprafarmstead labor groups, farmers regularly traveling on foot to work on other farmers’ land. Recent research on Kofyar agriculture provides a detailed picture of this type of movement and its effects on settlement. In this paper I present measurements of the spatial organization of agricultural inputs, compare movement between dispersed farms with Chisholm’s model of movement in nucleated systems, explore the effects of interfarm movement on settlement pattern, examine the size and shape of agricultural territories and how these vary with population and agricultural intensity, and consider the extent to which ecological considerations in agricultural movement are overridden by social or political factors.

KOFYAR AGRICULTURE AND SETTLEMENT

The Kofyar were the subject of a classic study by Netting [1968] that emphasized their intensive agriculture in the crowded hills along the southeastern edge of the Jos Plateau (fig. 1). Since the 1950s, they have been moving into the savanna south of the plateau. This frontier’s low population density and fertile soils at first allowed them to adopt extensive methods of cultivation, while the ready access to markets provided opportunities to sell surplus. Over the years, the Kofyar population in the area has increased sharply, and intensive methods have appeared in many areas [Netting, Stone, and Stone 1989]. The agricultural calendar has been lengthened and adjusted so that more labor can be invested in field preparation and weeding while minimizing the labor bottlenecks that plague savanna agriculture [Stone, Netting, and Stone 1990]. The principal crops are yams, sorghum, and millet, followed by rice, cowpeas, and peanuts.

After a brief experiment with residence in hamlets during the early days on the frontier [Holzall and Stone 1990], the Kofyar developed a dispersed settlement pattern with individual households (mean size 8.4 persons) residing on farmsteads (mean size 5.5 ha). Farmsteads tend to be roughly rectangular, with the household residing in a compound (typically 4–10 mud huts) located near the center, usually close to a dirt road or path (fig. 2). Farmsteads are contiguous, filling much of the study area shown in figure 1.

Although there is no evident structure to this settle-
ment pattern, the Kofyar recognize an areal entity called the ungwa that is essential to understanding patterns of agricultural movement. Ungwa (or unguwa) is a Hausa loanword with no direct English equivalent. It refers to a settlement grouping, neighborhood, or district but implies a certain formality and distinct identity. An ungwa is often named for the homeland village of its inhabitants or for a distinctive feature of the local landscape. It is not bounded or marked in any way, and since settlement is more or less continuous there is no way to tell where one ungwa ends and another begins. Each ungwa has a head, or mengwa. The mengwa acts as a spokesman for and representative of the ungwa, collecting taxes for the government and presiding over the distribution of farmland to newcomers.

The ungwa structures the mobilization of suprhousehold labor. The primary type of communal labor is the festive work meeting called mar muos (beer farming). Such meetings take place almost daily during much of the agricultural season. Parties of workers from most of all households in the ungwa convene to work for several hours on a farm. Neighbors who fail to participate in group labor can be subjected to considerable pressure, including ostracism. After (and often during) a mar muos, workers are served the muos (millet beer) brewed during the preceding week. More than simply a refreshment or mild intoxicant, muos and its attendant sociality are, in a sense, a currency in Kofyar affairs (Netting 1964). Mar muos allows agricultural labor to be "banked" in the form of millet, an advantageous ecological complement to the staple sorghum. Labor invested during the short growing season of Pennisetum millet can be "withdrawn" by brewing millet beer for mar muos when there is need for a major infusion of labor. There are economic as well as social reasons for communal labor [Stone, Netting, and Stone 1990, Richards 1983], and it has played an important part in both intensive and extensive farming among the Kofyar.

For the study of agricultural labor reported here, a group of young Kofyar farmers were hired and trained as enumerators. Each had a primary education, lived on a farm in the study area, and participated in the suprhousehold labor system. Each monitored his own and at least one neighboring household, making up a total sample of 39 workers in 11 households. Using their own observations as well as interviews, the enumerators recorded each adult's daily activities, noting the task, the crop, the approximate amount of time spent, and the farmstead on which each task was performed. Time spent on each activity was rounded to the nearest hour, and activities less than ca. 45 minutes in duration were omitted. The daily returns were carefully checked on a weekly or biweekly basis.

