REPORT ON THE MAPPING OF THE CYPRUS CULTURAL LANDSCAPE

by

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1. BACKGROUND AND INTRODUCTION

1.1. The mapping of the cultural landscape of Cyprus was undertaken by the Laona Foundation with the assistance of the Cyprus Environmental Studies Centre (CESC) and with financial support from the US Embassy plus a small grant from the Ministry of Education. It follows the *Cyprus Level 1 Landscape Character Assessment*, carried out in 2008 by Steven Warnock and Geoffrey Griffiths of the Reading University Landscape Unit with financial support from the Cyprus Department of Town Planning. The Level 1 output was based on the key physiographical factors such as topography, geology, soils, vegetation & land cover, with minimal reference to human activities.

1.2. As it was found that historical/cultural maps of the required level of detail were not available for Cyprus (with the exception of some land tenure and land-use maps prepared by D. Christodoulou in the 1950’s) it was decided in 2009 to begin the Cultural Landscape Mapping project with the aim of providing this missing input to the overall landscape character assessment process and particularly to facilitate the production of the more detailed Level 2 Landscape Character map.

1.3. The Cultural Landscape Mapping project was begun in early 2009 by Martin Parker (a Geographer working with the CESC) together with Nicholas Symons of the ESC, but after a few months of useful work the project had to be put on hold due to the subsequent illness of Mr. Parker. The work was taken up again in late 2010 by topographer Vassiliki Vassou and Symons, with support from Steven Warnock, and completed in early 2011.

2. OBJECTIVES

2.1. The key objectives were to map:

- Settlement patterns (clustering, compactness, size) and
- Agricultural field patterns (shape, size, regularity)

2.2. A secondary objective was to explore some of the historical and resource patterns influencing these.

3. APPROACH AND SOURCES

3.1. All the data sources were imported to GIS (using ArcGIS 9.3) or added by digitising, then processed to develop interpretive maps (polygon-based).

3.2. Settlement patterns.

3.2.1. Clustering of settlements was approached using nearest-neighbour analysis, allowing the average distance of each settlement from the 3 nearest surrounding settlements to become a mapable parameter. Areas were then mapped into polygons by eye as areas of either closely-spaced (1-2km), medium-spaced (2-3km) or sparsely-spaced (>3km) settlement. Areas without settlements were left blank.
3.2.2. **Compactness of settlements** was evaluated based on the 1975 map KYPROS - CYPRUS Topographical at 1:100 000 scale. This shows distinctly the dense core area of a settlement and the surrounding ‘halo’ of more scattered buildings. Settlements were assigned subjectively to one of three categories: dense (mainly compact core with little or no halo), loose-knit (large halo with small or no dense core) or intermediate (both core and halo clearly present and well-developed).

3.2.3. **Size of settlements** was evaluated in two different ways: as population (based on the 1960 census data – an ideal date because settlements populations were still intact prior to any inter-communal strife) and using the diameter of the village core (based on the same 1975 map, which was the earliest available with detail on a scale of 1:100,000). In the end, the value of settlement size as a characteristic for landscape character assessment has come into question, mainly because other spatial and economic patterns (such as accessibility and distance from other settlements) seem to play an overriding role in the determination of settlement size.

3.2.4. The causal factors underlying settlement patterns were explored principally from the aspect of water resources, using data from the Department of Hydrology on spring supplies, rivers and groundwater resources. The influence of water supply is clearly a major factor in the evolution of settlement patterns, although other factors such as soil quality, relief and geology also have a strong influence. These other factors, however, have already been brought into the landscape character assessment process at Level 1, so our efforts were focused on the water resources, since this represents a new source of information. Viewing this information on the same map as the settlement clustering or compactness patterns makes clear that water supplies have an influence on the first, but a weaker effect on the second. This knowledge allowed us to form the settlement-spacing polygons in a more informed way than would be possible on the basis of the settlement data alone.

### 3.3. Field Patterns

3.3.1. Field patterns were analysed by eye directly from two data sources: primarily Google Earth satellite imagery with the help of cadastral maps where necessary.

