



Ministry of Forests and Soil Conservation
REDD-Forestry and Climate Change Cell, Nepal
October, 2013

policy brief



Invasion and colonization of alien species: A threat or benefits in Nepal

Nepal is one of the developing countries participating in the REDD+ readiness program supported by the World Bank. The country's Readiness Preparation Proposal (R-PPs) for 2010-2013 records *nine (9) major drivers* of deforestation and forest degradation as identified in the different physiographic regions of Nepal. Expansion of Invasive Alien Species (IAS) is one of the drivers. However, the assessment of its impact on forest regeneration, degradation and deforestation at large spatial scale was not established then. A study on IAS as drivers of Deforestation and Degradation of Forest was therefore done to determine the nature and extent of negative impacts caused on the forests of Nepal and the key species mapped out accordingly.

The results of the study is purposed to inform the development of a National REDD Strategy which is a pre-requisite document for Nepal as a Forest Carbon Partnership Facility (FCPF) for REDD Readiness process. The information is also useful for the formulation of the long-term forestry sector plan.

Key messages

- *Disturbance and removal of trees are the major factors that make the forests highly susceptible to infestation by IAS in Nepal. Therefore, disturbance should be kept at minimum and sustainable utilization of biological resources ensured to make the forest communities less susceptible to infestation by IAS.*
- *Community participation can be a key component of IAS management. All stakeholders including local communities should be made aware of the IAS in their localities, mode of dispersal, negative impacts to natural ecosystems, and management option to contain them. A field guide book of IAS with illustrations is desirable for educating the communities.*
- *In Nepal, the Invasive Alien Species are 'passengers' of deforestation and forest degradation at their early stage of colonization, which later change into 'drivers' by disrupting regeneration process. The IAS invades the degraded forests and gradually colonizes the sites. So the most effective, economical, and ecologically sound approach to manage invasive plants is to prevent them from invading in the first place.*
- *As a next step, an intensive research to quantify contribution IAS on carbon emission would be important. Whereas, degraded forest where natural re-growth of trees is slow or severely disrupted by IAS, enrichment plantation of native species will be effective to naturally reduce abundance of IAS.*

Invasive alien species and forests of Nepal

Invasive Alien Species (IAS) are species, native to one area or region, that have been introduced into an area outside their normal distribution, either by accident or on purpose, and which have colonized or invaded their new home, threatening biological diversity, ecosystems and habitats and human well-being (CBD 1992).

The brief covers selected sites of KTWR¹, PWR¹, SWR¹ CNP¹ and BNP¹ in Terai and Chure region conducted in the pre-monsoon 2012as as shown in Figure-1. These are 3 wildlife reserves and 2 national parks are in the southern lowland of Nepal. The land cover sites fall under 8 different classes; bare, bushes/Grassland, water bodies, dense forest, sparse forest, cultivation and settlement.



Figure 1: Protected Areas where study was conducted

The origin of IAS in Nepal dates back more than 50 years. The occurrence is higher in eastern and central than in the western regions of Nepal. Their richness and abundance have been increasing over the years. The country is suitable for flora and fauna with a wide range of life histories and origin due to its high climatic and physiographic diversity.

21 remarkable IAS species pose various levels of impacts on biodiversity and ecosystems in Nepal. Of these, 13 species were found in the study sites. *Lantana camara* is found in all five sites while *Chromolaena odorata* is only in KTWR, PWR and CNP. *Mikania micrantha* which is highly notorious is found in KTWR, PWR and CNP. *Ageratum conyzoides* occurrence is high in BNP and SWR.

Projections of forests products demand in terai, hills and mountain areas

In the context of global change, the aggressiveness of many IAS is likely to increase, with potential feedback effecting various components of global change such as carbon emission, nutrient dynamics, etc. (Dukes and Mooney 1999).

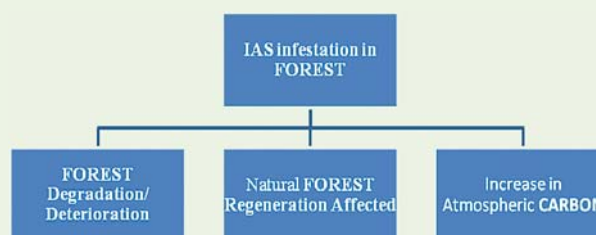


Figure 2: IAS and carbon emission effect

¹Koshi Tappu Wildlife Service ; ¹Parsa Wildlife Reserve; ¹Shuklaphata Wildlife Reserve; ¹Chitwan National Park; ¹Bardia National P
The Study on Invasive Alien Species(IAS) as Drivers to Deforestation and Degradation of Forest in Different Physiognomic Region of Nepal was undertaken by BS-API JV Baneshwor, Kathmandu Tel: 01-4485565/4620408, E-mail apiresearchfoundation2011@gmail.com

Distribution and intensity of the IAS

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Box 1: IAS dominance

- The species richness and cover of IAS decline with the increasing tree canopy cover.
- The IAS dominates the forest understory.
- IAS species richness and coverage are higher in BZCF and show an increasing trend.

