The bunched settlement pattern: Western Samaria and the Hebron Mountains

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ABSTRACT. The pattern of settlement which prevails in parts of Western Samaria and Western Hebron resembles a 'bunch', because its components form loose groups along stream valleys, hill-tops, and other patches of arable soils. The mean nearest-neighbour distances between the hamlets are less than two kilometres, but in most cases, conventional quantitative analysis fails to identify the bunches because the factor of accessibility and roughness of terrain cannot be adequately taken into account. The factors associated with bunch foundation are mainly soil and topography, family ties, and location in respect to home towns, roads or other settlements. Topography was found to be the most significant factor. Where the land is flatter, the bunches tend to be looser or even non-existent. This pattern is associated with relatively new settlements (about one hundred years old) which were founded by related families of poor farmers and herders in a process of 'clone colonization'. A model offered by Morgan for the Ibo area of Nigeria is generally applicable to this situation. Its main feature is the development of the grouped hamlets into towns, and, eventually, into continuously settled belts.

The study of settlement patterns has always been a major subject of geographical research The idea that type and distribution of settlements provide information on the factors and forces which shaped them has been a recurrent theme in settlement geography.

This notion has been stimulated, during the past two decades, by the growing body of quantitative methods which seemed to promise greater precision in distinguishing between the various patterns and the possibility of relating them to processes. The works of Dacey (1968), Birch (1976), Siddle (1970), and Hudson (1969) can be quoted among the numerous examples of studies which utilized quantitative pattern analysis in this way.

The usefulness of patterns as indicators of processes remains, however, a subject of controversy. Olsson has expressed great doubts about the ability of models of settlement diffusion to establish 'explicit cause and effects relationships' (Olsson, 1968), and, lately, even more fundamental objections have arisen. They were directed at the quantitative techniques themselves, and implied that their very use leads to mistakes and erroneous conclusions.

An example of this was the highly critical discussion of the nearest-neighbour method. The method which was developed by Clark and Evans (1954) was among those which stimulated the initial interest in quantitative pattern-process relationships, but many geographers appear, by now, to be disenchanted with it, and claim that it fails to provide an adequate measure of patterns (see Vincent, 1976; Sibley, 1976; Ebdon, 1976; and Charlton, 1976). Disappointment has also been expressed with the performance of other methods used for pattern recognition, particularly quadrat analysis (Vincent, 1976), and one of the authorities on the subject has even been quoted as saying that 'there is not available a conceptual and methodological framework that structures the study of spatial distributions' (Dacey, 1973).

The question of the interpretive power of pattern analysis must be separated, however, from the problem of pattern recognition methodology. It is obvious that part of the disappointment results from a lack of sufficient awareness about the limitations inherent in

quantitative techniques. It is necessary to avoid the tendency to rely on them too heavily, and to develop or return to alternative tools for evaluating geographical data. This does not mean, however, that pattern analysis, as a tool for understanding settlement evolution should be totally abandoned.

In the present article an attempt will be made to show that patterns can be effectively used for the understanding of settlement processes if the limitations involved in pattern analysis are taken into account. The study will focus on a certain type of the clustered pattern (the 'bunch'),' and will endeavour to demonstrate that this type is indicative of certain phases in the process of settlement. The data refer to rural Arab settlement diffusion in parts of Samaria and the Hebron Mountains (Fig. 1).

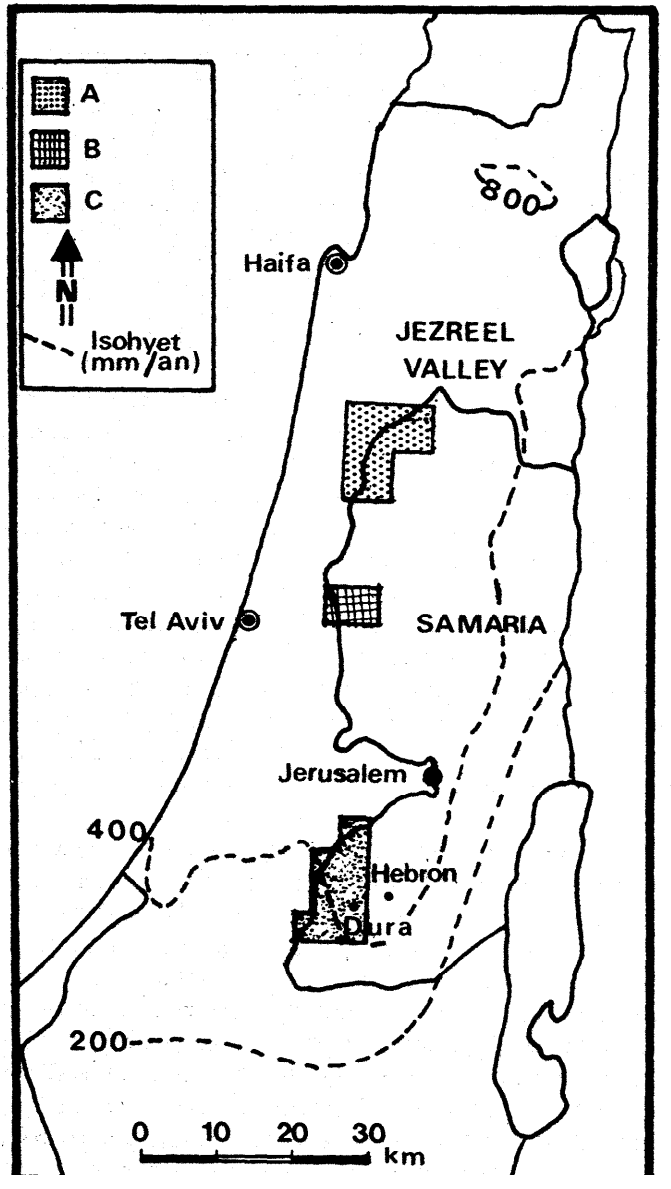

FIGURE 1. Location of study areas

Field work, oral accounts, acquaintance with the available written sources, as well as the use of maps and aerial photographs were all indispensable tools for the analysis, and by using them simultaneously and in a complementary manner along with quantitative methods, some of the problems inherent in the latter could be avoided, and the potential explanatory force of the pattern enhanced.