Most of the recorded tasks can be located in space because of a survey of farm compounds in the study area based on aerial photographs and surface reconnaissance. Each ungwa was surveyed after a household census had provided a list of the inhabitants. Compounds were visible on 1:25,000 aerial photographs shot in 1978-79; those postdating the aerial survey were spotted on the photographs and surveyed with Brunton compass and distance wheel.

Farm labor data collected in Kofyar and Kwallala allow us to compare ungwas with relatively high and low population densities on the frontier (fig. 3). Kofyar is an early-settled area, many farms having already been claimed by the late 1950s. It runs along a watershed between two converging streams, giving it a linear shape. This 1.62-km² area had 44 farmsteads at the time.

6. The actual number of farmers being monitored fluctuated slightly because of changes in household composition and the occasional unavailability of enumerators. On the average, 22.6 workers were reported in Kofyar and 16.2 in Kwallala.

7. Data on labor inputs, farm locations, and agricultural censuses were managed in a relational database management system I wrote for the project. Analysis was done entirely on microcomputers with a spreadsheet and my own programs. Figures 6 and 7 were made with Surfer.

8. "Kofyar" here refers to Ungwa Kofyar, not be be confused with Kofyar village in the Jos Plateau homeland.
of the study, and its population density of 154.9/km² was one of the highest on the frontier. Kofyar’s seven monitored households are all located near the northern end.

Although Kwallala may in some ways be regarded as an ungwa, it comprises, along with Koedoegoer Koegoen (KDK), the single noncontiguous ungwa of Goejak. Because of the history of settlement, Kwallala and KDK recognize a single mengwa and often collaborate in group labor parties. Although there were a few early settlers in northern KDK, its swampy southern end has been settled only recently, and some of it is still uninhabited. Kwallala is relatively late-settled for a different reason; it has good soils but limited access to water. An analysis of the changing determinants of site location has shown that early settlements were attracted strongly to water but weakly to highest-quality soils; with increased land competition, the attractive value of water was eclipsed by that of large plots and good soil [Stone 1988b]. Most of the population in Kwallala arrived during the 1970s, and several farms still contain primary forest. Kwallala, with an area of 2.56 km², has 32 households and a population density of 85.6 km², one of the lowest on the frontier. The four sample households are located near the center and in the southern end of Kwallala.

The longer-settled Kofyar has undergone farm fragmentation, reducing the mean farm size to an estimated 4.2 ha as compared to 8.8 ha in Kwallala. Cultivation is intensive by African standards in both areas but demonstrably more so in the more crowded Kofyar. Levels of off-farm labor are identical, but Kofyar farmers put in

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Fig. 3. Ungwas used in the analysis. Kwallala and Koedoegoer Koegoen (KDK) together comprise Goejak. compound; ◆, sample compound.
21% more bouts on their own farms. These bouts are comparatively short, and the differences in total hours are small, but marginal returns to labor (the essential characteristic of intensive agriculture) are decidedly lower in Kwallala. Table 1 shows that the average hour in the fields in Kwallala produces 9% less sorghum but 57% more yams, 33% more millet, and 10% more rice than in Kofyar.

**TERRITORY SIZE**

Excluding entries for animal feeding, hut construction, etc., left a sample of 17,066 agricultural labor bouts. Cross-tabulation was made of how many times the members of the sample households worked on their own fields and on every other farm. The proportion of all labor bouts occurring on other farms ranges from 9.0% to 23.9%, averaging 16.7%. Kofyar farmers conduct more own-farm work, but the proportion of their total agricultural time spent at home is approximately the same as in Kwallala.

Distances were calculated from the compound of each sample household to every other compound. The location of the residential compound was used as a proxy for the location of the work on other farms; compounds tend to be located centrally within the farm, and workers customarily congregate at the residence before heading to the work site. A proxy was devised for the distance to own-farm work, since precise locations of many labor bouts within the farm are unknown. For the own-farm distances, a series of points was plotted midway between the residential compound and the farm perimeter (see fig. 2), and own-farm activities were assigned the average distance from the compound to this midline. Midline values ranged from 56 m to 138 m, averaging 84 m.