3.3.2. A complication is the phenomenon of land consolidation (αναδασμός) since this has had the effect of partially or completely wiping-out historical field patterns. Those areas have not been analysed and are simply shown as polygons where land consolidation has taken place – or is still in progress.

3.3.3. Otherwise, all areas of distinctive field pattern greater than 1km$^2$ were mapped as polygons, on the basis of size, shape and regularity of the fields, as well as whether irrigated or not. The following categories were found to cover virtually all cultivated areas more than adequately:

- Dry cultivation
o Regular or semi-regular with mostly rectilinear boundaries (small, medium or large)
o Irregular fields with straight boundaries (small, medium or large)
o Irregular fields with sinuous boundaries (small, medium or large)
o Terraces (wide or narrow)

- Irrigated cultivation, regular or semi-regular fields with rectilinear or geometrical boundaries (small, medium or large)

3.3.4. At an earlier stage it was hoped to include the characteristic of the presence/absence of raised boundaries (walls, fences, hedges) but it was found that this cannot be reliably distinguished from the data sources available.

3.3.5. Categories of small, medium and large are defined as follows:

- Small: fields mostly < 0.5 ha
- Medium: fields mostly 0.5 – 1 ha
- Large: fields mostly > 1 ha

3.3.6. Some of the major factors determining field patterns are likely to be physiographical (topography, soil type) but there may also be historical factors. In an attempt to throw some light on these we have shown on the same map the locations of the major ecclesiastical estates, chiftliks, commercial estates and government-owned estates. We were unable to locate maps showing the estate boundaries, however.

3.3.7. Examples of different field patterns follow at point 5 below.

4. Maps

Three maps were produced, see point 6, Key Results:

- Village Settlement Data: villages clusters
- Village Settlement Data: village compactness
- Field Patterns
5. **Examples of Areas with Different Field Patterns are Shown Below**

(all at approximately the same scale):

Irrigated fields, regular or semi-regular, rectilinear or geometric

- Phassouri
- Morphou
- Kissonerga

Dry cultivation, regular or semi-regular, rectilinear

- Astromeritis
- Mesaoria
- Paralimni
Dry cultivation, irregular but with straight boundaries (geometric)

Mouth of Kourris river

Potima Bay

Polemi

Dry cultivation, irregular, sinuous boundaries

Akamas: abandonment obscuring pattern

Amargeti

Polemi

Dry cultivation, terraced fields

Wide terraces, Stoumbi

Narrow terraces, Pachna

Lofou
6. KEY RESULTS: THE MAPS

The map produced by N. Symons and V. Vassou for the Laona Foundation shows village settlement data with village clusters categorized into Type 1, Type 2, Type 3, and Type 4 clusters. The map uses different colors to represent the clusters' densities, with a legend indicating mostly closely spaced, mostly medium spaced, and mostly widely spaced settlements. The map is at a scale of 1:750,000.
6. **INTERPRETATION AND COMMENTARY**

a. **Clustering of Settlements (Map 1)**

i. There are striking variations in the spacing of rural settlements in Cyprus from very virtual absence of settlement (e.g. much of Paphos Forest, Akamas) through to areas with a village every 1km or less (e.g. Laona plateau, Solea valley). However there are also large stretches with relatively even spacing of settlements every 4-8 km (e.g. Mesaoria, Kokkinohoria)

ii. **Dense settlement clusters** appear to occur wherever there is a higher density of reliable water sources combined with land suitable for agriculture. A statistical test (Spearman’s rank correlation test) shows a **strong correlation between the number of springs per 5km square and the number of settlements** \( p<0.01 \). There are also areas of exception, particularly where springs are frequent but there is little land suited to agriculture, or where settlement clusters are found for which water sources other than springs formed the main supply (e.g. permanent river flows, wells)

iii. **The principle types of cluster**, based on the nature of the water supply, can be summarised as:

   1. Clusters linked with extensive groups of springs (Type 1 on map). Some areas of limestone plateau dissected by valleys have frequent occurrence of springs where erosion has cut into water-bearing strata. The plateau lands nearby are suited to dry farming whereas the slopes may be terraced. Some areas were made accessible to irrigation water by means of ditch systems and latterly pipe systems, but the extent of irrigation is very limited. Good examples are the Laona Plateau and the Lasa-Phyti cluster.