MAJOR CHARACTERISTICS OF THE BUNCHED PATTERN

The phenomenon of bunching was observed during extensive field study in Samaria and the Hebron Mountains. There are distinct areas which have high concentrations of bunches while others are 'bunch-poor'. In each of these areas there is a tendency for additional, finer selectivity of bunch concentration

This article is concerned with the western part of the West Bank where the greatest concentration of bunches is to be found The bedouin bunched settlements which are situated mainly east of Jerusalem and Bethlehem, and the variety of settlement patterns of North-eastern Samaria have been treated in other studies (Shmueli, 1970; Grossman, 1981).

The major characteristics of the bunches are summarized in an outline form below. These are generalized from findings of studies which have been partly reported in previous articles (e.g., Grossman and Safrai, 1980; Grossman, unpublished MS). The following summary is based on the findings of those articles.

i) The hamlets which make up the bunches are relatively recent settlements established as offshoots of older villages. They are often dominated by members of an identical extended family *(hamula)* or by families which originated in the same neighbourhood in the source village.

ii) The distribution of hamlets reflects, broadly, the distribution of farm resources. They are mostly located near isolated patches of arable land or along winding *wadis* (stream valleys) and their tributaries.

iii) Where aridity is encountered, the bunches are less defined, and spacing between hamlets tends to increase.

iv) Cropland (mainly grains) dominates the landscape today, but does not necessarily provide the major source of income since the labour force depends, in many cases, on urban employment. There is evidence that in most areas the major economic activity in the initial stages of settlement was herding rather than farming. Semi-nomads, originally from outside the settlement zone, were among the early settlers. In some cases, notably that of Dura in the Hebron Mountains (Figs 1 and 2), the villagers practised a form of transhumance which involved spending part of the winter in the *wadis* of the lowlands and the summer in the highland villages.

v) Bunches are often separated from the 'mother' settlements by barren and rocky slopes where herding is the only economic activity.

vi) The 'mother' settlement's main farmland is usually more compact and larger in extent than the individual patches of the offshoot's bunches

vii) Prior to the establishment of permanent settlements, the bunches consisted in many cases of a series of caves or ruins which were occupied seasonally or intermittently. The location of these caves or ruins determined the pattern of settlement at the stage when these 'dwellings' were replaced by permanent houses.

viii) The areas which form bunches are often characterized by well-defined extended family *(hamula)* territories. This *hamula* identity is commonly fortified by a parallel in socio-economic characteristics. Herders, usually descendants of migrants (or semi-nomads), were,

formerly, 1oosely attached to the land. They ranged their herds and farmed plots in remote and barren slopes, or in other less desirable localities. Relatively wide valleys, on the other -hand were the sites of the original land-owning families who were farmers,

ix) The size of the individual hamlets as well as that of the whole bunch was related to the quality of the land

x) The shape of the bunch is often a reflection of the communication lines (paths or paved roads). These account for the nearly linear shapes of many bunches, but there is a close identity, in most cases, between route location and the availability of arable land It is the fatter which may be the primary factor, but the communication system provides coherence to