Habitat	Forests, shrub lands	Wetlands, aquatic ecosystems	Agriculture lands	Urban areas
IAS	<i>Ageratina adenophora</i> , <i>Chromolaena odorata</i> , <i>Lantana camara</i> , <i>Mikania micrantha</i> , <i>Parthenium hysterophorus</i>	<i>Eichhornia crassipes</i> , <i>Ipomoea carnea</i> , <i>Alternanthera philoxeroides</i> , <i>Myriophyllum aquaticum</i> , <i>Mikania micrantha</i>	<i>Ageratum conyzoides</i>	<i>Parthenium hysterophorus</i>

Box 2: IAS species and habitats colonized

- *Ageratina adenophora* and *Chromolaena odorata* are the most widely distributed IAS in Nepal's forest ecosystem. These species are particularly common in degraded and secondary forests with relatively low tree canopy.
- *Chromolaena odorata* is the most common IAS in forests of river valleys in the mid hills and the southern part of Nepal. Therefore, with the regeneration of trees after forest conservation, the abundance of *C. odorata* has declined in some community managed forests of mid hills inner Terai (*Shorea robusta*) (pers. obs. BB Shrestha).
- *Mikania micrantha* is an aggressive IAS colonizing relatively moist habitats such as wetlands, grasslands, shrub lands, and riverine forests. More than half of the area of Koshi Tappu Wildlife Reserve (KTWR) has been invaded by *M. micrantha* while in the surrounding community forests in buffer zone; the abundance of *M. micrantha* is relatively low due to the periodic removal of its biomass by forest users' group (Siwakoti 2007).

The levels of infestation by IAS is dependent on tree canopy cover. High canopy cover means less availability of light on ground cover which is less favorable for the growth of the IAS. Therefore maintenance of high tree canopy and/or understory vegetation of native species can be an effective approach to minimize the infestation and colonization by IAS in forest ecosystems.

IAS is a dominant component of forest understory vegetation. Infestation is high in forests of protected areas and buffer zone of Koshi Tappu WR and Chitwan National Park than other forests. There is rapid expansion of *Mikania micrantha* in recent decades in the two protected areas.

Impacts of IAS: Environmental and economic effects

The IAS modifies the micro-habitat, changes physical environmental conditions and releases certain metabolites that make the chemistry of the soil unsuitable for germination of other species. The

situation is more extreme if the already infested forests are subjected to anthropogenic disturbances such as grazing, vehicle movements, and tourism and logging. Results:

- ❖ Affect ecological and evolutionary on biodiversity including extinction of species.
- ❖ Alter community structure and modify ecosystem process-nutrient cycling, hydrology
- ❖ Diminish tree regeneration; reduces tree seedlings sampling, reduce species diversity

The eventual deterioration of the degraded forests and effect on natural regeneration cause economic impacts i.e.:

- ❖ Direct damage to forest resources,
- ❖ Costs demand to control the IAS.

Current infestation trends of IAS in forest management regimes

Local community observation indicates that majority of the IAS abundance are on the increase over the last decade. Such are *Ipomoea carnea sp.*, *Fistulosa sp.*, *Lantana camara* and *Parthenium hysterophorus*. A few others species such as *Cassia tora* and *C. occidentalis* remained constant in abundance over the recent decade. The abundance of *Mikania micrantha* and *Chromolaena odorata* on the contrary is declining in community managed buffer zone forest at Chitwan. The removal of the

weeds and tree plantation in the shrub land are responsible for this decline.

The human activities in the buffer zone areas (BZA); tourism and resource utilization by local residents i.e grazing, vehicle movements are responsible for high intensity of IAS in the forests of the buffer zone. The presence of IAS in the protected areas implies that the management strategies of the protected areas have not effectively addressed the expansion of IAS.

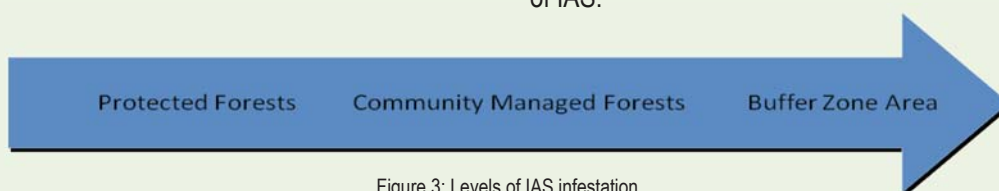


Figure 3: Levels of IAS infestation

Recommended management actions

The most effective, economical, and ecologically sound approach to manage invasive plants is to prevent them from invading in the first place i.e. control the introduction of the seeds; detect early and eradicate small patches of the plants; Minimize the disturbance of desirable plants along passage ways; Maintain desired plant communities and Re-vegetate disturbed sites with desired plants. The study recommends detailed study with boundaries of various management regimes to incorporate status of IAS in various management regimes.

The awareness programs should aim to enhance biodiversity conservation, agricultural production and carbon emission reduction developed and involving all concerned groups. The target groups are local forestry authorities, local communities, Protected Area Authority and local NGOs. The local communities are basically agriculture and livestock households. The programs will advocate for minimal disturbance, avoid over exploitation of the biological resources in natural forests, enrichment plantation in shrub lands and degraded forests.

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