   2. Clusters centred on a single or few large springs (Type 2 on map). A single large spring can in some cases provide sufficient water to sustain several villages, to which it is distributed by channels or latterly by pipe systems. Dependence on gravity for the supply means the villages fan-out on the slopes below the central spring. Good examples are the areas below Kythrea and Lapithos.

   3. Linear clusters along river valleys with permanent flow (Type 3 on map). These reach remarkably high densities in some cases, with a string of villages almost touching one another down each side of a river. The settlements tend to be on the higher river terraces or gently-sloping valley sides, where there is no risk of flooding but still with easy access to water, either from the river itself or from wells sunk into the valley floor gravels. The flood plain is an essential element in providing cultivable land, so the mountain rivers with narrow valley floor are not usually settled. Classic examples of linear clusters are the Solea valley (Kalohorio to Kakopetria), Marathasa valley (Kalopanagiotis to Kaminaria) and part of the Pedhiaios valley (Dheftera to Politiko)
4. **Linear clusters following spring lines spanning several valleys (Type 4 on map).** In these cases the common factor is again the occurrence of springs, but arranged in a series along what is known as a spring-line, often corresponding with a geological boundary where permeable rocks overlie impermeable ones. These clusters are less distinct than the above. An example is the band of settlements along the southern fringes of the Troodos massif, from Phoini to Palodhia. These settlements are in the zone of broad contact between the volcanic massif and the overlying limestone foothills, where springs are relatively abundant. A further attraction may be the diversity (and therefore versatility) of soil types along this transition zone.

5. **There are other settlement groups that cannot yet be explained in these ways.** Further investigation of historical water supplies and other physiographic factors is needed to make full sense of the patterns.

iv. **It should be noted that water supplies are presumably equally important in areas with lower density of settlement.** This is clear, for example, from the fact that many series of settlements occur along river courses, even though those rivers are dry for much of the year. This may be related to the availability of groundwater at shallower depth in the riverine alluvial deposits. These supplies would be more limited and much less suited to irrigation, however, so that farming would necessarily have been lower in intensity and productivity. This in itself could explain the wider spacing of settlements in relation to a lower agricultural carrying capacity.

b. **Compactness of settlements**

i. One of the surprises of this study was the considerable geographical variation in the **compactness** of settlements, at least as far as could be judged from the 1975 map. A typical compact village has the houses very close together in a dense core, with few houses spread away from this (good examples would be Pano Arodhes, Lofou and Pera Orinis), whilst a loose-knit village may have several tens of metres between one house and the next, with small fields or gardens in between (examples being Rizokarpaso, Myrtou and some of the Kokkinohoria). The patterns (Map 2) are broader and somewhat less distinctive than those for settlement spacing discussed above. They are also harder to explain.

ii. A broad hypothesis is that settlements with a single main historical water source, whether a spring, a chain-of-wells (Laghoumi) or a single communal well, will tend to have remained compact in structure, since people had to carry water to their homes by hand or by pack animal from that supply point. By contrast, other settlements made use of individual wells for their water supply, or even used rainwater collected in a cistern under the building, so that houses could be built further from each other without inconvenience, perhaps closer to their fields or flocks. A well can be sunk anywhere with a suitably high water table, such as the alluvial deposits of a river valley.
iii. There are some indications that the above relationship holds true in many cases. The largely compact villages of the southwest foothills of Troodos (e.g. the Ambelohoria, Area 1) were mainly dependant on a village spring, whilst the loose-knit villages of Karpass (Area 2) or Kokkinohoria (Area 3) were ground-water dependant with scattered wells. However there are other areas of compact or loose-knit villages with no obvious explanation (e.g. Areas 4 & 5). Unfortunately, the data available on historical water supplies in each community are very incomplete so the relationship – even if it exists - does not clearly emerge. This issue would very much repay further field research on a village by village basis to get full and reliable information on historical water supplies. It is entirely possible that compact villages that have no spring marked on the available hydrological maps, may instead have been reliant on a single central well or laghoumi. An example of this is Pera Orinis, which had a single large well on the river floodplain, from which all the houses met their drinking water needs (M. Hellicar, pers. comm.).