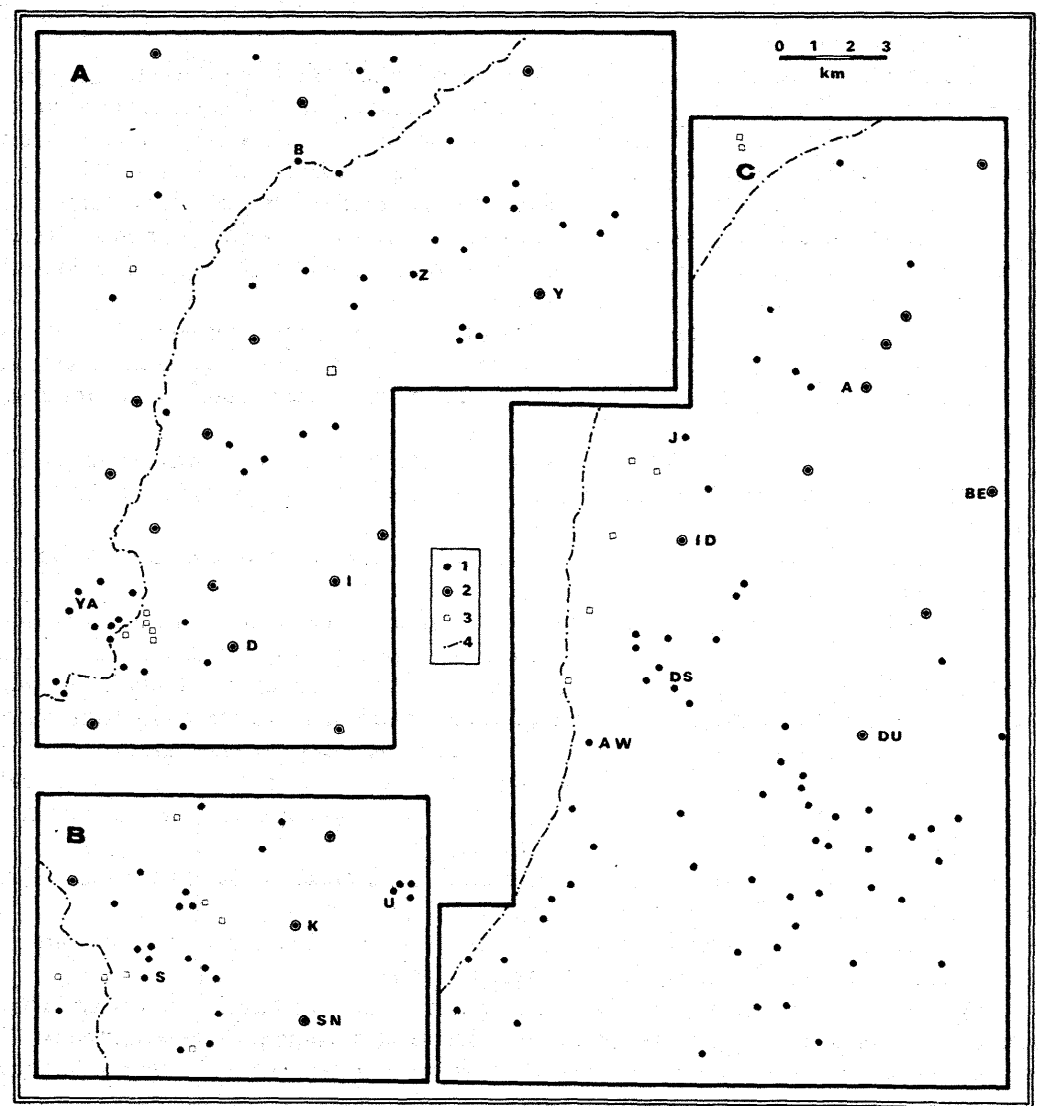

FIGURE 2. Settlement distribution in Northern Samaria (A), Kufr Thulth (B), and Western Hebron (C): 1. "New" settlements; 2. Older villages or towns; 3. Abandoned setttements; 4. Former Israel-Jordan boundary; 2A: Y-Yabed; D-Deir el-Ghussun; I-Illar, Z-Zibda; B-Barta'a; YA-Yamma; 2B: K-Kufr Thulth; SN-Saniriya; S-Abu Salman; U-Uyun Kufr Qara'; 2C: DU-Dura; BE-Beit Kahil; A-Benit Aula; J-Jamrura; ID-Idna; DS-Deir Samit; AW-Beit Awwa

the bunch by supplying the thread which ties it together. The recognition of the bunch as a distinct pattern must take into account the role played by the access routes. This will be demonstrated in the following discussion which will be concerned with the effectiveness of applying quantitative methods to pattern identification.

QUANTITATIVE PATTERN ANALYSIS

A simple pattern analysis using variance/mean ratios (Birch, 1976) was performed on the areas where bunching was identified. (Personal observations, topographic maps and aerial photographs were the basis for the identification.) These ratios usually failed to point to any specific patterns. The analysis was conducted in three areas: the first where Yabed is the dominant settlement; the second where Deir el-Ghussun is dominant (both are parts of Fig. 2A); and the third where Dura is dominant (part of Fig. 2C). The areas are 128, 64, and 148 km^2 respectively (Table I), and the cell size selected for the analysis was 2 x 2 km.

TABLE I

Varince/ mean ratios of selected Northern Samaria and Western Hebron areas (Cell size 2 x km)

Area	*Year of data*	*No. of* Cells	*Mean*	*Variance*	$\frac{Variance}{Mean}$
Yabed (Y)	1972	32	1·03	0·87	0·845
Deir el-Ghussun (D)	1972	16	1·12	1·45	1·295
Y and D	1972	48	1·10	1·07	0·97
Dura (DU)	1975	37	1·35	1·29	0·95

The methods and the results concerning two of these areas (Yabed and Deir el-Ghussun) are discussed in detail in a separate article (Grossman, unpublished MS). Only a short summary is presented here, therefore. The results showed that only in the case of Deir el-Ghussun was there any pronounced tendency towards clustering. The other cases had a variance/mean ratio very close to 'one', indicating a random pattern. No tests of significance were performed because the data were 'total populations' and not samples.

Besides these 'micro' studies, an analysis was conducted on the 'macro' areas of the Hebron Mountains (800 km^2) and Northern Samaria (720 km^2). The analysis of the latter did not indicate any pronounced tendency towards a clustered pattern

The Hebron Mountain area (the settled part, excluding the uninhabited judaean Desert) deserves special attention. It was nut analysed in previous studies which were concerned with Samaria, and should be considered, therefore, in some detail.

As already indicated above, no tendency towards clustering could be revealed in the Dura area when considered separately, but when the Hebron pattern was analysed in its entirety, a tendency towards clustering was observed. This was especially noticeable in the last (1975) data which registered a high variance/mean ratio. The analysis was performed fur the earlier dates also (1922 to 1967). The results pointed to a similar tendency for all post-1948 data even though the patterns were not as clear (Table II).

Similar records do not exist, unfortunately, for the areas outside Hebron, and their settlement patterns could be recorded only by the use of aerial photographs (Palestine Survey,

TABLE II
Variance/mean ratios of Hebron sub-district (1922-1975) for 50 cells
(Cell size 4 x 4 *km*)

Dates	Mean	*Variance*	$\frac{Variance}{Mean}$
1922; 1931	0·38	0·32	0·82
1961	1·48	1·89	1·28
1967	1·32	1·94	1·39
1975	1·58	2·90	1·84

Sources:
1922: Palestine Census Office (1923); 1931: Palestine Census Office (1932); 1961: Hashemite Kingdom of Jordan (1964); 1967: Israel Defence Forces (1968); 1975: Israel (1976)

1945). Prior to 1961 no complete records were available even for the Hebron area, but an examination of the aerial photographs revealed that most of its non-listed hamlets were already in existence by 1945. A long list of 99 ruins in the Hebron area is found in the 1931 census (Palestine Census Office, 1932). This list was used by Amiran as evidence of the intermittent settlement of these ruins by that time (Amiran, 1948). The number of official settlements listed in censuses of the British Mandate period for the part of Hebron's territory which was included in the West Bank after 1948 was nineteen (Palestine Census Office, 1923, 1932), while the 1975 official estimates listed as many as 80 inhabited settlements (Israel, 1976). The calculated variance/mean ratio for the nineteen 'official' villages of Mandate times showed no tendency towards clustering (a ratio of less than l), and contrasted markedly with the clustered pattern of the post-1948 data.

The disparities between these two patterns may be taken as indicators of the difference between the bunched and non-bunched patterns. However, the pre-1948 Hebron case cannot be considered as 'normal' in terms of settlement distribution. As already noted, it did not adequately represent the *real* existing settlement pattern. Furthermore, the fact that the pattern is revealed only against the background of non-bunched settlement highlights the failure of the analysis to point to the *internal structure* of the bunches.