Cumulative percentages of labor bouts against distance from residence are plotted in figure 4. The pattern is dominated by the high rate of trips to home fields; 73.0% of all trips occur within 1 km, and 89.2% occur within the range of the largest home farm. A more interesting pattern emerges if we isolate trips to other farms, which better reflect farmers’ willingness to travel in the normal conduct of agriculture. Figure 5 shows that trips increase linearly with distance up to 700 m. Beyond this increases in total trips drop off sharply, becoming asymptotic between 2,000 and 2,500 m. This means that within a range of 700 m, or around 15 minutes’ travel time, distance has virtually no effect on off-farm agricultural movement. The number of trips increases regularly with distance, rate of increase being very close to 1% of total trips for every 10 m of distance (20% of trips are within 200 m, 50% within 500 m, etc.). When square area is made the independent variable, the pattern is similar. When percentage of trips is plotted against a circular area centered on the residence, the slope of the line is of course lower, but the threshold at which trip percentages begin to taper off is 130 ha, the area within 643 m of the compound.

These findings show a clear threshold below which distance does not affect farmers’ willingness to travel from their farmsteads. The finding of such a threshold, with the sharp dropoff in inputs beyond, corroborates the general structure of agricultural movements argued by Chisholm; the threshold, however, is at a radius of 700 m rather than 1 km. It must also be kept in mind that the majority of agricultural work occurs on one’s own farm, and the distance to this work is kept extremely low by settlement dispersal (Stone 1988b).

**TERRITORY SHAPE**

The Kofyar data show how social factors of production can affect territory shape. The ungwa plays a key role in

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**TABLE I**

**Labor and Agricultural Production in Kofyar and Kwallala**

<table>
<thead>
<tr>
<th></th>
<th>Kofyar</th>
<th>Kwallala</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population per km²</td>
<td>154.9</td>
<td>85.6</td>
</tr>
<tr>
<td>Estimated farm size [ha]</td>
<td>4.2</td>
<td>8.8</td>
</tr>
<tr>
<td>Households in sample</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Adults per household</td>
<td>3.6</td>
<td>4.3</td>
</tr>
<tr>
<td>Agricultural productiona</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household averages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yams</td>
<td>2,571</td>
<td>5,500</td>
</tr>
<tr>
<td>Sorghum [bundles]</td>
<td>44.1</td>
<td>55.0</td>
</tr>
<tr>
<td>Millet [bundles]</td>
<td>29.5</td>
<td>50.8</td>
</tr>
<tr>
<td>Rice [bags]</td>
<td>2.7</td>
<td>4.0</td>
</tr>
<tr>
<td>Per capita [adult] averages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yams</td>
<td>833</td>
<td>1,275</td>
</tr>
<tr>
<td>Sorghum</td>
<td>14.1</td>
<td>12.5</td>
</tr>
<tr>
<td>Millet</td>
<td>8.7</td>
<td>11.4</td>
</tr>
<tr>
<td>Rice</td>
<td>0.87</td>
<td>0.94</td>
</tr>
<tr>
<td>Per 1,000 person-hoursb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yams</td>
<td>524</td>
<td>822</td>
</tr>
<tr>
<td>Sorghum</td>
<td>8.9</td>
<td>8.1</td>
</tr>
<tr>
<td>Millet</td>
<td>5.5</td>
<td>7.3</td>
</tr>
<tr>
<td>Rice</td>
<td>0.55</td>
<td>0.60</td>
</tr>
<tr>
<td>Trips per person [per year]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To own farm</td>
<td>391</td>
<td>324</td>
</tr>
<tr>
<td>To other farms</td>
<td>59</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>363</td>
</tr>
<tr>
<td>Length of bout [hours]c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On own farm</td>
<td>3.3</td>
<td>3.9</td>
</tr>
<tr>
<td>On other farms</td>
<td>3.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Hours [per year]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On own farm</td>
<td>1,288</td>
<td>1,448</td>
</tr>
<tr>
<td>On other farms</td>
<td>302</td>
<td>303</td>
</tr>
<tr>
<td>Total</td>
<td>1,590</td>
<td>1,551</td>
</tr>
</tbody>
</table>

a Figures are sample means, based on data for 1984.
b Figures are available for time worked by sample households on particular crops, but using these figures would miss the labor exchange that is important in production.
c Based on enumerators’ estimates.

