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Roman Centuriation in Satellite Images

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Abstract

The satellite images of Google Earth can show us how the Roman divided the land in their colonies, according to the surveying system of Centuriation.

Keywords: Satellite images, Google Earth, Centuriation.

Centuriation is the surveying system used in the Roman world to divide the land to be used by Roman settlers, which were sent in the conquered territories for military or demographic reasons [1]. This division of the territory was based on parallel and perpendicular lines which were called "decumani" and "kardines". The decumani were usually arranged along the larger part of the territory, or were parallel to a public main road. Decumani and kardines were the "limites" of the land, and "limitatio" was synonymous with land division. The principal axes of centuriation were the Decumanus maximus and the Kardo maximus, wide roads that crossed each other perpendicularly, at a point which was the ideal center, the "umbilicus", of the land division [2].

The main limites were distant 20 actus, about 700 m. The actus is the unit of land measurement, about 35 m. Inside the limites, there were many squares or rectangles, called centuriae. This figure is attributed to Romulus and to his legendary founding of Rome. Let us remember that centuriation was used, besides for the land subdivision, also for the planning of castra and towns (a castrum was a plot of land reserved for a use as military defensive position). In some cases, castra evolved in towns, an example is the town of Torino, the ancient Julia Augusta Taurinorum (Figure 1). To have an idea of the urban planning of a Roman colonia, it is enough to look at a satellite map of the center of Torino or to the map of Timgad (Figure 2) [3-5]. In Torino, the Decumanus coincides with Via Garibaldi. The Kardo (Via di Porta Palatina) crosses the Decumanus at the center of the town, the Turin's umbilicus (Figure 1). As we can see from the satellite images of Google Earth, centuriation is evident in both cases.

Figure 1 – Romans planned military castra with a precise regular scheme, based on two main axes, crossing at right angles at the center of the settlement. These axes are known as Decumanus (D) and Kardo (K). Sometimes, a castrum evolved in a colonia and then in a town. Torino is an example of this evolution, that was born as a Julius Caesar's castrum. The Decumanus is today Via Garibaldi. It is crossed by Kardo, which is Via di Porta Palatina, at the central point of the town, the umbilicus soli. In this Google Earth map, we can easily see the rectangle of the Roman town, composed of several insulae. Note that the orientation of the Decumanus is not coincident to East-West cardinal direction [3]. At the ends of Kardo and Decumanus, four gates existed, but only two remain.

Figure 2 – Another Roman colonial town as seen in a Google Earth image. It is Timgad, in the Aurès Mountains of Algeria, founded by Emperor Trajan around AD 100, with the name Colonia Marciana Ulpia Traiana Thamugadi. Located about 35 km East of the town of Batna, the ruins are clearly showing the grid plan, based on Decumanus (D) and Kardo (K). Here, the Decumanus is at a small angle with the East-West cardinal direction [4]. The arc of Trajan is at the west end of Decumanus.

The centuriation was performed by surveyors, the "agrimensores" or "gromatici", so called because they used an instrument, the "groma", for the alignment of "limites". About such a kind of surveying, we have information by some Latin texts of the first century AD that were gathered in a corpus in the following centuries [6-9]. Among gromatici, we find Hyginus Gromaticus, a writer, who flourished during the reign of Trajan (AD 98–117).

The erudition of the end of Roman Republic combined the science of land surveying with the doctrines of Etruscan division of the sky [2], by establishing a parallel between the four parts in which the land is divided by Decumanus and Kardo and the quadripartition determined in the sky by two ideal axes, envisioned in E-W direction (according to the Sun's apparent motion) and N-S direction, given by the axis mundi, the cosmic axis, about which the universe seems revolving. Acccording to [2], this alleged dependence of Roman surveying on Etruscan Disciplina is probably unfounded. Romans were inspired almost exclusively by practical purposes, that is, by the uniform division into squares to have a clear cadastral base. Another purpose of this huge work of surveying was, of course, the creation of a road network and the provision of water to the territories of the Empire.

Besides written resources and epigraphes, we know the centuriation from the surviving road layouts, which is still existing and efficiently used in many regions. According to [2], best known examples of Roman centuriation are the plain of Capua (ager Campanus) [10,11], large areas of the Po Valley and a large part of Tunisia [14-17]. In these territories the layout of roads and, sometimes, the arrangement of individual fields are still those established in Roman time. The remains of the centuriation give us the opportunity of assessing in a tangible way the extent of the agricultural transformation of the conquered territories and the ethnic penetration, which favoured the cultural unification of different regions of the Roman Empire [2].

The task for Roman surveyors was to draw straight lines, "rigores", on the ground forming exactly right angles. According to surveying rules, Decumani should have been aligned in East-West direction, but in practice this rarely happened. Often, the Decumanus is oriented towards the rising sun. In other cases, it is the main road of the region, which is determining the decuman direction; therefore, many towns of Emilia have as Decumanus the Roman Via Aemilia. The limits were marked by stones and Roman laws sanctioned the prohibition of their removal.

Since the Roman land subdivision was maintained for a long time, we can easily see that it is still evident in satellite images. Besides the examples given in Figs.1 and 2, here in the following some other examples. In the Figure 3, we can see a large area near Padova (the distance between Padova and Mira is 20 km), as given in Google Earth; adjusting the scale of the image, the grid of the Roman centuriation becomes visible.

Figure 3 – In this image from Google Earth, note the regular grid of roads created by the Roman centuriation.