On the basis of all of these studies, taken together, it seems that the available statistical methods of pattern analysis do not provide a meaningful tool for recognizing the bunches. This may be partly attributable to the relatively loose nature of most of them, but another deficiency inherent in the quantitative analysis lies in the fact that it 'sees' the imaginary flat surface rather than the real terrain. Bunches located along winding *wadis* show up mostly as randomly arranged points while in fact they form a coherent group whose members are tied to each other. Accessibility rather than mere distance is the criterion for their recognition, but this goes unnoticed in the regular measurements. The significance of the factor of accessibility is clearly illustrated in all the study areas, but in taking it into account, it is impossible to retain the objective approach which conventional quantitative methods require.

The results of the simple calculations for a small area (Kufr Thulth, Fig. 2B) illustrate this point. The western part of the area (16 km^2) was subjected to a variance/mean ratio calculation in two different ways (Figs 3A and 3B). The first calculations $(\frac{v}{m})_a$ were based on the actual map surface, while the second set $(\frac{v}{m})_b$ was based on identifying landscape units by the relative roughness of the terrain and on grouping together the hamlets located along accessible hilltops or stream valleys. The differences in the resulting variance/mean ratios

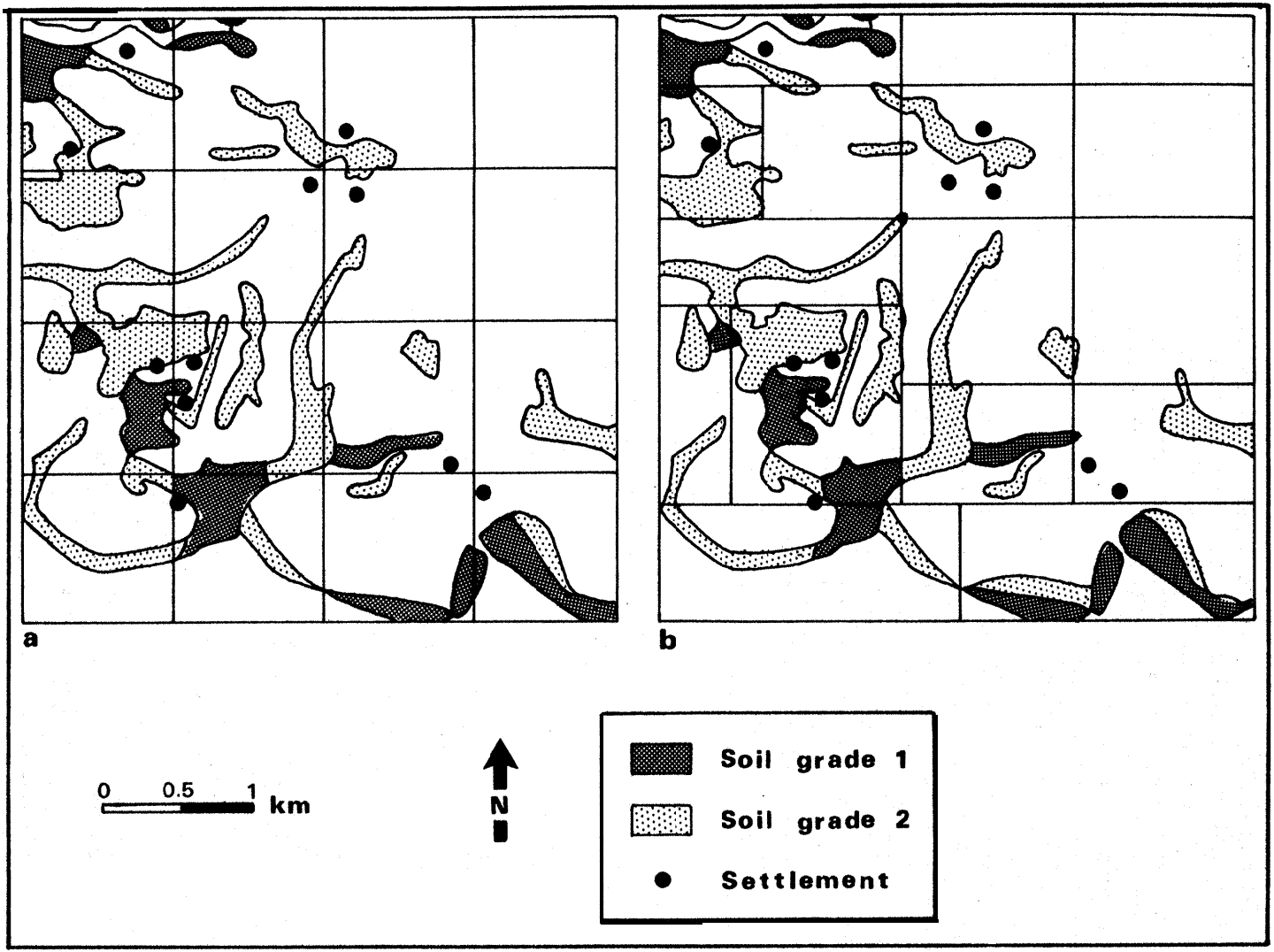

FIGURE 3. Western Kufr Thulth settlements and soils: (a) Regular (1 × 1 km) cells, (b) Weighted cells

$[(\frac{v}{m})_a = 0{\cdot}8;\ (\frac{v}{m})_b = 2{\cdot}0]$ are clear, and there is little doubt that the second approach is more useful in bringing out the patterns which were observed in the field.

The fact that in Deir el-Ghussun's territory the clustered pattern was 'seen' even by regular quantitative analysis is significant. It may indicate the existence of powerful factors drawing the hamlets together which do not exist in other areas.

