



Traditional silvopastoral management and its effects on forest stand structure in northern Zagros, Iran



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ABSTRACT

Oak forests of Iran are managed for soil conservation, water quality and other non-market ecosystem services. Nationalization policies in 1963 implied shifts from private ownership and informal traditional management to public ownership and state forest management. In spite of the nationalization, informal practices and conventional ownership have been continued which has caused considerable conflicts between local people and the state forest administration. The aim of the study was to systematically gather the components of traditional silvopastoral management in these oak forests and to investigate the effects of these practices on forest stand structure. To understand how the traditional forest management system works, empirical survey methods, in particular face to face interviews and participation in traditional practices have been employed. In general, local livelihoods depend on three main components: animal husbandry, farming and forestry, which are all spatially interrelated in the territories of individual families. Silvopastoral management is based on a well-developed foundation of traditional ecological knowledge (TEK) which has been shaped over time and conducted for sustainable utilization of oak forests in northern Zagros. Forest regulation and tree characteristics were developed under traditional rules to provide fodder using a set of practices, including pollarding of oak trees as an essential feature of traditional land use in northern Zagros. The impacts of traditional forest management on forest structure, regeneration and composition were investigated by comparing pollarded stands with adjacent undisturbed reference sites. Our analyses show lower woody species richness in managed stands than at reference sites. Stand structure is affected by traditional practices in regard to stand density, stocking, crown cover percentage, diameter distribution type and spacing. Regeneration failure due to heavy livestock browsing is considered the main weakness of the system. We conclude that respectful conventional regulations and customs can provide bedrock to conservation of the forest area. In this regard the role of traditional forest management and community-based approaches should be acknowledged to encourage public participation for sustainable forest management.

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1. Introduction

1.1. Traditional land management

Many landscapes of the world have been shaped by traditional land-use practices that have implied intensive, long-term and locally adapted interactions between humans and nature (Calvo-Iglesias et al., 2006; Farina, 2000; Plieninger and Bieling,

2012). Traditional forms of land management can sustain a variety of ecosystem services, including the diversity of secondary natural environments (Takeuchi, 2010), while providing primary sources for the daily needs of local communities in many regions of the world (Ramakrishnan, 2007). However, a general trajectory of traditional landscapes worldwide is that their ecological, aesthetic and cultural values are being threatened by processes of social change and industrial development (Calvo-Iglesias et al., 2006; Parrotta and Agnoletti, 2007). Major processes endangering such landscapes include rapid and large-scale intensification of land use, simplification of land management, decline of agricultural and livestock activities in some regions, expansion of urban sprawl,

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development of road and rail networks, as well as pressure from tourism and leisure activities (Parrotta and Agnoletti, 2007).

Historically, the dependency of various peoples on local environmental resources to secure food and income have led to established sets of rules, structures and regulations governing forest use. Such governance structures have typically been based on a combination of traditional ecological understanding and practices and learning from crises and new experiences (Gómez-Baggethun et al., 2012). In the scholarly literature, such collections of rules, regulations, beliefs and norms which seek to adjust the relationship between living beings (including humans) with one another and their environment have been termed traditional ecological knowledge (TEK, assuming historical continuity) or local ecological knowledge (LEK, stressing local peculiarity of resource use) (Berkes et al., 2000; Olson and Folke, 2001). Although the usefulness of TEK/LEK and their roles in modern societies and lifestyles are still under debate (Cox, 2000; Hernández-Morcillo et al., 2013), there is already broad agreement on the importance of TEK/LEK for the conservation of biodiversity (Antrop, 2004; Charnley et al., 2007; Parrotta and Agnoletti, 2007; Yaofeng et al., 2009) and the sustainable use of ecosystems in general (Berkes and Turner, 2006). The outstanding role of TEK has in fact been emphasized by the recently established Intergovernmental Platform on Biodiversity and Ecosystem Services (Turnhout et al., 2012). Traditional management practices have been inventoried or assessed in sectors such as agriculture (Calvo-Iglesias et al., 2006; Gómez-Baggethun et al., 2012), water resource management (Olson and Folke, 2001), pastoralism (Kizos et al., 2013) and forest management (Chun and Tak, 2009; Ghazanfari et al., 2004). However, traditional practices integrating livestock husbandry with forest management have been studied with less intensity.

