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Invasive plants – Do they devastate or diversify rural livelihoods? Rural farmers' perception of three invasive plants in Nepal

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ABSTRACT

In this paper, we examine how rural people in the buffer zone of Chitwan National Park in Nepal perceive the effects of accidently transported invasive plant species, such as *Mikania micrantha*, *Lantana camara* and *Chromolaena odorata*, on their livelihoods. We found that their perception of the impact of each species on their livelihood varies with factors such as the duration of the presence of invasive plants in the landscape, and household characteristics. Results of a household survey indicate that farm households close to the forests have responded to the invasive species both as a victim and a beneficiary. Farm households are likely to adapt to the invaded environment as they have a history of interacting with invasive plants and can commoditise them through appropriate intervention. Additionally, the findings indicate that rural people are willing to invest in the control and management of invasive plants if appropriate technical assistance is available. Without assistance, they consider mitigating the infestation an unattainable mission and consider acceptance of the invasive species as a part of the rural ecosystem an inevitable outcome.

Introduction

Invasive plants are exotic species that threaten native ecosystems, habitats or species (Convention on Biological Diversity, 2008). They are considered either deliberate or accidental ecological consequences of economic processes (Holmes et al. 2009). The pace of the spread of invasive plants is increasing with economic activities including travel, trade and technology, and they have now invaded forests throughout the world (Millennium Ecosystem Assessment 2005). Unquestionably, the introduction of new species into a forest alters the ecosystem properties and processes through the manipulation of plant species composition. Invasive species, therefore, are considered one of the important drivers of ecosystem change and the second most serious threat to natural habitats after habitat fragmentation (Millennium Ecosystem Assessment 2005; Randall 1996).

The effects of invasive plants on natural habitats are more complex than the direct negative impacts. Their additional potential positive impacts such as providing economic and ornamental values have sparked a controversy as to whether they are friends or foe, pest or providence, and weed or wonder (e.g. Foster & Sandberg 2004; Pasiecznik 1999). Therefore, infestation of exotic plants may create complicated circumstances in the invaded ecosystem, particularly in rural areas where the majority of people are directly involved in forest management, and forest products such as firewood, fodder, and medicinal herbs are considered a major input of agricultural household production functions. This suggests a need to understand the role of particular invasive plants in local livelihoods as a part of forest management and decision-making processes.

Generally, rural people evaluate the impact of invasive plants based on how their economic needs are influenced by the species (e.g. Binggeli 2001; Shackleton et al. 2007). Some species which are considered detrimental to a specific group of rural people may be considered useful to others (e.g., Kannan et al. 2008; Mwangi & Swallow 2008). This is because invasive plant species have differing characteristics offering a variety of ecosystem services, and farm households in developing countries are heterogeneous. The variations in interactions between agricultural households with diverse livelihood strategies and invasive plants producing different types of ecosystem services are undisputed (e.g. Kaufman 2004; Pasiecznik et al. 2001; Shackleton et al. 2007).

In addition to the variations in the relationship between invasive plants and rural livelihoods, previous studies on invasive species have primarily concentrated in developed countries (Pysek et al. 2008). However, appropriate control strategies in developing countries could be more beneficial in terms of conserving global biological diversity because these countries tend to have highly diverse natural habitats, and intervention can be cost-effective because of the availability of low-cost labour (Nunez &

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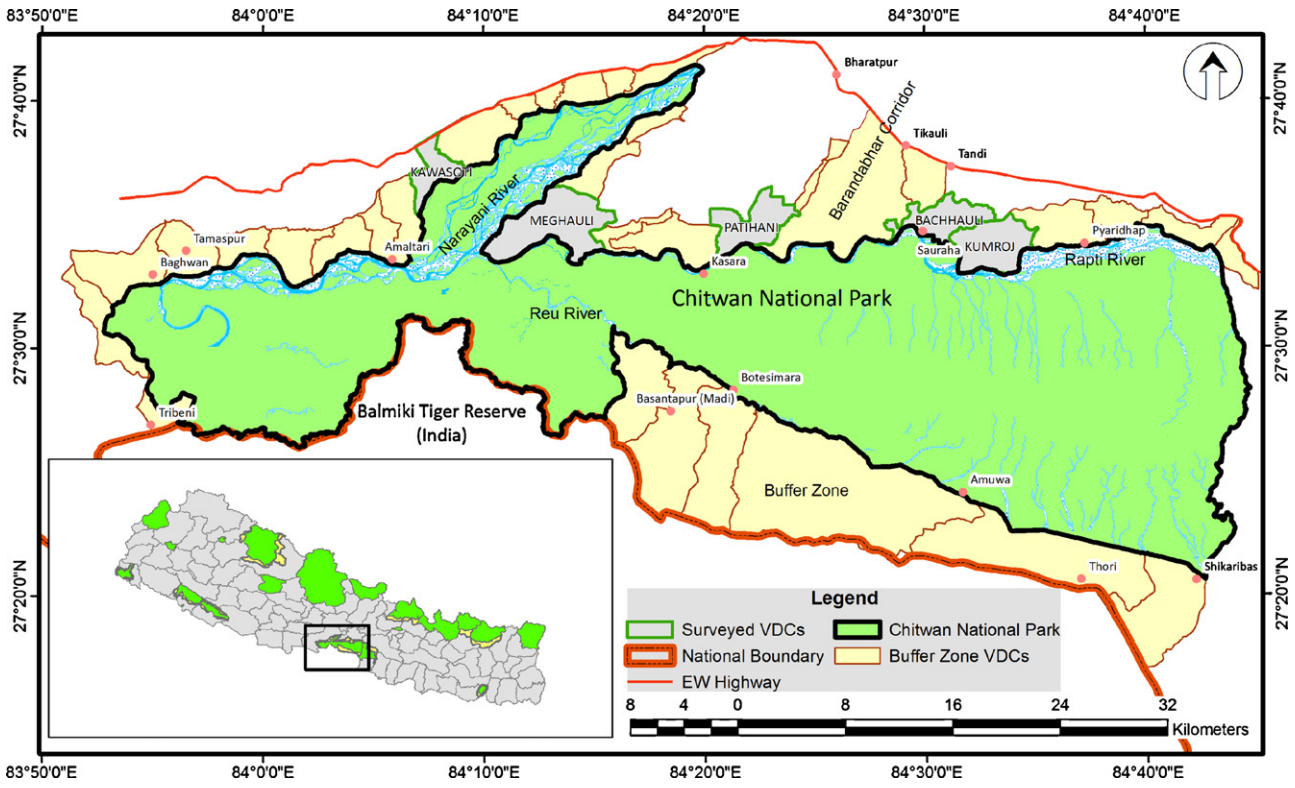