The relationship between settlement location and soil quality can be demonstrated quantitatively also by correlating settlement sites with cells which contain adequate farmland. An analysis of this nature was carried out for Dura, Yabed and Kufr Thulth. Cells of one km^2 were chosen (except for Kufr Thulth where, because of the small size of the area, 0-5 km^2 cells were used). A cell was defined as having good soils if at least 30 per cent of its area had Grade 1 or 2 soils.[2]

The percentage of all settlements located in 'good' cells was computed. A parallel calculation was made of the percentage of settlements located in 'good' cells in relation to the number of such cells. The results of these calculations support the visual observations regarding the high correlation between settlements and soils (Table III). Dura's western areas stand out as the best adjusted to soil conditions. They have no settlements outside the high-quality soils. The eastern areas of Dura, on the other hand, are among the least well adjusted. The position of the settlements close to Dura (North-east Dura) is outstanding. It is the only zone which has a greater number of settlements than 'good' cells, and has the highest density of settlements per 'good' cells. It has, on the other hand, also the greatest proportion of settlements located outside the 'good' cells. (Compare Figures 2 and 4. Note that Figure 4

TABLE III

Correlation between land quality and settlement in Kufr Thulth, Yabed and Dura

		(a) *No. of all settlements*	*(b)* *No. of settlements in good cells*	*(c)* $\frac{b}{a}\times 100$	*(d)* *No. of goods cells*	*(e)* $\frac{b}{d}\times 100$	*(f)* *No. of settlements outside good cells*	*(g)* $\frac{f}{d}\times 100$
Kufr Thulth	N.	5	3	60·0	6	50·0	2	33·3
	S.	7	6	85·7	11	54·5	1	9·1
Sum or mean		12	9	75·0	17	52·9	3	17·6
Yabed	N.	7	7	100·0	8	87·5	0	0·0
	S.	9	6	66·7	13	46·2	3	23·1
Sum or mean		16	13	81·25	21	61·9	3	14·3
Dura	N.W.	11	11	100·0	16	68·75	0	0·0
	S.W.	9	9	100·0	14	64·3	0	0·0
	N.E.	17	12	70·6	14	85·7	5	35·7
	S.E.	13	9	69·2	20	45·0	4	20·0
Sum or mean		50	41	82·0	64	64·1	9	14·1

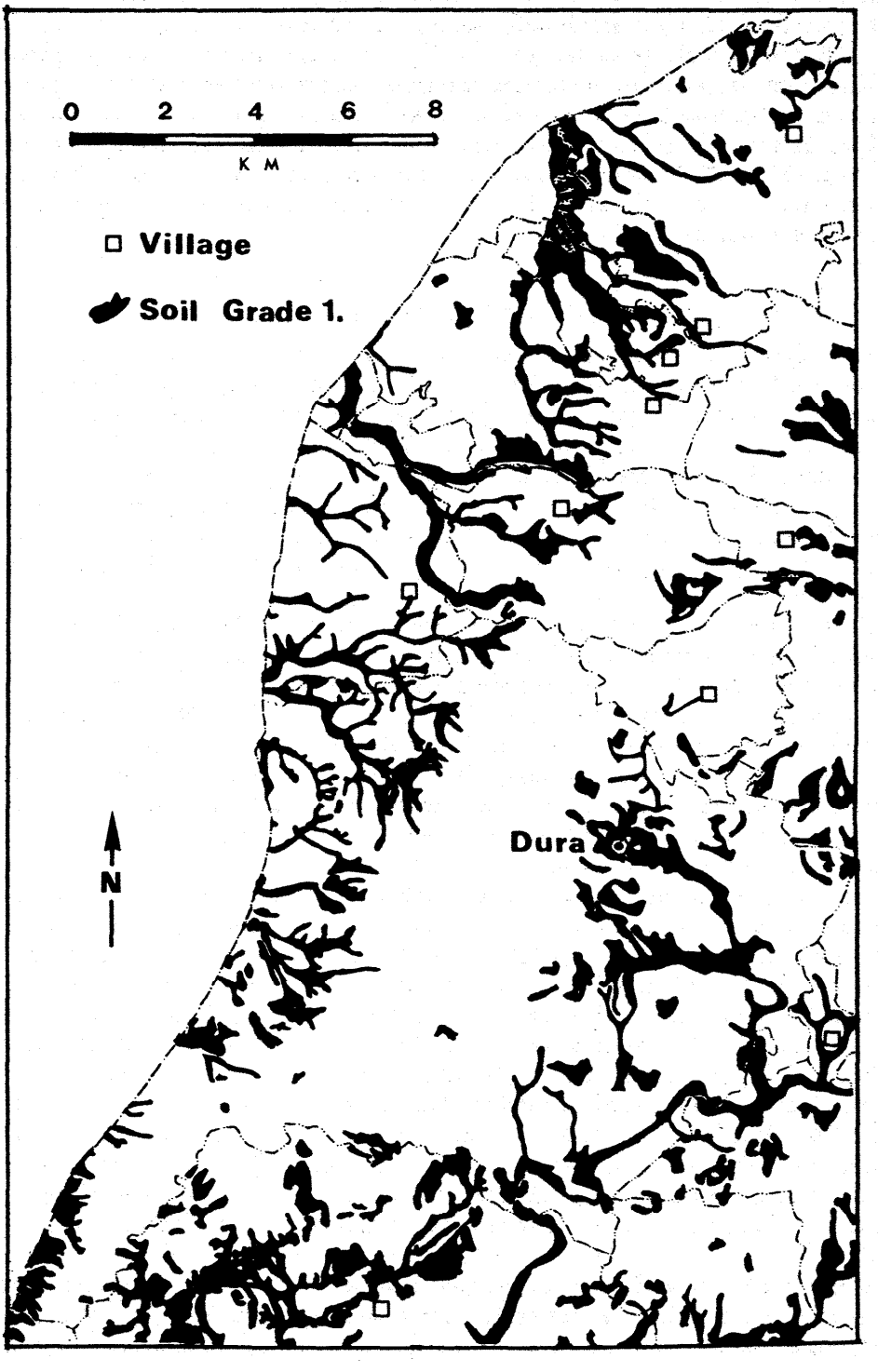

FIGURE 4. Distribution of prime soils, Western Hebron

shows only Grade 1 soils.) These findings indicate the importance of factors other than soil quality (proximity to Dura) in conditioning location and density.

