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

Introduction

Sri Lanka is considered as tropical monsoonal with a marked seasonal variation of rainfall. Out of the major climatic parameters, temperature, rainfall, humidity, and evaporation are of special significance to Sri Lanka, which can cause substantial impact on the agricultural productivity of the country. The climate changes in recent decades in the forms of drought, flood, cyclone, accelerated land degradation and sea level rise have posed serious threats to national food and water security. The main issues of watershed in Sri Lanka are lack of interest by the land owners, inadequate government support, violation of acts and conditions enforced by the authorities, improper land use, land tenancy or land ownership issues, climate change impacts, encroachment of forest reserves, deforestation, urbanization, sand and rock mining in catchment areas. All these factors affects watersheds sustainability. Therefore the following watershed interventions can be more appropriate:

Irrigation Management

Efficient use of irrigation water enhances crop production and productivity of other inputs. Majority of irrigation practices on farm are inefficient in Sri Lanka. High efficiency irrigation systems (HEIS) are water and nutrient efficient (Figure 1), thus can be instrumental to reduce irrigation application losses and in bringing more areas under cultivation in both hilly as well as levelled lands and one of the most suitable option to address various crop production issues in Sri Lanka. 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.

Figure 1: Rain-gun Irrigation system on Maize

Critical Area Planting

Establishing vegetation on sites with high erosion rates or exposed to physical, chemical or biological conditions preventing the establishment of vegetation with normal practices (Figure 2). According to Natural Resources Conservation Services NRCS (US); the main objectives of critical area planting are; 1: Stabilize stream and channel banks, and shorelines; 2: Stabilize areas with existing or expected high rates of soil erosion by wind or water; 3: Rehabilitate and re-vegetate degraded sites that cannot be stabilized using normal establishment techniques; and 4: Stabilize coastal areas, such as sand dunes and riparian areas. This practice applies to highly disturbed areas such as active or abandoned mined lands, urban conservation sites, road construction areas, conservation practice construction sites, areas needing stabilization before or after natural disasters such as floods, hurricanes, tornados and wildfires, eroded banks of natural channels, banks of newly constructed channels, and lake shorelines and other areas degraded by human activities or natural events.

Figure2: Critical areas planting on steep slope

Plant species selected for critical area seeding or planting shall suit the site specific conditions and intended uses. Grazing animal should be controlled while gullies and deep rills shall be filled and levelled a. Based on a soil test and other appropriate site evaluations, soil amendments shall be added as necessary to ameliorate or eliminate physical or chemical conditions that inhibit plant establishment and growth. Use of the area shall be managed as long as necessary to ensure the site remains stable. Plantings shall be protected from pests (e.g. weeds, insects, diseases, livestock, or wildlife) as necessary to ensure long-term survival.

Waste Management/Utilization

Waste management is the collection, transportation, and recycling or disposal of waste. Waste can be categorized as liquid, solid rubbish, organic, recyclable rubbish and hazardous waste. The commonly used method of waste management are: Open burning, dumping into the sea, sanitary landfills, incineration; composting, ploughing in fields, hog feeding, grinding and discharging into sewers, salvaging, fermentation and biological digestion. For ideal waste management, we should encourage using cloth bags instead of plastic, buy food that has less packaging, do vermi-composting, reduce use of bottled drinks, reduce paper usage, and make own household cleaners and detergents.

In a watershed condition, human and animal waste should be managed to avoid contamination of drinking water and ground water resources. Sediments in runoff water should be minimised through improved soil and water conservation practices. Organic waste on farm can be utilized for improving the soil fertility and organic matter. Awareness of improved waste management methods needs to be pursued for sustainable watersheds.

Micro Catchment Management

Micro catchment is a technique generally used for in situ rain-water harvesting around the periphery of individual plants and have shown potential in many countries. Micro-catchment is one of the direct water harvesting method, where small structures are constructed across land slopes which captures surface runoff and stores in plant zone for subsequent plant use. The shape of micro catchment depends on plant type, plant age, land slope, plant spacing, watershed topography, soil type and rainfall characteristics. The micro catchments generally guide the rainwater from the micro catchment area to store in the root zone of the plant either as surface or subsurface storage, so that the plant can utilize the stored water for longer period. A micro-catchment is generally comprised of a catchment, storage, bund and spill way. The micro-catchment can be semi-circular/eye brows, v-shaped and rectangular. Generally, v-shaped and rectangular micro catchments can harvest 50-70 and 200-500 litres of rainwater around the plant. The micro catchments development can be helpful in sustaining forests, supporting plant growth and small scale crop production. The stored water can be conserved in the root zone by eliminating evaporation losses through treatment of micro catchment surfaces with mulches. Different materials including plant biomass (straw, leaves), synthetic (plastic, cloth) and boulders/stone pieces etc can be used as mulches. Keeping in view the growing water scarcity issues, deforestation and flooding under the current climate change scenario, different micro-catchment treated with different types of mulches can be instrumental in conserving water and sustaining plant growth.

Rainwater harvesting with micro-catchments requires development of small structures across mild land slopes, which capture overland flow and store it in soil profile for subsequent plant uses, as illustrated in Figure 3. Water availability to plants depends on the micro-catchment runoff yield and water storage capacity of both the plant basin and the soil profile in the plant root zone. The micro-catchments water harvesting potential varies between 5–85% with an average value of 30% of the incidental rainfall, while its unit runoff yield increase with rainfall amount and decrease with micro-catchment area. The micro catchment has elevated importance in Sri Lanka due to high rainfall and runoff issues, which negatively affect the sustainability of watershed productivity thus leading to poor livelihood.

Figure3: Micro catchment management for conserving rainwater

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