



Extensification in a Mediterranean semi-arid marginal zone: An archaeological case study from Early Iron Age Jordan's Eastern Karak Plateau



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ABSTRACT

The extensification of agricultural systems into marginal lands is a common response to environmental, economic, and political pressures for more cultivable land. Yet the course that extensification takes in particular instances is unpredictable given the choices available to producers. This article investigates an instance of extensification during the late second millennium BCE on the semi-arid Eastern Karak Plateau in west-central Jordan. Architectural, faunal, and archaeobotanical evidence is presented from Khirbat al-Mudayna al-'Aliya, one of several communities that participated in an extensified settlement system on the edge of the Wadi al-Mujib and its tributaries. Producers practiced agriculture and pastoralism in a low-intensity subsistence economy that supported a nucleated settlement of households. Faunal analysis determined goats were kept, and wild animals supplemented diets. Archaeobotanical analysis of charred plant remains from storage bins in a building destroyed by fire indicated that barley was stored in a semi-processed state and that harvesting by uprooting was practiced, thus resulting in the maximization of the straw harvest. The riparian zone beneath the settlement was a key venue for subsistence activities. This Early Iron Age example contrasts with later episodes of extensification whose settlement systems were more dispersed and agro-pastoralist regime more integrated.

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1. Introduction

A key issue in discussions of preindustrial agricultural development (e.g., Boserup, 1965; Brookfield, 2001) is why, when, and how producers extend production into marginal lands where yield is potentially lower than other regions, a practice defined as extensification. Extensification into the semi-arid margins of settlement poses particular challenges for sedentary agro-pastoral producers. Although subsistence production is often possible, such contexts can exhibit high temperatures, low precipitation with high inter-annual variability, nutrient poor soils, and a propensity for droughts and famine (Wallén, 1967). Extensification on marginal lands is often explained as a response to one or more “push” factors such as climate change, population growth, land

shortages, market or imperial demands, or socio-political factors such as territorial conflicts or agrarian policies (Chen, 2006; Tachibana et al., 2001; Walsh et al., 2002). In different ways, “push” factors make marginal land less economically marginal by either raising its marginal utility (e.g. higher crop prices, political or economic incentives, etc.), or by lowering the satisfaction threshold in terms of the expected return on labor (i.e. working harder for less).

These same “push” factors are also frequently cited as explanations for intensification, and indeed, in the case of marginal lands, there is some debate as to whether extensification is an alternative to intensification or a step along the same path (Brookfield, 2001: 200). To some extent this difference relates to the nature of the marginal lands in question. Extensification in upland forest or rain forest usually requires deforestation and hence is closely linked to land-degradation (Pichón, 1996; Tachibana et al., 2001; Walsh et al., 2002). In contrast, extensification in semi-arid lands, of necessity, often results in capital investments in water and soil management facilities (e.g. terraces, cisterns, check dams, diversion walls, etc.), even if these

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investments are realized incrementally (Doolittle, 1984, 1988). It is therefore important to be clear by what is meant by intensification. Scholars have typically distinguished between the intensification of production and the intensification of productivity. The former refers to an increase in inputs, usually labor and/or capital, against fixed land (Brookfield, 1972: 31–32), while the latter refers to an increase in output per unit of labor as the result of innovation (Brookfield, 1984: 6–17; Renfrew, 1982: 266). Distinguishing these two forms of intensification from each other, and from population growth, in archaeological contexts is very difficult since one can seldom measure inputs and outputs directly (Morrison, 1994).

For these reasons, the increased use of marginal lands is of particular interest to archaeologists since evidence for their occupation could be seen as evidence for the intensification of production. This is because, all else being equal, attaining equivalent returns on marginal land would require more inputs of labor or capital than would be the case on less marginal land (Doolittle, 1988: 255–56). This is particularly the case with economic rather than ecological marginality. Of interest is land where crop yields and/or herd by-products will provide returns close to, but not less than, the sum total of subsistence needs, the minimum requirements of social reproduction and the inputs of production (Blaikie and Brookfield, 1987: 19–21). Beyond balancing inputs and outputs, production also facilitates, and is embedded in, a set of preferential lifeways whose attainment may require trade-offs between access to key resources, competing land-uses and maximizing agricultural or pastoral output. From this perspective, economic marginality is relative to particular modes of existence up to the ecological margin of total crop or herd failure. This is relevant to the question of whether or not the expansion of settlement onto semi-arid margins (i.e. extensification) always requires the ‘push’ factors associated with the intensification of production. Because the definition of marginal land varies with different preferential lifeways, one cannot presume that the extension of settlement onto semi-arid land always requires an external ‘push.’

