

# Local consequence of global process: challenges of maintaining pastoral production in high mountain pastures of Nepal

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## Introduction

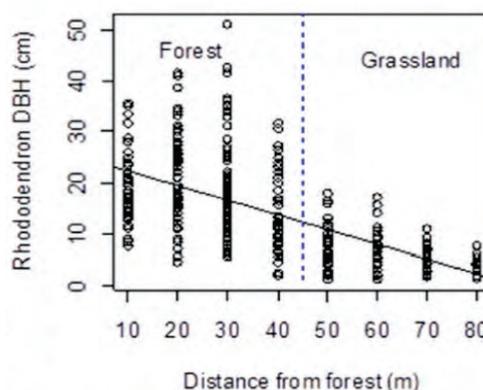
Grassland pastures are important livelihood resources for local people in agro-pastoral production in high mountainous areas of Nepal. The character of these pastures, as part of cultural landscape, result from historical interaction of human activities and local ecological processes. Fire and grazing are two important landscape drivers that have a direct impact on the structure, diversity and composition of pastures. Recently, grasslands in many semi-arid regions of world are undergoing rapid transformation as consequence of changes in fire and grazing regimes. One conspicuous change is an abrupt proliferation of native shrub species. Migration of herders away from marginal mountain areas has many local environmental consequences associated with land use change (Aide and Grau 2004). In this context, the present study explores the main ecological consequences of shrub invasion in selected grasslands of Nepalese mountain areas and discusses the management challenges associated with these ecological changes. In these mountain pastures, shrub invasions are either overlooked or underexplored.

## Methods

The present study was carried out in mountain pastures of central Nepal. Information on changes in livestock numbers, pastoral abandonment, grazing and fire history were gained from interviews with 40 herders and three discussion groups with a total of 16 participants. Interviews and discussions were focused on understanding linkages between shrub invasion and pastoral abandonment. An understanding of management response of herders to the recent changes in grasslands was also sought. In addition, vegetation sampling was undertaken to assess the current condition of grasslands in the forest-grassland ecotone.



**Figure 1.** Pasture covered with shrubs.



**Figure 2.** New trees established in pasture.

## Results and discussions

Large changes in migration of herders from mountainous areas had occurred over the last four decades; livestock numbers have declined by two thirds and most of the pastures had been abandoned as a consequence of migration of local people from the mountain areas. A few herders who were still continuing the traditional summer grazing in pastures witnessed a complete transformation of the grasslands due to shrub and tree invasions. Some of the pastures had more than 80% coverage of shrubs (Fig. 1). Shrub cover (*Berberis* species in particular) slowly increased after abandonment of pastures and an associated decline in livestock numbers. Successional establishment of trees (*Rhododendron* species and *Abies spectabilis*) in the pasture was also evident (Fig. 2). Herders consistently reported that shrub invasion in grasslands started three decades ago but became problematic and an obvious problem some 15 years ago. It was also found that some populations of native species were being threatened with grassland conversion.

These results revealed that native shrub invasion in mountain pastures is of recent origin. Globally, changes in land use (particularly increased grazing pressure) are associated with fire suppression and shrub invasion of grasslands (Archer 1995; Briggs *et al.* 2005). However, drivers in Nepalese grasslands contrast to these global trends of semi-arid and arid grasslands. Nepalese Mountain grasslands are undergoing changes as a result of decline in livestock numbers and associated migration of herders from these areas. Changes in fire regimes in Nepal did not appear to be a major driver of grassland change. However, in some of the pastures- where fire is still being used - it appears to be playing a role in protecting specific pastures.

Currently very few herders are continuing to use traditional migratory herding in mountain pastures and their continued management is being challenged by the invading species. Shrub proliferation appears to have reduced grasses and forbs and grassland area. Trails are being blocked by shrubs and causing physical harm and even death of livestock. Local herders have attempted to remove shrubs from grasslands manually and through the use of fire. However, both these management activities have proven unsuccessful as once shrubs are established they become difficult to remove. The recently developed Rangeland Policy of Nepal (GoN 2012) has also overlooked these problems and has adopted a conventional view on rangeland problems.

### Conclusion

This study showed that shrub invasion is a local environmental consequence of migration of people from marginal areas. Shrub invasion not only threatens the survival of pastoral activities in the marginal-mountainous areas of Nepal but also brings challenges in protecting grassland biodiversity and ecosystem services in this cultural landscape.

Further research is needed on the mechanisms for controlling extensive shrub invasion and management initiatives needed to protect biodiversity and ecosystem services of these livelihood resources of transhumant herders.

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