

recommended NPK fertilizer, the fungus populations with dilutions 10-5 and 10-6 was found to be (6.19x10⁵) and (7.1x10⁶) respectively. Thus, the result showed the enhanced soil microbial biomass in the organic fertilizer applied soil.

Keywords: soil fungus, bacteria, biomass, fertilizers, serial dilutions

Transition to sustainable mountain agriculture: Agroforestry experiences in the mid-hills of Nepal (PO -PO -1 -48)

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A transformational strategy towards sustainable development has to promote further improvement of mountain farmers' livelihoods while at the same time ensuring ecological sustainability and inducing social equity. In this context, a multiyear joint project with local farmers was launched in spring 2009 to introduce agroforestry practices in the village Kaule, Nuwakot district, mid-hills of Nepal. The farmers got involved in the entire process, beginning with the definition of goals, the envisioning of a desired future and formation of their NGO 'Kaule Environment Nepal'. Practical components of the project included trainings and workshops on agroforestry, restructuring of terrace fields for conversion to agroforestry, and monthly meetings for open discussions among involved households. In order to improve water supply and management, a corresponding sub-project was initiated recently after evaluation of environmental, technical, social and political framework. The project was accompanied scientifically to analyze socio-economic and ecological initial conditions and impacts. This paper presents scientific findings and summarizes the experiences during the transition to sustainable land management of various sub-projects from an interdisciplinary perspective. Participation of the farmers in the entire process, and the integration of local knowledge, skills and resources was found to be of key importance for the project success. We conclude that the transition from conventional terrace cultivation to agroforestry practices, accompanied by various specifically fitted measures to improve framework conditions, e.g. improvement of water management, has the potential to generate significant environmental and socio-economic benefits, thus contributing to increased livelihood security and to sustainable modernization processes in mountain agriculture.

Keywords: land management, water management, livelihood, mountain agriculture

Threat of *Ageratina adenophora* to Nepalese Alder forest (PO -PO -1 -49)

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Alnus nepalensis (Nepalese Alder) is a native tree in Nepal which is very common, deciduous and fast growing subtropical species. This tree accelerates ecological restoration of the degraded habitat and considered useful for land reclamation. Nitrogen fixing ability in the root nodules by symbiotic relationship with Frankia is one of the important characteristics of this tree. A serious issue is that the native forests dominated by Nepalese alder have become severely invaded by a worst alien species *Ageratina adenophora* since decades. Various mechanisms of *A. adenophora* invasion have been proposed previously such as its phytotoxic ability to inhibit native species, soil pathogen accumulation and altering soil quality in an ecosystem. We have proposed an interesting mechanism of *A. adenophora* invasion in Alder forest that is *A. adenophora* interferes *A. nepalensis* root nodulation and symbiotic association with soil Frankia. Water extracts from *A. adenophora* fresh leaves were found phytotoxic to the growth and development of *A. nepalensis* seedlings and inhibited the number of root nodules. Overall, affecting plant bacteria symbiotic relationship could be a possible reason behind invasion success of *A. adenophora* in Nepalese Alder forests. Hence, implementation of appropriate control measures for this alien species is essential to protect Alder forests from being severe invasion in future.

Keywords: crofton weed, native species, invasion, plant-bacteria symbiosis

Development of a low-cost pesticide detection method using paper-based analytical device and desktop spectrometer (PO -PO -1 -54)

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Pesticide residue in environment has become a major concern today. Pesticide use in Nepal is growing by 10-20% per year with the increased risk of pesticide misuse. Insecticides, organophosphates and carbamates are commonly used pesticides by Nepali farmers. Monitoring of pesticide contamination in food, vegetables and water samples is essential to avoid potential health hazards. Traditional detection techniques like spectrophotometer, high performance liquid chromatography, gas chromatography, or mass spectrometry are time consuming, have tedious operations, require expensive instruments, and trained personnel. Here, we present a paper-based analytical device (PAD) to detect pesticide residue in vegetable samples. The PAD was fabricated on Whatman filter paper using commercially available permanent marker. The low-cost colorimetric assay is based on the inhibition of acetylcholinesterase enzyme activity on enzyme substrate by pesticide. The change in color was measured by a low-cost desktop spectrometer at 412 nm. We optimized the PAD method by using standard organophosphate, Malathion of different concentrations. The new method was tested on cucumber samples spiked with the standard pesticide solution. This low-cost and easy to use method holds great potential to be used in resource limited settings.

Keywords: paper-based device, microfluidics, desktop spectrometer, inhibition assay