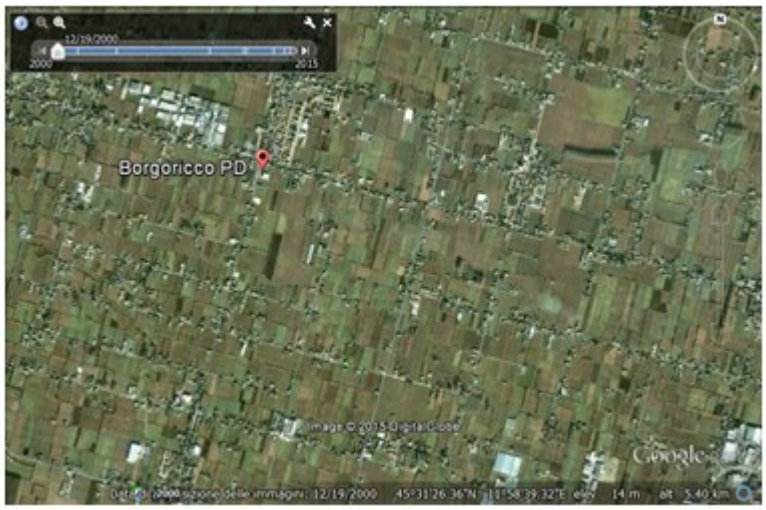

Figure 4 – Position of Borgoricco, a village located in the grid of centuriation of Fig.3.

In the central part of the grid of Figure 3, we find Borgoricco. Figure 4 shows this village and the country around it, obtained from an image of Google Earth time-series, which is best evidencing the centuriation. In this manner, we can use the satellite image to mark Decumani and Kardines of centuriation. This had been made to have the Figure 5. In the following Figure 6, the measurements of some distances are given too. In the Figure 5, we can see remains on the "limites intercisivi". The internal arrangement of the centuries consisted of 20 rows of fields, 35.5 meter wide, in the direction of Kardines, and internal "limites intercisivi", parallel to decumani [18]. The centurial grid formed in such a way, was used for cultivations, but also for pasture.

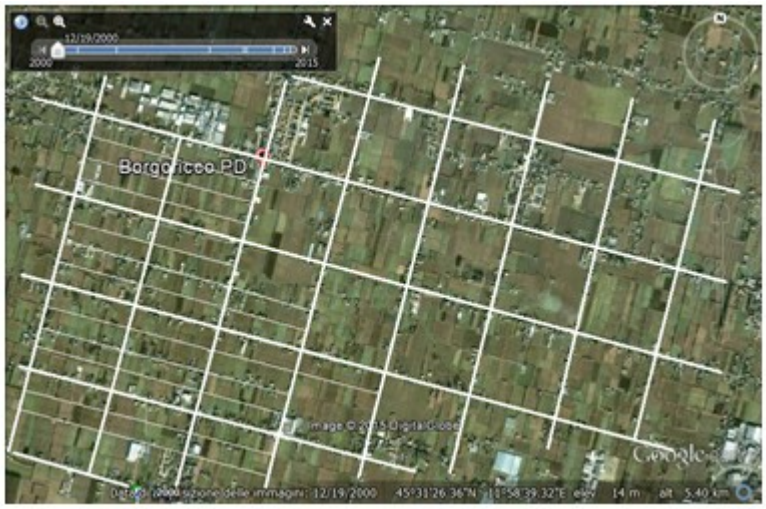

Figure 5 – The centuriation near Borgoricco. White lines are used to mark the grid. Note that, besides the main decumani, it is possible to see a further subdivision of land, that made by the "limites intercisivi".

Figure 6 – Here the measures of Borgoricco centuriation.

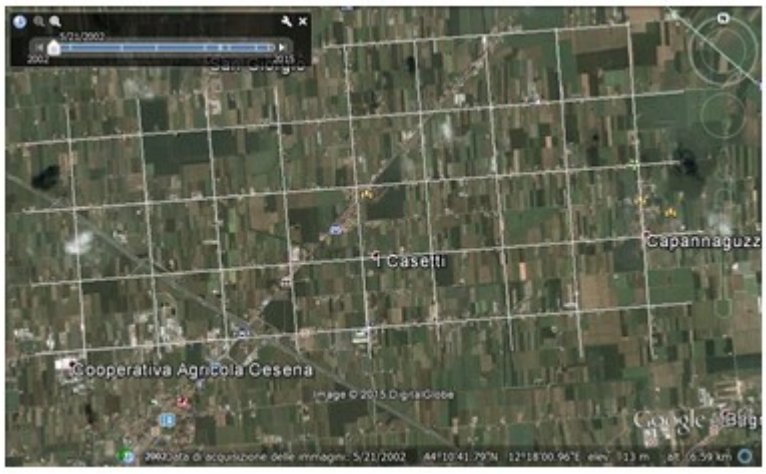

Figure 7 – Centuriation near Cesena. Decumani and Kardines had been marked in the satellite image with white lines.

Another example of centuriation is given in the Figure 7 for the land near Cesena. And in the Figure 8, an example of the centuriation of land in Tunisia is shown.

Figure 8 – The centuriation near Chebba in Tunisia. The grid has a size of about 700 m.

From the satellite images, and using a grid as those given in Figures 5, 7 and 8, we could investigate, by means of Fourier analysis, the regularity of the grid [19-21]. As told in [21], in 1989, Rita Compatangelo first applied the Fourier analysys to a Roman cadastre in the Salentine peninsula. In certain parts of the Salentine cadastre, which is a typical centuriation with a module of 705 m, there are also many other existing boundaries at the same orientation as the grid, which may be the remains of regular "limites intercisivi". Compatangelo looked for signs of subdivision because this may give clues to this cadastre's date and function, by allowing comparison with other better known Roman cadastres. Let us note that such an approach, could be also important for the possibility of an environmental restoration and reinstatement on land of the past Roman centuration [22].

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