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10. The relationships among population density, nature of agricultural labor, and household size were anticipated by Netting (1965) long before measurements of labor were available.
mobilizing group labor, and ungwa boundaries influence the shape of agricultural territories. More than 90% of all off-farm trips are within the ungwa (table 2), even though several sample households are near ungwa boundaries (see fig. 3). To reveal the spatial configuration of agricultural movement, a composite map was made for each ungwa. The coordinates of the trip destinations for each sample household were normalized by subtracting the household’s own coordinates; in other words, each sample household’s coordinates were set to 0,0, and the locations of the farms its members visited were adjusted accordingly. The composite map for Kofyar appears in figure 6. A total of 68.7% of off-farm trips occur within the 700-m range, and 78.3% occur within 1 km. The deformation of the concentric model is especially evident here. Despite the elongated shape of the ungwa, which leaves much of the 700-m area outside of it, there is significant movement across the ungwa boundary only to the west, into KDK. There are few compounds in the ungwa to the southeast, and one was involved in a dispute with the Kofyar mengwa about their common border that probably further reduced agricultural movement. A little movement occurs across the northern boundary but only up to the 700-m threshold. Of Kofyar’s 45 recorded trips outside the ungwa, 40 (88.9%) were to KDK, where much of the 700-m ranges lay. In this way the effects of sheer distance override the social factors of production that are manifested in the boundaries of labor mobilization units.

Kwallala agricultural movement (fig. 7) represents the activities of fewer individuals than the Kofyar sample, but agriculture is also less intensive here and agricultural movement less concentrated. Only 55.7% of off-farm trips occur within 700 m and 70.8% within 1 km. To the southeast and northwest of the sample households are boundaries of Rafin Gwaska and Koprume; no trips were recorded into these ungwas. What is interesting is the significant amount of movement over 2 km away into KDK. Despite the distance across the northern end of Rafin Gwaska, 3.7% of trips were to this area. Since KDK and Kwallala comprise a single ungwa, communal labor pools regularly draw on both areas despite physical separation. The social factors of production, manifested in the boundaries of labor mobilization

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Agricultural Trips Within and Outside the Ungwa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kofyar</td>
</tr>
<tr>
<td>Including own farm</td>
<td></td>
</tr>
<tr>
<td>Total trips</td>
<td>10,868</td>
</tr>
<tr>
<td>Percent within ungwa</td>
<td>99.6</td>
</tr>
<tr>
<td>Excluding own-farm</td>
<td></td>
</tr>
<tr>
<td>Total trips</td>
<td>1,537</td>
</tr>
<tr>
<td>Percent within ungwa</td>
<td>97.1</td>
</tr>
</tbody>
</table>

FIG. 4. Location of agricultural work. Each data point represents number of trips a household made to a particular location divided by total number of trips that household made during the agricultural calendar. Data from the two ungwas were pooled and sorted by distance from the residence to the work location, and cumulative percentages were computed.
units, here override the effects of sheer distance. Thus KDK, close to Kofyar in space but to Kwallala in the organization of production, shows both the strength and the limitations of the distance-minimization model.

Plotting numbers of trips to specific farms allows us to look at specific social factors that override simple distance considerations. In figure 8, the mean number of trips per person is in almost all cases below the logarithmic curve. The outliers marked a all involve one farm near the center of Kofyar that our sample farmers visited frequently. I recognized travel to this farm as an outlier only after returning from the field, and I do not know what the attraction was. The outliers marked b represent travel by a household that has ample land and no children or other dependents [with the result that labor is not in short supply] and a young head with a particular enthusiasm for the millet beer available at work parties. Attending a large number of mar muos while hosting a normal number produces a net loss of labor, but it is an indulgence allowed by this household’s situation.