Northern Yabed settlements, like those of Western Dura, are highly correlated with soil quality. No Grade 1 soils are located there, however, and the findings relate to Grade 2 soils only.[3] Corrielation with soils is, on the whole, lower than in Dura, but higher than for Kufr Thulth. The high values obtained for the percentage of settlements located in 'good" cells in all three areas (75 to 82) is a useful indicator of the relationship between settlement and soil quality. They reveal that in all the study areas there is a tendency to cluster in places which have soils of better quality.

FACTORS AFFECTING BUNCH FORMATION

The above analysis demonstrates that bunches are mainly a function of soils and terrain. This observation can be the starting point for the study of other factors which affect their shape and evolution. It is possible, thus, to recognize the significance of family ties, roads, or the pull of the home towns or villages (Dura and Yabed are *towns*, but Kufr Thulth and Deir el-Ghussun are still villages) and the form in which they modify the bunches.

Roads, particularly major ones; add coherence to bunches and accelerate the process of 'filling-in' the spaces between the hamlets. This is evident north of Yabed, in Eastern Dura, and in the western (Israeli) part of the Deir el-Ghussun area. It is not, however, a primary factor elsewhere.

The importance of family ties is clearly visible. Many bunches coincide with family or clan groups. The fit for the Kufr Thulth area is almost perfect, but there is a marked difference between its southern area and the northern one. The latter is occupied by migrants who were, originally, herders. They had to be satisfied with the least favourable parts of the land. Patches of good soils are limited in the north, and consequently, the distribution of hamlets does not correlate well with soil quality. In Deir el-Ghussun territory the fit between family group and bunches can be found only in more remote parts of the land. In the western, more accessible areas, the families are very mixed. This is the result of the attraction of the high economic potential of this location.

Mixing of families can also be observed around Yabed where a heterogeneous semi-circle pattern has emerged around the town. The portion of the circle located along the road, north of Yabed, developed into a clear cluster, but its coherence is related to its proximity to Yabed rather than to family ties. The only bunch which is clearly based on family ties is found west of Yabed, but it forms a fairly loose one. This area is separated from the other hamlets of Yabed territory by large blocks of rocky terrain. Grade 1 soils, however, are more abundant in its area than in other parts of Yabed-offshoot territories. Other Yabed clans tend to be scattered over a number of isolated patches. This is 'an expression of the fact that, like the northern Kufr Thulth clans, they are the descendants of herders who migrated to the territory over the past centuries. These outsiders, particularly the Kabaha, had to be satisfied with the more remote parts of Yabed territory, and settled mainly north of the large block of shallow soils which covers its north-western part. The heart of this area is still largely unsettled.

The relationship between clan groups and bunches is clear in the Western Dura area also. The coherence of the bunches which are bounded on the east by a steep wall of 'mountain, rising 300 to 400 metres within a distance of less than 5 km, is most obvious near Deir Samit where seven hamlets form a well-defined bunch (Fig. 2).

The hamlets in the western valleys of Dura are settled mostly by families who have

inferior social status. They are attached to one or other of the two dominant factions: the Arjan or the Amar. The southern part of this area is settled mainly by the sharecroppers of the dominant Amar families who controlled Dura (and all of the Hebron District) in the past century. In the northern part, where the Amar's rivals, the Arjan, are dominant, sharecropping is less prevalent. But throughout the entire western area the bulk of the inhabitants are descendants of groups which migrated to Dura at a relatively late date. The politically dominant families, on the other hand, settled in the more centrally located bunches of the eastern area.

TABLE IV

Mean nearest-neighbour distances between settlements of major *bunched patterns*

	Mean	*Standard deviation*
Yabed	0·82	0·66
Deir el-Ghussun	0·58	0·53
Kufr Thulth	0·71	0·58
North-western Dura	1·05	0·89
South-western Dura	1·09	0·56
Central Dura	0·76	0·56
Southern Dura	0·99	0·65

Spacing is closer in the eastern uplands than in the western lowlands of Dura (Table IV), but it is in the upland areas, south of Dura town, that the bunching tendency is most vague. This is an area of wider basins, and the pull of Dura town, like that of Yabed, results in a mixing of families and in the ignoring of otherwise unifying forces of the basins. Climate may also be a factor. Its impact is seen, however, only in Southern Dura where it obliterates the bunches' shapes (Figs I and 2) because the density of the settlement decreases as the amount of land needed for subsistence increases at the margin of the desert.

The effects of family ties, the proximity to the home town and other outside forces provide partial explanations of specific patterns of the bunches. South of Dura and in parts of Yabed territory, family and clan ties are clearly of secondary significance, and it can be concluded that where terrain allows a more irregular lattice to emerge, the distribution of clans has little impact on the settlement pattern.

The relationship between size and bunch structure is more complex. Where farmland is concentrated and compact, as in the relatively flat areas of north-eastern Samaria, nucleated villages tend to emerge {Grossman, 1981). Beit Awwa, the largest of Dura's offshoots (about 1700 people in 1975) looks like a large nucleated settlement of the traditional type, but it is, in fact, a tight bunch composed of three nuclei, located at distances of 200 to 300 metres from each other. It is separated from its neighbours by distances which are larger than usual. This relationship between size and distance-can be explained by the over-scattering of soil patches which lowered the attraction of the individual plots as localizing factors. A somewhat similar agglomeration, but smaller (with only about 300 persons in 1975) is found in Dura's south-western comer where distances also tend to be relatively great.

These examples demonstrate that the process of growth results in the eventual creation of clusters which absorb the initial nuclei. The bunch becomes, in fact, a unified settlement. Such a development is still uncommon, but the process can be observed in some areas, notably in Deir el-Ghussun where distances between settlements tend to be smaller than elsewhere (Table IV).

