

Soil and Water Conservation Measures for Better Management of Red and Black Soils in Semi-Arid Regions of Karnataka



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Semi-arid regions are characterized by a mean annual rainfall between 400 to 700 mm associated with periodic droughts, salinity, soil erosion and water scarcity that leads to land degradation, lower crop yields and biomass production. Soil erosion in semi-arid areas is severe due to poor protective vegetative cover and frequent convective storms of high intensity having high erosive capacity. Therefore, management and adoption of soil & rainwater conservation measures by farmers is crucial in this region to improve the soil fertility, conserve top fertile soil and increase the water and nutrient use efficiency. In view of this existing situations in the region farmers have to be well informed with best and widely adopted soil and rainwater conservation measures to reduce erosion and sustain crop productivity in the arable lands of the semi-arid region.

Mechanical Conservation Measures for Arable Lands

Contour bunding

Method : Construction of bunds with size of 1.8 to 2 m basal width, 0.30 to 0.45 m top width and 0.60-0.75 m height along the contours (across the slope) in red soils with slope less than 6%.



Benefits : Reduce slope length. Promotes water retention and reduce soil erosion and increase crop productivity.

Graded bunding

Method : Bunds with size of 2.4-3.0 m basal width, 0.5 m top width, 45-60 cm height with cross section of 0.82 m² are formed across slope at suitable horizontal intervals of 60-80 m depending on slope in black soils.



Benefits : Promotes *in-situ* conservation of rainwater and allows excess rainwater from field to avoid water stagnation across bunds in black soils and controls erosion.

Compartmental bunding

Method : Small bunds of 15 cm width & height are formed in both directions (along and across slope) to divide the field into small basins or compartments using bullock or tractor drawn bund former.



The size of compartments / basins varies from 5 m × 5 m (Slope >2%) to 10 m × 10 m (Slope <2%) depending upon slope in medium to deep black soils. In general 10 m × 10 m is optimum in levelled farmer's field.

Benefits : Reduce soil erosion, promotes *in-situ* rainwater conservation, improves nutrient availability to plant and increases crop productivity.

Farm pond

Method : Farm pond with normal size of ponds varying from 15 m × 15 m × 3 m to 20 m × 20 m × 3 m with side slope 1:1. Farmer can use silpaulin in higher infiltration soils i.e. in red soils.



Benefits : Run off water conserved in the farm pond will be utilised as a protective irrigation at critical stages of crop growth for sustained productivity, especially during water scarcity/post monsoon season.

Borewell recharge filter

Method : Farmers can adopt recharge filter for low yielding borewells. A pit of 3 m × 3 m × 3 m around the casing pipe has to be dug and small holes are made around the casing pipe at bottom of the pit for entry of infiltrated water. A Nylon mesh is wrapped around the casing pipe to avoid blockage of the holes. Then bottom of the pit filled with 30-40 cm large boulders



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Trench cum Bund

Method : An earthen embankment constructed with trenches are made having 5 m length, 1 to 1.5 m width, 0.45 to 0.6 m depth and a berm of 0.6 to 1m from pit to pit and bund to pit has to be maintained. It can be practised in red soil to break this slope and for soil and water conservation *Styloxanthus* spp. can be cultivated on bunds for feeding the livestock and to strengthen the bund.



Benefits : Bunds breaks the land slope, control the velocity of runoff, conserves rainwater in-situ and control erosion.

Agronomical Management Measures

Contour tillage

Method : Agricultural operations such as ploughing, harrowing, sowing and intercultural operations are done across the slope with line sowing.



Benefit : It reduces the soil erosion and improves infiltration rate, soil moisture in the profile and crop productivity.

Dead furrow

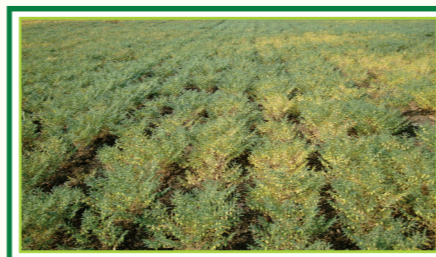
Method : This technology generally adopted in groundnut crop in red soils. After 30 days of sowing of crop it is advisable to form a deep dead furrow at every 3 m interval.



Benefits : It reduces runoff velocity of rainwater and conserves rainwater *in-situ* and improves crop productivity.

Line sowing

Method : Avoid broadcasting method of sowing and adopt line sowing on contour with recommended seed rate for optimum plant population.



Benefits : It reduces soil erosion, conserves rainwater *in-situ* with optimum plant population, facilitates intercultural operations, controls weed growth and produce higher crop yields.

Organic manure

Method : Add 4 to 5 tons of farmyard manure or 3 to 4 tons of vermicompost per hectare every year as a basal application 15 days prior to sowing.



Benefits : Improves soil physical, chemical, biological properties and crop yields.

Mulching

Method : Mulching is achieved by spreading stubble, trash or any other vegetation in crop rows. Farmer also creates dust mulch using blade hoe between crop rows that breaks the continuity of capillary thus avoids deeping of cracks, conserves soil moisture and increases crop yields.



Benefits : Mulching reduces evaporation; increases infiltration control weed growth and increases crop productivity.

Crop Management Measures

Cover cropping

Method : Farmers are advised to cultivate cover crops like sunhemp, greengram, cucumber, ridgegourd during *kharif* season followed by cultivation of sorghum, sunflower and chickpea during *rabi* season in the medium to deep black soils.

Benefits : Reduces soil erosion, improves soil fertility, increase crop yields and net returns.

Strip Cropping

Method : Farmers are advised to raise erosion resistant crops i.e. Leguminous crops like cowpea, greengram, dolichas with erosion permitting crops like cotton, sorghum, bajra at 20:10 rows or 30:10 rows each in strips across the slope.



Benefits : The erosion resistance leguminous crop reduces soil erosion, conserves rainwater *in-situ*, improves soil fertility and crop productivity through nitrogen fixation.

Inter-cropping

Method : Inter-cropping of groundnut + pigeonpea (8:2, 11:1 & 15:1); groundnut + castor (8:1); finger millet + fieldbean (8:1); sorghum + pigeonpea (2:1) in red soils and bajra + pigeonpea (20:1); groundnut + castor (8:1) and *rabi* sorghum + chickpea (2:1) in black soils are the promising cropping systems.



Benefits : This cropping system protects against failure sole crops, reduces soil erosion, conserves rainwater *in-situ*, and fetch higher yields and returns.

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