DISCUSSION

Archaeologists usually accept that agricultural territories should not exceed a 1-2-km radius and that beyond 1 km travel time becomes an important factor, prompting the establishment of new or subsidiary residences. The Kofyar data indicate a parallel structure to interfarm agricultural movement, with a distinct threshold at 700 m and an asymptotic dropoff beyond 2,000 m—well within the range outlined by Chisholm but more precisely measured than any of the cases he cites. The shape of the dropoff parallels that recorded by Richardson (1974) in one of the few studies with measurements of trips to fields.

This parallel is interesting because rather than exploitation territories surrounding a single residential core, the Kofyar have work-exchange territories within a dispersed system. The two kinds of territories relate farming to different sets of variables. The agricultural-location theory supporting Chisholm’s findings holds that the marginal return to intensive cultivation is high near the residence but declines precipitously with distance and is overtaken by the returns from extensive cultivation (Richardson 1974, Chisholm 1979). Thus, travel is frequent and short for intensive farming, infrequent and long for extensive farming. This differs from Kofyar interfarm movement, in which the decision to attend a mar muos does not depend on the crop or on the task. The return for work on a neighbor’s farm is not sorghum or yams but beer and reciprocation. Since the beer varies little, we should be able to model work-exchange territories as a function of reciprocation and movement minimization.

Comparing ungwa boundaries with those of work-exchange territories helps to isolate the role of movement minimization in land use and settlement. Kofyar farmers cross ungwa boundaries mainly when much of the 700-m radius from their residence is outside their ungwa. Yet because of the irregular shape of ungwas,
almost 40% of off-farm trips are beyond the 700-m range.

Similarities between Kofyar work-exchange territories and the agricultural territories summarized by Chisholm suggest some constancy in the distances that will be regularly travelled in the conduct of agriculture. The lower distance threshold of 700 m may be due to the more refined measurements, but it may also result from the smallness of farms, the absence of animal traction and wheeled transport, and the land-use intensity that was rare in Chisholm’s overview. Continuous and contiguous areas of intensive agriculture plus manual methods in a savanna environment with labor bottlenecks produce shorter but more frequent range movements—
to neighbors’ intensive fields rather than one’s own extensive fields.

Some aspects of settlement pattern can be seen as a function of movement minimization, reversing the causality in the classic models of settlement and land use. In the von Thünen/Chisholm model, intensively farmed land tends to be close to the residence because intensive cultivation requires frequent access; in other words, proximity promotes intensification. The corollary is that intensification promotes proximity; the push to intensify places a premium on reducing residence-to-plot distances and therefore on dispersal (Stone 1988b, Drennan 1988). If settlements are “pulled” to what they access frequently, and they access other farmsteads frequently, it follows that movement between farms affects settlement spacing. This is borne out by the Kofyar case. Kofyar pioneers settled in lines, a compound usually being located 100–150 m from its nearest neighbor even though farms were generally more than 6 ha in size. Elongated farm patterns have been attributed to progressive clearing of forests (Chisholm 1979:37), but spacing among Kofyar settlements had changed little even long
FIG. 7. Agricultural movements of the four Kwallala households. (Symbols are as in fig. 6.)

Fig. 8. Number of trips to other farms.

\[ y = 10 - (\log(0.008x) \times 6) \]
after the interstices between the initial lines of settlement had been filled in [Stone 1988b:170]. Kofyar settlement spacing reflects a balance between the pull of the residence to the plot [by intensification] and the pull to the other farms [by labor mobilization].

Ethnographers often treat settlement pattern as an independent variable in the study of labor or tacitly assume that settlement size is related to labor grouping. Archaeologists, however, faced with explaining diachronic changes in settlement, have considered labor a cause of aggregation. In the Southwest, for instance, Vivian [1989:109] has stressed how the need for a large, coordinated work force to meet the demands of “horticultural intensification” promoted Chacoan nucleation; Cordell and Plog (1979:471) also point to the organization of labor as a factor in the formation of large villages. In dealing with the European Neolithic, Hamond [1981:222] models the size of communities as a function of the labor requirements of farm operations. The Kofyar case shows that even where farmers regularly form suprahousehold labor pools, households may disperse in response to the movement demands of intensive agriculture, there can be stable, even formalized communal labor pools where households reside in individual farmsteads. The greater the reliance on interfarm labor, the more we might expect culturally defined divisions of the landscape such as the Kofyar ungwa.