The understanding of the process requires the recognition of the effects of terrain or other ecological factors. It is possible to view the denser concentrations, such as western Deir el-Ghussun, the semi-cricle around Yabed, or the Deir Samit cluster as more advanced phases in the settlement process. They are all the results of hamlets which grew towards each other, and may point to the possible future trend in other bunches which are still non-contiguous.

A study of the process from its initial shape will help to clarify the relationship between these patterns and the process.

SUMMARY OF THE PROCESS AND RECENT DEVELOPMENTS

The bunched pattern originated in temporary ruin and cave dwellings *(izab,* plural of *izbah)* which were established in remote farm areas. Their existence was reported by nineteenth-century researchers and travellers (Robinson and Smith, 1841; Robinson and Smith, 1856; Guérin, 1868-9; Finn, 1877; Conder and Kitchener, 1883) particularly in western and southern Hebron, Some of them were even shown as regular settlements on one of the nineteenth-century maps (Pierotti, 1860), but their description leaves little doubt that they were inhabited only intermittently, mostly in the winter and spring. From the records of sixteenth-century tax registers, it can be learned that south-western Hebron was an area with many intermittent settlements (Toledano, 1979). Their distribution shows many similarities to that of the nineteenth-century pattern, and this may be taken as evidence for the long historical stability of the system associated with temporary and seasonal dwellings in the area.

Even though the evidence for the past existence of temporary or semi-fixed hamlets is dependable and of undoubted value, these data cannot be used for mapping the pattern of settlement distribution accurately. They are incomplete since even the best of them are no more than casual observations. They can be supplemented, however, by other sources. In many cases cave dwellings are still observable today (1980) and many old men can recall the construction of the first houses in the former *izab*. It was possible to check these details against oral information obtained from other old men in adjacent areas, and, partly also against the census data (Palestine, 1923; Mills, 1932). The 1922 census data provided the basis for mapping the distribution of the first phases of the settlement pattern in Northern Samaria where intensive field work and oral accounts made it possible to trace the process in detail (Grossman, unpublished MS). The 1922 census records did not provide parallel data for the other areas. Even within Northern Samaria, it is probable that the list is far from complete.

The list of ruins in the 1931 census provided parallel information for Dara, but in contrast to the 1922 data, it may have overstated the spatial distribution of the bunches. The number of 58 ruins which it listed within the former Jordanian area is larger than any number given by subsequent records which refer to permanently inhabited places However, the total number of inhabited places as obtained by means of the 1979/80 research was found to be similar to that of the 1931 list, after proper adjustments were made for differences in definitions. (At least three former offshoots are now part of the contiguously settled area of Dura itself, while others, as mentioned above, were absorbed by two large offshoots in the western zone.) There is, however, a certain discrepancy in the place names of the two lists, and it is likely therefore, that not all the former caves and ruins developed into permanent habitations, especially in the area south of Dura.

From the accumulated evidence of the various sources, it is possible to conclude that in many cases the fixation of the bunch was not a simultaneous action. Construction of

permanent dwellings started from a pioneer hamlet which acted as a 'growth pole' for subsequent hamlets. The process of bunch formation may take several decades, but the second phase is marked by the existence of a clear group of hamlets (having their own recognized names) formed Mostly within one or two decades after the construction of the first permanent buildings. By 1940 a relatively stable state seems to have been reached.

The formation of the larger bunches is accompanied by a desertion of some of the older hamlets or family compounds, but this process is limited in distribution. The prevailing process is, instead, a reverse one. The bunches grow progressively towards each other and, eventually, they can be expected to produce a continuously inhabited landscape. The processes and patterns described here resemble, in broad outline, the model offered by Morgan for explaining the settlement process of the Northern Ibo of south-eastern Nigeria (Morgan, 1957).

Morgan's model was devised especially for explaining the emergence of the large overgrown villages termed the 'grassland towns' of the Northern Ibo. He recognized the existence of a number of different patterns, but showed that all of them ultimately 'produce the same patterns as density of population increases' (Morgan, p. 221). The ultimate pattern is a 'decomposed', amorphous, giant settlement which results from the growth of all of the separate towns towards each other until there is hardly any space left between them.

The model is intended mainly to explain the settlement pattern of the Northern Ibo whose territory is found in the Derived Savanna. In this zone the initial stage is associated with dispersed compounds. These tend to group together to form hamlets and villages which, in more advanced stages, make up a typical 'grassland town'. This was considered by Morgan to be the mature stage of settlement development.

The similarity between the Northern Ibo and the Hebron-Samaria area is to be sought in the proximity of the units which form the grouped bunch or 'town'. The causes for this proximity may differ from one place to another. The West Bank bunches represent the accumulated impact of numerous forces -rapid population growth, improved security, an emphasis on closeness to relatives, but most of all, the scarcity of prime land and the restricted choice among the few remaining patches. These restrictions are not as clear in open flat areas as they are in rough terrain, but there too, the 'new' settlements are closely spaced, and their coalescence into a large, sprawling settlement may be expected. Modem economy does not seem to impose clear restrictions on settlement growth, as yet, and this accounts for the difference between the 'traditional' pattern and the 'newer' one. In the long run, however, the forces of 'competition' may reduce the density even in the newer 'towns'. This eventuality, which is envisaged by Hudson (1969) is not yet detectable in the study area except in a few isolated cases.

CONCLUSIONS

The bunched pattern is an expression of a settlement process associated with the transition from a traditional economy to a modem one. It represents the present stage in the process which started in the latter part of the nineteenth century. In the initial stage temporary ruins and cave dwellings were converted into isolated groups of permanent dwellings. The typical bunched pattern is the result of such development, but if the present trends continue, large agglomerated 'towns' are likely to be formed.

The major factor in the foundation of the bunches is to be sought in the nature of the terrain. Land scarcity forces the settlers into isolated patches whose outlines condition the location of the hamlets. Family relations, access to the home town, and the road pattern are all important factors, but they are secondary to the impact of the ecological factor.

It has been demonstrated that the recognition of the bunched pattern requires the abandonment of conventional quantitative pattern analysis, and the adoption of a method which is capable of considering accessibility rather than mere distance. The processes associated with the pattern's morphology suggest that its loose nature is a reflection of its present stage. Initially,it was even looser and had no discernible coherence. Present trends, on the other hand, point to a steady increase in coherence in a manner that will reinforce its clustered nature and will convert the bunch into a 'town'.

