

Improving Skills for Promoting Sustainable Watershed Management Practices in South Asia - Nepal

Introduction

Nepal has been ranked 13th most vulnerable to climate change impacts. Floods and droughts have always been a major concern in Nepal affecting not only the essential resources for survival but also the human life as well. There has been a noticeable change in the river flows resulting in an increased floods and droughts. Erosion, sedimentation, landslides, surface and ground water contamination, droughts, floods and degradation of natural resources are among the major hazards induced by climate change in Nepal. Rainfall has been increased up to 30 mm a year during the last four decades, while temperature has been estimated to increase by 0.5 to 2 °C by 2030. Therefore, the watersheds are most vulnerable to climate change impacts.

Addressing these issues, a capacity building program was initiated among the three (Pakistan, Nepal and Sri Lanka) countries, funded through Asia Pacific Networks for Global Change Research (APN gcr) Japan. In this capacity development program, a separate capacity building workshop is being organized in each collaborating country for project partners (hydrologists/ climate scientists /agriculturists /community workers) from the lined departments, who will analyse the watersheds and prioritize the most effective technologies according to their countries according to their local climate change scenario. In a workshop at Kathmandu, the Nepali project partners have prioritized the following watershed management technologies for Nepal.

Check Dams and Bio Engineering Structures

A check dam is a small barrier wall made of rocks, gravel bags or sand bags, constructed across a waterway or channel to counteract erosion by reducing the flow velocity of a water stream as shown in Figure 1. This obstruction induces infiltration rather than eroding the channel. They can be used not only to slow down flow velocity but also to distribute flows across a swale, to avoid preferential paths and guide flows toward reinforced sections of vegetation, stone pitched or mulched

areas. As per site situation and the availability of the material, different types of structures can be constructed and the design of the structures may also vary accordingly.

Bioengineering is the application of engineering design and technology to living systems. In terms of flash flood mitigation, it refers to the combination of biological, mechanical, and ecological concepts to reduce or control erosion, protect soil, and stabilize slopes using vegetation or a combination of vegetation and construction materials.



Figure 1: Loose Rocks Check Dam.

Grasses & Cropping Management

Grasses and cropping management are used to cover the land for improving land surface resistance to rainfall splash effect, erosion, and deformation as illustrated in Figure 2. Land management with grasses can be very effective in improving rainwater absorption by delaying runoff and reducing flow velocity at initial stage. Similarly, growing crops timely before rainy season with sufficient canopy cover can provide better shelter for cultivated lands, which are more vulnerable to erosion due to runoff. The denser crops can be more effective in high rainfall regions as compared to row crops. These grasses and crops are not only helpful in reducing soil erosion and conservation of water resources but will also help in improving the climate and providing food for the humans and animals, which can improve livelihood of the local communities.



Figure 2: Grasses and Cropping Management

Conservation Pond

Conservation pond is an effective technology for harvesting rainwater, which can be subsequently used for livelihood improvement. Generally, rainfall in Nepal did not meet the crop water requirement of major crops. Thus, there is a need of additional irrigation water to meet crop water demands. However, during rainy seasons the excess rainwater generally generates floods and landslides and majority of water is wasted as runoff. Water conservation ponds (Figure 3) is one of the most effective technology, for conserving rainwater, replenishing groundwater reserves and protecting sloppy watersheds from landslides during the rainy season. Conservation ponds are not a new practice in Nepal, as indigenous populations in the mid-hill region had used them in the past, but were lost due to the introduction of piped water supply.



Figure 3: Conservation Pond.

High Efficient Irrigation Systems

It is well established fact that irrigation water is the most critical input in crop production and its efficient use enhances productivity of other non-water inputs as well. Nepal is facing severe shortage of irrigation water in many areas for many years now and on the other hand, there is inefficient use, where irrigation water is available. In the climate change vulnerable hilly areas water is available in springs, streams, rivers but mostly at deeper depths thus gravity irrigation of unlevelled lands, generally lying at higher elevation is difficult. Consequently, a much lower agricultural production is generated from a very highly productive resource base. High efficiency irrigation systems (HEIS) are water and nutrient efficient (Figure 4), thus can be instrumental to reduce irrigation application losses and in bringing more areas under cultivation in both hilly as well as levelled lands. Drip, bubbler, sprinkler, rain-gun, center pivot, furrow bed etc. are together referred to as high efficiency irrigation systems, majority of which use pipes for conveyance of water from the source to points of use. These systems can enhance production.



Figure 4: Rain-gun Irrigation system

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