The traditional assumption that agricultural movement consists exclusively of trips between residence and field has been a valuable heuristic device in isolating principles underlying agrarian land use. The study of movement between dispersed settlements highlights differences in dynamics between dispersed and nucleated patterns and calls attention to social factors in the arrangement of rural settlement.

References Cited


11. Frontier farms are also attracted to the dirt roads that allow evacuation of agricultural surplus. This gives the settlement pattern a tendency towards linearity, in contrast to the situation in the homeland, where crops were not evacuated [cf. Udo 1966].

In dealing with the European Neolithic, Hamond (1989:109) has stressed how the need for a large, coordinated work force to meet the demands of “horticultural intensification” promoted Chacoan nucleation; Cordell and Plog (1979:471) also point to the organization of labor as a factor in the formation of large villages. In dealing with the European Neolithic, Hamond [1981:222] models the size of communities as a function of the labor requirements of farm operations. The Kofyar case shows that even where farmers regularly form suprahousehold labor pools, households may disperse in response to the movement demands of intensive agriculture, there can be stable, even formalized communal labor pools where households reside in individual farmsteads. The greater the reliance on interfarm labor, the more we might expect culturally defined divisions of the landscape such as the Kofyar ungwa.

The traditional assumption that agricultural movement consists exclusively of trips between residence and field has been a valuable heuristic device in isolating principles underlying agrarian land use. The study of movement between dispersed settlements highlights differences in dynamics between dispersed and nucleated patterns and calls attention to social factors in the arrangement of rural settlement.

References Cited


11. Frontier farms are also attracted to the dirt roads that allow evacuation of agricultural surplus. This gives the settlement pattern a tendency towards linearity, in contrast to the situation in the homeland, where crops were not evacuated [cf. Udo 1966].


The Evolution and Dispersion of Modern Humans in Asia

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An international symposium was held at the University of Tokyo from November 14 to 17, 1990, on the evolution and dispersal of modern humans in Asia. Organized by T. Akazawa, K. Aoki, K. Ashizawa, T. Kimura, R. Ohtsuoka, and T. Yoro, it brought together researchers from 13 countries: Australia, Canada, China, England, France, Germany, India, Israel, Japan, Syria, the Soviet Union, the United States, and Vietnam. Their areas of expertise included human paleontology, human osteology, dental anthropology, human genetics, Paleolithic archaeology, and vertebrate paleontology. The communications and discussion covered aspects of the phylogeny/cultural history and, to a lesser extent, behavior of Middle-Pleistocene-to-recent humans across Asia.

The prehistoric discussion focused on the work currently under way in the two opposite regions of Asia, the Levant and northeastern Asia (mostly China, Japan, and their immediate neighbors), with some attention to India, Siberia, Southeast Asia, and Australia. The neontological discussion focused more on mainland eastern Asia (Southeast Asia north to Siberia) and its late-Pleistocene human-populational extensions (Japan, the Americas, Oceania, Melanesia, and Australia). In these contexts, several main issues emerged: [1] chronology, [2] the "African origin" of modern humans, [3] the relative strengths of hard-tissue and genetic data for determining population relationships, [4] the effects of historical overlay in sorting out multiple past migration/gene-flow patterns, [5] the roles of raw material and environment in determining prehistoric technologies, [6] regional variation across Asia, and [7] what to do with the Qafzeh-Skhul sample.

Chronology, as always, was hotly debated, especially in light of recent efforts to use thermoluminescence and electron spin resonance, combined with vertebrate paleontology, to establish a late-Middle-to-Upper-Pleistocene chronology for the Levant. Despite general agreement (but by no means universal) acceptance of the approximate ages provided by recent thermoluminescence and electron-spin-resonance determinations for Kebara, Qafzeh, Skhul, and Tabûn, the relative chronology of most pre-40,000-years-B.P. sites in the Levant and neighboring regions remains problematic. The situation is even worse for eastern Asia and Australia, in which pre-