Patterns can, thus, provide clues for possible future growth even where the early processes are not sufficiently and accurately known. The understanding of local ecological factors, such as soil, is, however, imperative.

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NOTES

1. The term 'bunch' refers to a loose clustered pattern which is recognized by visual map analysis It is composed of hamlets or compounds separated from each other by a distance which does not exceed two kilometres and is usually less than one kilometre.
2 The definition of soil grades is based on a classification system developed for Judaea and Samaria by the Mapping and Survey Unit of the Israel Ministry of Agriculture. Classes which had minor (or no} limitations were considered as Grade 1, and those with moderate limitations as Grade 2 Classes with very severe limitations were not mapped. Grading is based on personal field checking and a study of air photographs. See Israel, *c.* 1970.
3. Since the soil grade maps utillized for this research dealt with West Bank areas only, the analysis was not carried out for Yabed settlements located in Israel. The findings related, therefore, to part of the area only.

REFERENCES

AMIRAN, D. H. K. (1948) *'Dura-Lidmut hayishuvim b'sfar habeduim'* /'Dura-The nature of settlement in the Beduin frontier', *Bull. Isr. Explor. Soc.* 14,30-38, Hebrew (Author's previous name was Kallner)

BIRCH, B. P. (1976) 'Frontier farm settlement: a pattern-process framework', in SINGH, R L. *et al.* (eds) *Geographic dimensions of rural settlements* (Varanasi) pp. 33-40

CHARLTON, B. (1976) 'On botanists' boundaries and buttercups', Area 8,170-I

CLARK, P. J. and EVANS, F. C (1954) 'Distance to nearest neighbor as a measure of spatial relationship in population', *Ecology* 5, 445-53

CONDER, C. R. and KITCHENER, H. H. (1883) *The survey of Western Palestine: memoirs of the topography, orography, hydrography, and archaeology,* III (London)

DACEY, M. F. (1968) 'An empirical study of the areal distribution of houses in Puerto Rico', *Trans. Inst. Br. Geogr.* 45,51-69

DACEY, M. F. (1973) 'Some questions about spatial distributions', in CHORLEY, R. J. (ed.) *Directions in* geography (London) pp- 127-51

EBDON, D. (1976) 'On the underestimation inherent in the commonly-used formulae', *Area* 8, 165-9

FINN, J. (1877) *Byways in Palestine* (London)

GROSSMAN, D. (1981) 'The relationship between settlement pattern and resource utilization-the case of North-eastern Samaria', *Trans. Inst. Br. Geogr.* N.S. 6,19-38

GROSSMAN, D. (unpubl. MS) 'Arab frontier settlement in Northern Samaria'

GROSSMAN, D. and SAFRAI, Z. (1980) 'Satellite settlements in Western Samaria', *Geogr. Rev.* 70, 446-61

GÜERIN, V. (1868-9) *Description géographique, historique et archéologique de la Palestine-Judée* (Paris)

HUDSON, J. C. (1969) 'A location theory fur rural settlement', *Ann. Ass. Am. Geogr.* 59,365-81

ISRAEL MINISTRY OF AGRICULTURE *(c.* 1970) 1: 20000 Sheets of Soil Survey Maps for Judea and Samaria (with Manual and Computer Sheets of the Data Bank, unpublished)

ISRAEL MINISTRY OF THE INTERIOR (1976) *Distribution of population in Judaea, Samaria, Gaza and Sinai, 31 December 1975* (Jerusalem)

ISRAEL DEFENCE FORCES (1968) *Population census 1967* (Jerusalem)

JORDAN, HASHEMITE KINGDOM, DEPARTMENT OF STATISTICS (1964) *First census of population and housing, 18 November, 1961* (Amman)

MORGAN, W. B. (1957) 'The "Grassland Towns" of the Eastern Region of Nigeria', *Trans. Inst. Br. Geogr.* 23,213-24

OLSSON, G. (1968) 'Complementary models: a study of colonization maps', *Geogr. Annlr* Ser. B. 50, 115-32

PALESTINE CENSUS OFFICE (1923) *Report and general abstract of the census of 1922, taken on the 23rd of October, 1922* (Jerusalem)

PALESTINE CENSUS OFFICE (1932) Census *of Palestine 1931* (Jerusalem)

PALESTINE SURVEY (1945) Aerial Photographs PS 15, Nos. 5080-83; 5146-55; 6002-12; 6074-96.1: 15000, Flown 10 January 1945

PIEROTTI, E. (1860) Carta Biblica e storica della Palestina, 1 : 210000

ROBINSON, E. and SMITH, E. (1841) Biblical researches *in Palestine, Mount Sinai and Arabia Petraea, a journal of travels in the year 1838* (Boston)

ROBINSON, E. and SMITH, E. (1856) *Later biblical researches in Palestine and in the adjacent regions, a journal of travels in the year 1852* (Boston)

SHMUELI, A. (1970) *Hitnahalut habeduim shel Midbar Yehuda / Sedentarization of fudaean Desert Beduins* (Tel Aviv) Hebrew

SIBLEY, D. (1976) 'On pattern and dispersion', Area 8,163-5

SIDDLE, D. (19770) 'Location theory and the subsistence economy the spacing of rural settlements in Sierra Leone', *f.* trop. *Geogr.* 31,79-90

TOLEDANO, E. (1979) *'Sanjak Yerushalayim b'meah hashesh-esrai-hityashvut kafrit umegamot demografiot'/* 'The *Sanjaq* of Jerusalem in the sixteenth century-patterns of rural settlement and demographic trends', in COHEN, *A.* (ed.) *Perakim b'toldot Yerushalayim b'reshit hatkufa haottomanit/ferusalem in the early Ottoman period* (Jerusalem) Hebrew

VINCENT, P. (1976) 'The general case: how not to measure spatial point patterns', *Area* 8,161-3