With the exception of run-off irrigation agriculture in the Negev Highlands of Israel (Ashkenazi et al., 2012), investigations of the pre-modern use of semi-arid zones in the Middle East have been more concerned with irrigation or pastoral nomadism than with rain-fed agro-pastoralism. Studies that have been carried out often follow the general literature in emphasizing external “push” factors when explaining extensification (e.g. Haiman, 2012; Rosen, 2000; Wilkinson, 2006). Alternatively, some studies have emphasized the ‘pull’ of non-agricultural income sources, such as mining or overland trade (e.g., Barker et al., 2007; Finkelstein, 1995). Much less attention has been given to the implications of differences in the organization and orientation of agro-pastoral systems.

The archaeological investigation of agro-pastoral systems in Jordan is a case in point. Evidence accumulated over the past sixty years of excavations and surveys have identified periods of intensified sedentary settlement practices and increased output of agricultural production. These periods contrast with episodes of abatement, which often includes the withdrawal or collapse of polities, the disintensification of production, and a dispersal of population centers. In its most influential formulation (LaBianca, 1990, 2007), the intensification and abatement paradigm explains intensification in terms of external demand (e.g. markets and imperial tribute) and external investment, while abatement is explained in terms of indigenous risk reducing strategies. While this paradigm accounts broadly for long-term changes evidenced in the archaeological record, it does not offer sufficient temporal or spatial precision to understand particular agro-pastoral systems during specific historical episodes. In particular, the diverse patchwork of environmental zones that constitute Jordan’s landscape (Cordova, 2007) are treated as uniformly marginal, while

agro-pastoral systems are presumed to intensify or abate uniformly along a continuum of greater or lesser reliance on pastoralism. Neither synchronic nor diachronic differences in the form that settlement takes in semi-arid lands can be accounted for within this cyclical paradigm (cf. Barker, 2012).

Such differences can be observed when examining Jordan’s thin longitudinal semi-arid strip that lies between the eastern end of the Mediterranean Basin and the western edge of the Arabian Desert. This zone saw intermittent agricultural extensification over five millennia of history. Some of these episodes occurred, as one might anticipate, during periods when the Levant experienced increased population growth and the appearance of new markets for raw materials and finished goods, usually during imperial interventions led by the Roman, Byzantine, and Mamluk Empires. However, there are other instances of extensification in periods when such “push” factors were minimal or non-existent.

One instance that will be explored in detail below takes place at the end of the second millennium BCE, the early Iron Age, a period of relatively low political and economic complexity in the Southern Levant following the region-wide collapse of Bronze Age polities throughout the Eastern Mediterranean (Ward and Joukowsky, 1992). On the Eastern Karak Plateau in west-central Jordan, multiple small agro-pastoral settlements established themselves in the eleventh century BCE, lasting less than a century before their abandonment. Architectural, faunal and archaeobotanical evidence from one settlement, Khirbat al-Mudayna al-’Aliya (KMA hereafter) demonstrates how the community’s producers organized a low-intensive, non-specialized agro-pastoralist economy around a thin riparian zone in a wadi canyon beneath the settlement. The nucleated settlement pattern associated with the early Iron Age contrasts markedly with later Iron Age, Roman and Byzantine settlement patterns in the same semi-arid zone, which are characterized by a mix of forts and dispersed farmsteads and towers. To foreshadow our conclusions, we argue that while “push” factors work well as an explanation in cases where extensification on the Eastern Karak Plateau represents a form of intensification of production, as in the later Iron Age, Roman and Byzantine periods, they work much less well when applied to the nucleated settlements of the early Iron Age. This evidence supports our general point that both extensification and marginality can mean rather different things depending upon the orientation and organization of any given agro-pastoral system.

2. Study area: the Karak Plateau

The Karak Plateau is an uplifted 875 square kilometer slice of west-central Jordan bordered by the Dead Sea on the west, the massive canyons of Wadi al-Mujib on the north, the Wadi al-Hasa on the south, and the Arabian Desert on the east (Fig. 1). On the plateau, both elevation and precipitation decrease from west to east. The western half of the plateau ranges from 1200 to 900 m asl in elevation and averages up to 400 mm of precipitation per annum, while on the eastern half elevations decline from 900 to less than 700 m asl and precipitation recedes to an average of less than 250 mm per annum, before transitioning to a fully arid, Irano-Turanian, steppic zone (el-Sherbini, 1979: 174; Table 2). Fertile Red Mediterranean soils are abundant on the western half of the plateau, but give way to calcareous Yellow Mediterranean and steppic soils to the east.

Mitigating the Eastern Karak Plateau’s semi-arid conditions are riparian zones found at the bottom of deep wadi canyon systems, the al-Mujib and its tributaries on the plateau’s north edge, and the al-Hasa system on its south edge (Fig. 2). These riparian zones contain lush microclimates created by run-off precipitation and perennial aquifers that together refuel stream systems that drain

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