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EFFECT OF SOIL CONSERVATION MEASURES ON SOIL EROSION, SOIL MOISTURE AND CROP PRODUCTIVITY IN THE MID COUNTRY INTERMEDIATE ZONE OF SRI LANKA

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EXTENDED ABSTRACT

Randenigala is one of the largest reservoirs in Sri Lanka constructed in year 1984 under Accelerated Mahaweli Development Program with a catchment area of 2330km^2. Considering the importance of the catchment area of Randenigala reservoir to the national economy and environment, Environment Action 1 Project (EA1P) introduced on-farm and off-farm soil conservation measures within the area in year 2001. Present study was conducted in Heelpankandura sub catchment of Randenigala reservoir catchment in the mid country intermediate zone of Sri Lanka to evaluate the effectiveness of introduced vegetative and mechanical on farm soil conservation measures, in terms of soil erosion, soil moisture conservation and growth and yield of brinjal (*Solanum melongena Linn.*) as there is very little information available on comparison of mechanical and vegetative soil conservation measures on soil erosion, crop productivity and soil moisture conservation in Sri Lanka.

The research was conducted in 2001-2002 *Maha* season in two farmer fields in Udawatta village, Randenigala reservoir catchment (IM_{3c} agro-ecological region). The area is having a uni-modal rainfall pattern with average annual rainfall of about 1250 – 3000mm. Soil of the area is Reddish Brown Latasolic in a steeply dissected rolling and hilly terrain (Panabokke, 1996). Three soil conservation measures (stone bunds, Gliricidia double hedgerows and Finger millet strip crop) were compared with sole crop control in Randomized Complete Block design with six replicates in (30% slope) two farmer fields. Stone bunds (45cm height, 60cm width) and Gliricidia double hedgerows (between row 50cm, within row 15cm) were already established in 12m interval along the transect, 6 months before the experiment by the *Environment Action 1 (EA1P) Project.* Finger millet (*Eleusine coracana*) seeds were sown densely (seed rate, 16 kg/ha) in 12 meter interval as 0.5m wide band along the contour at the time of land preparation as a strip crop.

Twenty five days old seedlings of brinjal (cv. SM 164) were planted in 60 x 90 cm spacing along the contours in each plot and the crop was raised as a rain-fed crop.

Fertilizer application and all the other crop management practices were adopted according to the recommendation of the Department of Agriculture (DOA, 1990). Soil erosion was measured using erosion plots made with 22.1m x 4m dimensions and gravimetric soil moisture content was measured using weight difference of wet soil and oven dry soil was divided by oven dry weight of soil. Bulk density of the soil was measured using core sampler and determined by dividing the weight of the oven dry soil by inner volume of the core. Average height of plants in each row was measured at 50% flowering and pods per plant were measured in each row by counting all the pods in each row at the time of harvesting.

According to the results, rainfall received during one month period of land preparation was 555.2 mm with 2 high intensity rainfall events of 99.5 mm/day and 111.5 mm/day. However, during the four months period of crop growth, received rainfall was only 685.4 mm with three moderate intensity rainfall events of 58.6 mm/day, 67.5 mm/day and 76 mm/day. Among the treatments, significantly highest soil erosion during both land preparation and crop growing period was recorded by the treatment of sole brinjal cropping. However, it was on par with strip cropping treatment in land preparation period. Stone bund treatment recorded the lowest soil erosion in both land preparation (66% reduction) and crop growing period (86% reduction, but on par with gliricidia double hedgerow treatment in crop growing period. Anyhow, compared to 4 months crop growing period of brinjal, one month land preparation period recorded over 80% of soil erosion regardless of the treatment.

Significantly highest brinjal pod yield was observed under stone bund treatment and rest of the treatments recorded on par crop yield values, but significantly lower than stone bund treatment. gliricidia double hedgerow treatment recorded the statistically similar crop yields as sole cropping and strip cropping treatments. Significant difference of gravimetric soil moisture content among treatments or between middle (6 m from lower end) and lower (1 m from lower end) parts of the plot was not observed at one month after planting of brinjal. However, significantly highest gravimetric soil moisture content was observed in stone bund treatment at both 2nd and 3rd months after planting. Significant difference of soil moisture content was not observed under the treatments of strip cropping, gliricidia double hedgerows and sole brinjal cropping at 2 months after planting. However, significant reduction of gravimetric soil moisture content at 3 months after planting was observed in the treatment of gliricidia double hedgerows. The effect became more apparent at the end of 3rd month, because there was a one and half month dry spell before 3rd sampling.

In position-wise comparison, highest gravimetric soil moisture content was observed in lower position (1m from lower stone bund) of the stone bund treatment compared to middle part of the plot (6 m from lower stone bund) at 2nd and 3rd months after planting. At 3rd month after planting, position wise difference of soil moisture was also observed under gliricidia double hedgerow treatment. However, in contrast to the stone bund treatment, highest soil moisture availability was observed in the middle part of the plot in hedgerow intercropping treatment.

Treatment-wise significant variation of bulk density of soil was not observed at the end of 1st, 2nd or 3rd months after planting of brinjal. However, significant reduction of bulk density of soil was observed in lower position of stone bund treatment at 3 months after planting of brinjal compared to middle part of the plot. Increasing trend of plant height and pods/plant from upper stone bund to lower stone bund was observed in row wise comparison of plant height and pods per plant. However, prominent row-wise variation of plant height or pods/plant of brinjal from upper strip crop layer to lower strip crop layer was not observed in strip cropping treatment. In the gliricidia double hedgerow intercropping treatment, variation of row-wise brinjal plant height and pods/plant across a transect of the ally between two adjacent gliricidia double hedgerows showed that brinjal plant heights and pods/plant were reduced in rows closer to the hedgerows on both sides. Row-wise plant heights and pods/plant had a single peak in the middle of the plot in gliricidia double hedgerow treatment across transect. However, sole crop row-wise plant height and pods per plant showed linear pattern of variation across transect.

Based on the results, it was concluded that the use of stone bunds for soil conservation in mid country intermediate zone is more appropriate compared to gliricidia double hedgerows and finger millet strip cropping. In addition to soil conservation, stone bund increases the crop (brinjal) yield and soil moisture availability to crop plants. gliricidia double hedgerows exert considerable competition to associate intercrop, when they are planted closer to the hedgerows.

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