The formation of a Mediterranean terraced landscape: Mount Eitan, Judean Highlands, Israel

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\textbf{A B S T R A C T}

Here we present the first results of a new interdisciplinary research project entitled “The Formation of Terraced Landscapes in the Judean Highlands, Israel”. The research traces the socio-economic and historical contexts in which terraces were constructed in the rural periphery of Jerusalem, a thriving political, economic and religious center for four millennia, by using optically stimulated luminescence (OSL) dating of terraces fill in combination with careful analyses of related geomorphological and archaeological records. The first sub-region studied is Mount Eitan, an isolated hilly spur located ca. 12 km west of the ancient city, above the Soreq Valley, the main drainage basin of the region. The results demonstrate a complex history of terrace construction and use, beginning with sporadic activity during the Hellenistic and Roman periods and reaching a zenith during the mid-second millennium CE. The results enable to put to test current paradigms regarding the relation between extensive terracing operations and settlement oscillations and the antiquity of the terrace phenomenon in the Eastern Mediterranean.

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\textbf{1. Introduction}

Terraces are the most recurrent man-made feature in the hilly agricultural landscapes around the Mediterranean (e.g., Bevan and Conolly, 2011; see also Davidovich et al., 2012: 192 and further literature there). Using terrace walls for artificial creation of arable plots was a major technological innovation that has led to the complete alteration of the natural terrain. The study of agricultural terraces holds great importance for a range of academic discourses, covering geomorphological and hydrological processes (Arnaez et al., 2015), ecological modelling and human-environment interplay (Bevan et al., 2013; Tarolli et al., 2014), as well as human subsistence strategies and social history (Wilkinson, 2003; Gibson, 2003).

A cornerstone for all terrace studies is the ability to directly date the time of construction and use of terrace walls and fills. Although sometimes presented as straightforward (and see further below), the dating of agricultural terraces is notoriously difficult and in most cases is based on indirect evidence (Wilkinson, 2003: 190–91). Since terraced landscapes are essentially palimpsests, identifying initial terracing operations and accurately differentiating them from later cycles of terrace construction constitute a challenging task for archaeologists. A review of terraced landscapes around the globe presented in a recent synthesis as positively dated (Arnaez et al., 2015: 123) reveal that their dating is based on the assumption that terraces are connected to horticulture (Galletti et al., 2013) (and therefore well-dated widespread horticultural activity indicates periods of terrace construction), on proximity to neighboring dated settlements (Wilkinson, 2003), or on datable objects collected from terrace fill (Price and Nixon, 2005). Recently, we have argued that these dating techniques, as well as others prevailing in past studies, are unreliable in dating actual phases of terrace construction and repair works, and may result in erroneous historical reconstructions (Davidovich et al., 2012: 193–94). It is clear that when it comes to understanding the social, economic and political contexts of terrace construction, reliable high-resolution dates are essential, and without them the question of why terraces were constructed cannot be addressed. Clearly, if we wish to better comprehend the subsistence strategies of Mediterranean cultures, their engagement with the landscape and their cultural choices, the correlation between terrace construction episodes and settlement patterns needs to be based on direct, independent and accurate methods of terrace dating.

In two recent studies, conducted at the site of Ramat Rahel near Jerusalem and in the Negev Highlands (Davidovich et al., 2012; Avni et al., 2013), Israel, we were able to demonstrate that using extensive...
sampling of terrace fill for optically stimulated luminescence (OSL) dating, coupled with careful analyses of related geomorphological and archaeological records, may lead to a correct evaluation of the timing of terracing operations and their historical significance. In our new research venture we wish to build on the methodology developed and tested in those studies in order to address the history of terrace construction in the hinterland of Jerusalem, a thriving political, economic and religious center for four millennia, including the first wide-scale distribution of terraces over the landscape as well as further cycles of terrace rebuilding and use (Gadot et al., 2015). Previous archaeological explorations show that Jerusalem Highlands were dotted with rural sites in numerous periods since the Neolithic, with substantial settlement activity as early as the Middle Bronze Age (ca. 1950–1550 BCE and see Gadot, 2015 with further references). Scholars working in this region traditionally assert that settlement is dependent on the ability to construct terrace walls and that terraces constitute a “minimum threshold of intensity at which agricultural systems in the highlands must operate” (Gibson, 2001: 124 and compare Ron, 1966). In the present research, we abandon these presuppositions and tackle the relationship between terrace agriculture and settlement processes using a large (> 100) number of soil samples dated by OSL. The emerging OSL age patterns, investigated in parallel with regional settlement patterns emerging from archaeological surveys and historical records, enable to safely date some of the significant stages in the transformation of the Judean Highlands from natural into cultural landscape they form today. Although local, the conclusions that we draw from this research hold clear implications for the study of terraced landscapes worldwide, and shed new light on the global question regarding the reasons behind human choices and agency while domesticating the landscape.

In order to sample the diversity of agricultural landscapes in the Jerusalem Highlands, four study areas were defined, three within the main valleys bisecting the region, which flow westwards from the main water divide towards the Mediterranean (Kesalon, Soreq and Refa'îm), and one located on an isolated hilly spur in the central part of the region, Mount Eitan (Fig. 1). This article presents the first results of the research project, focusing on Mount Eitan as an example to the formation of terraced landscapes in a “sub-optimal” zone compared to other, more favorable areas in the region (e.g. the upper reaches of the main valleys that offer wider plots rich with soil thus being favorable for cultivation). As Mount Eitan is rather remote from Jerusalem and the large villages surrounding the city, and mostly characterized by relatively steep slopes and thin soil cover, it is assumed that it would be a sensible sensor for demographic and settlement trends, and thus a perfect case-study to examine their relations to terrace development.

1.1. Research area

Mount Eitan (Hebrew: Har Eitan; Arabic: edh-Dhahr) is an isolated mountainous spur located in the central part of the Jerusalem Highlands, branching off one of the local east-west water divides that separates the Soreq and Kesalon catchments (Fig. 2). The spur is surrounded on three sides (north, west and south) by relatively steep slopes descending to the Soreq Valley (Wadi Sarar) and its tributary Zuba Valley (Wadi ’Awad), while to the east it is connected through a
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