1.2. Traditional silvopastoral practices in Iran

Though being a low forest cover country – with only 7.3%, or 12 million ha, of its territory being forests – Iran is one of the countries where traditional forest and silvopastoral management practices are still prevalent (Ghazanfari et al., 2004; Soltani and Eid, 2013). The Zagros Mountains of northwestern Iran, which harbor approximately 40% of the country's forests, are covered by open park-like forests that are mainly stocked by deciduous oak trees and subject to traditional pollarding practices to produce fodder and fuel wood (Fattahi, 1995; Ghazanfari et al., 2004). Conditions in this region, such as topography, shortage of rangelands and animal fodder, and lack of modernization have maintained a situation of particularly intense interaction between its people and natural resources (Ghazanfari et al., 2004; Henareh et al., 2012a,b).

Most of Iran's forests are not harvested commercially. But since prehistoric times the Zagros Mountains have been populated by forest dwellers (in the northern part, mainly Kurds) whose livelihoods have mainly relied on traditional silvopastoral practices. Still today, local people heavily depend on the area's forest lands, as their livestock graze them for almost seven months per year. Pollarding (disbranching and defoliation) is practiced to provide animal fodder from tree foliage, which in consequence has changed tree physiognomies and nutrient cycling and shaped a special landscape in Zagros. In addition to animal grazing and pollarding of trees, the main practices of the traditional forestry system there includes harvesting of fuel and construction wood as well as use of non-wood forest products such as oak acorns, gall varieties, and manna, a sweet sap, from oak trees.

Social changes in Iran, including rapid population growth and disproportionate technological progress, have resulted in unemployment, and increased demand for forest goods and services (e.g. land use change, dairy, meat, animal grazing), leading to degradation of many of the country's silvopastoral systems.

Substantial pressure on silvopastoralism arose out of the nationalization of natural resources, including forests, in 1963, a consequence of the White Revolution in Iran. Private ownership of forests was transferred to the public and all local utilization thereof was declared illegal. Since then, all Iranian forests have been subject to regulation by the Forest, Range and Watershed Management Organization (FRWO), which adopted a preservationist policy to ecosystem restoration. The FRWO views forest dwellers and their livestock as the most important drivers of regeneration failure and forest loss (Fattahi, 1995; Jazirehi and Ebrahimi Rastaghi, 2003; Mohajer, 2005). Therefore, the FRWO instituted policies to relocate and exclude people and their livestock from the forests. In this regard, some shortcomings of traditional silvopastoralism have been reported, in particular a lack of regeneration and structural destruction including vertical, horizontal and age structure (Ghazanfari et al., 2004; Shakeri et al., 2009; Valipour et al., 2011). In contrast, Henareh et al. (2012a,b) has pointed to urban population and climatic variables as the most influential factors and warns against blaming rural communities as the main agents of deforestation in northern Zagros. In fact, based on historical precedent, the inhabitants still consider themselves de facto owners of the land and have continued their traditional practices, which have caused considerable conflicts between local people and the FRWO authorities (Ebrahimi Rastaghi et al., 2001). Novel management approaches that would seek to foster ecosystem regeneration while including traditional silvopastoral practices have so far remained unconsidered.

Several authors have studied the structure of and temporal trends in Iran's forests (Yousefi, 2003; Salehi et al., 2008; Soosani et al., 2009; Torahi and Rai, 2011; Najafifar, 2012; Henareh et al., 2012a), finding that forest area has declined in many regions of Zagros from 1955 (when the first aerial photographs were taken in Iran) to the present. Henareh et al. (2012a), Soosani et al. (2009) and Yousefi (2003) relate the forest decline in southern Zagros to local and tribal¹ communities' activities, such as fuelwood collection, livestock grazing, expansion of non-irrigated agriculture and construction while Salehi et al. (2008) reported on the stability in crown cover density and the number of large trees in southern Zagros. Adeli et al. (2008) proposed applying tribal forestry methods to manage the forests in the region. Similarly, Ghazanfari et al. (2004) recommended application of traditional forestry to support its opportunities to establish a participatory forest management system. Salehi and Erikson (2010) found that the fuelwood amount collected by inhabitants is 10 times less than the forest's potential (allowable cut). Other studies, however, have reported degradation of forest structure emphasizing aspects of regeneration failure, declining crown cover density and shifts in diameter distribution (Ghahramany et al., 2009; Shakeri et al., 2009 and Valipour et al., 2011).

1.3. Objectives

The traditional silvopastoral management system plays an important role in the cultures and livelihoods of the local peoples of this region. Thus, there seems to be a need to integrate community-based management approaches into the forest conservation program that has been implemented by the FRWO. As a way out of the conflicts between local people and the FRWO, Ghazanfari et al. (2004) have proposed some modifications of traditional forest management that could satisfy the minimum expectations of sustained yield by combining modern silvicultural treatments with traditional and localized techniques. However, before modifications can be introduced, the traditional forest management system

¹ Tribal communities consist of a kind of transhumance movement through forests and rangelands from the lower to the high elevation of the Zagros Mountains as season changes.

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