Fig. 1. A map of the study area.

Pauchard 2009). Understanding community attitudes to invasive plant species in forest-dependent areas is sought for sustainable forest management in the context of changing environmental conditions, where community based forestry is a dominant strategy and deforestation and forest degradation persist as major environmental challenges.

Study sites and methods

Case study: buffer zone of Chitwan National Park, Nepal

The case study reported here involves the buffer zone (BZ) of Chitwan National Park (CNP), Nepal (Fig. 1). The BZ lies in between latitude 27°20–27°40′North and 83°52′–84°45′East longitude. It covers 750 km^2 and forest patches in the BZ are managed by local communities. The diverse habitats such as sal (*Shorea robusta*) forest, riverine forest and grassland in the BZ and core area of CNP support many charismatic species including one-horned rhinoceros (*Rhinoceros unicornis*), royal bengal tiger (*Panthera tigris tigris*) and asiatic elephant (*Elephas maximus*). Akin to other parts of the nation, the BZ and core area of CNP also host various unwanted guest plant species including mile-a-minute (*Mikania micrantha*), triffid-weed (*Chromolaena odorata*), and spanish flag (*Lantana camara*) hereafter *Mikania*, *Chromolaena* and *Lantana*, respectively.

Three assumptions were made in this study. First, India is the most likely transit for invasive species to enter Nepal because of the relationship between Nepal and India, in terms of geographical settings, trade volume and provision of an open border. Second, there is no documentation about when and how the two species *Chromolaena* and *Lantana* were introduced into Nepal. *Mikania* was first recorded in 1963 in the eastern part of Nepal, and was transported accidently with tea seedlings from India, before spreading west-ward (Tiwari et al. 2005). Based on their first arrival in India, *Chromolaena*, *Lantana*, and *Mikania* were introduced in the 1840s, 1908 and during World War-II respectively (Choudhury 1972; McFayden 1998; Varshney & Babu 2008). We speculate that *Chromolaena* was the first species introduced in Nepal, and that it was followed by *Lantana*, and *Mikania* respectively.

The third postulation is that these species are unwanted. This assumption is based on the following: (i) there has been no practice of plantation of these species in Nepal; and, (ii) the local names of these species assigned by local communities are prefixed or suffixed by *Banmara* (Lit: forest killer), indicating the community perception of their destructive nature and rapid growth rate.

Most of the previous studies on interactions between rural livelihoods and invasive plants are focused on deliberately introduced species such as; *Prosopis juliflora*, *Opuntia ficus-indica*, and *Acacia mearnsii* (e.g. Mwangi & Swallow 2008; Shackleton et al. 2007). In general, the introduction of purposely introduced species may be welcome by some sections of the community because they can at least satisfy the need for forest products from particular group of people.

The role of accidently introduced invasive plants on rural livelihoods is rarely understood. Typically, accidently introduced species such as *Chromolaena*, and *Lantana*, are likely to cause economic and environmental harm (e.g. Babu et al. 2009; McWilliam 2000). However, their use can also be widely observed in rural areas (e.g. Integrated Development Society 2008; Kannan et al. 2008). The focus of the discussion here is the social attitudes towards the invasion of rural ecosystems by *Mikania*, *Chromolaena* and *Lantana*, on the BZ of CNP. The BZ is likely to be more susceptible to invasion because of the increasing number of tourists and, habitat disturbance persists due to human pressure, habitat fragmentation and forest-fire.

Household survey

The study was conducted in five randomly selected village development committees (VDCs) of the buffer zone of CNP. The