iv. A complicating factor in trying to unravel this question is that water supplies and settlement structures have both changed with time. For example the constraint of a single spring supply was already lifted by the 1960s when modern water distribution systems become commonplace in all the villages and the tiring business of fetching water became a thing of the past. Since that time any village with an expanding population will have been able to sprawl outwards at lower density. Another problem is that with rising land values, loose-knit settlements with expanding populations may have undergone infill development as small fields are taken up as building plots. Both these trends will tend to obscure older patterns. We would need to find high-quality maps showing the village structures dating from the 1950s, prior to the influence of large scale rural water development, or to undertake painstaking fieldwork to map the historical growth zones of each settlement.

v. A further complication is that different supplies were often used for drinking water and for irrigation. Many wells around Famagusta Bay, for example, have always had a salt content making them unsuitable as a drinking supply but adequate for irrigation. Here again further research is needed village-by-village to discover the intimate relationship of resource supply and human activity in the evolution of Cyprus’ settlements.

c. Fields patterns

i. The mapping of field patterns was undoubtedly the most challenging aspect of this project, both in terms of the volume of work and its technical difficulty. The mapping process using Google Earth was very painstaking, requiring long hours of work at a computer screen on the part of our Researcher. The recognition of the different patterns and mapping of clear boundaries between areas of one field type and another was also technically very challenging. The examples shown on pages 4 & 5 are chosen for their distinctiveness. In practice, in many areas the field patterns are less clear and distinct, either being somewhat intermediate in character or having small patches of different field types in close association.
ii. In view of the difficulty of the work, we are very pleased and satisfied with the resulting map. We believe it to be of great interest both historically and in terms of analysing landscape character.

iii. The main patterns are undoubtedly closely linked with topography, in that regular, rectilinear fields and irregular, geometric fields (uneven shapes and sizes but with straight edges) are on flatter ground, whilst irregular fields with sinuous boundaries are often found on rolling terrain with moderate slopes. Terraces are a well known feature of agriculture on steep to very steep slopes, used both as a way of creating flat ground and as a way of preventing soil erosion.

iv. The historical overlay of land ownership probably modifies this in two ways. Firstly, large estates, whether owned by the Church, by wealthy individuals or by the state, have more regular field patterns and larger fields. This probably arises partly because the flattest land came into the ownership of the more powerful sectors of society, partly because unified ownership allowed systematic planning of cultivation, and partly because large holdings were generally not subject to the repeated dividing and subdividing of land between siblings in successive generations, a phenomenon leading to the well-known result that an individual’s land often consists of many small and widely scattered fields. This is a particular problem of land holdings in communities and families, and undoubtedly affects the nature of the field patterns. Fields tend to be smaller in size and irregular in shape, often with some sinuous boundaries (following a topographical feature) and some straight ones (where larger fields have been subdivided).

v. A second historical influence is in terms of access to water supplies. We see that many of the estate lands fall in the large-scale irrigated zones. Generally the larger, more wealthy and powerful land owners were, firstly, more likely to have ownership of land with natural water supplies (e.g. rivers) and secondly were more able to invest in the infrastructure needed to provide irrigation from ground-water, by drilling deep boreholes for example. Poorer communities and families, on the other hand, probably had less access to water resources and limited means to develop them, so were constrained to growing mainly extensive (dry-country) cultivations and to developing only small-scale and patchy irrigation that does not really show up on the scale of the present survey.

vi. These conclusions are, however, somewhat speculative due to the limitations of our data on historical land holdings. For example, there is no systematic documentation – at least in the public domain – of the boundaries of the historical and large-estate holdings.

Conclusions. The objectives of mapping the key human-influenced aspects of the Cypriot landscape that have been missing from the data sources available to the ongoing process of landscape character assessment (settlement patterns and agricultural field patterns) have been successfully achieved. The results raise many questions about historical influences determining these patterns which in the limited scope of this project have only been partially addressed. There is great scope for investigation along these lines, particularly in relation to
the influence of water sources on settlement patterns and the influence of land ownership (especially size of holdings) on field patterns.

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