

Soil health in rainfed regions:

Grass strips of soil conservation

Pushpanjali¹ and Josily Samuel²

ICAR- Central Research Institute for Dryland Agriculture, Hyderabad, Telangana 500 059

Principle constraint in the crop production in semi-arid region is erratic rainfall, high evaporation rate and limited water holding capacity of the soil. Soil loss through erosion leaves the soil degraded and infertile. In semi-arid regions, tropical grass may hold the key to a low cost, and practical solution for controlling soil erosion on a huge scale. In India it was found that the inter-cropping of grasses and dryland crops are sometimes not feasible in farmers micro-farming situation. Further, both sides (at the end of the slope and upside of the slope within a field) cropping of grass strips (may be 1 meter width strip) are cost-effective, durable and would find people's acceptance as they offer multiple benefits such as no mechanical hindrance in crop planning and management, and also provides fodder for small ruminants.

Key words: Crop production, Grass strip, Soil conservation, Soil health

SINCE time immemorial, major crops grown in the dryland tracts of India included cultivation of drought resistant crops, viz. millets for food and fodder. During good rainfall years, the hardships of farmers seem to have been mitigated, as surplus grain and fodder were available. But, as water is the most important single factor of crop production, the inadequacy (200-800 mm/year) and extreme uncertainty (CV: 60-70 %) of rainfall often caused partial or complete failure of crops leading to periodic food scarcities. These factors made the economic life of the dryland

cultivator extremely difficult and insecure. Long-term record of rainfall for 50-80 years showed below normal rainfall (50% of the normal). It was also realized that rainfall was not only scanty but, was erratic too. The dry spells extended from 3 to more than 8 weeks during the rainy seasons. It was thus felt that for good crop production, conservation of soil moisture and minimization of surface evaporation comprised the most suitable interventions. Low risk bearing capacity of the farmers and erratic rainfall distribution leads to high crop yield fluctuations. Sudden down pour of rain invites high soil

loss from the agricultural field leading to erosion of upper-most soil layer. The new improved technology of growing grasses towards the slope end of field boundary and at the uppermost field boundary may hold the key to a low cost, practical solution for controlling soil erosion on a huge scale in tropical and semi-arid regions. The choice of grass should be done in such a way that it must not spread or become a pest to crop; densely tufted perennial clumps are preferred. Planting of improved varieties of grasses on the field's edges will not only bind the soil but also provide a rich source of fodder



Grass strips in cropped field

for the livestock.

The main purpose of grasses at both the edges and crop system is to:

- reduce soil loss by causing deposition of eroded sediment on slopes and thus improve soil fertility and infiltration;
- provide fodder to small ruminants thus supporting farmer to full-fill cattle's green fodder demand; and
- check pest and disease spreading to others field and vice-versa.

Vegetated filter strips can be effective at checking nutrient removal and trapping sediment thus reducing soil loss from the field. Grasses such as vetiver (*Vetiver zizanioides*), switchgrass (*Panicum virgatum*), Congo signal (*Brachiaria ruziziensis*) and Stylo (*Stylosanthes scabra/hamata*) can reduce soil loss *vis-a-vis* meet the green fodder demand of small ruminants. Grass barriers reduce the water flow intensity within the cropped field thus enhance water and nutrient availability to crops. However, with rising overall agricultural production costs, it will be vital to implement best management practices to keep soils healthy, conserve agronomic inputs, minimize environmental impacts, and produce adequate yields. Nutrients removed by erosion create a limitation to land productivity. One



Worm cast in Grass strips

tonne of soil may contain a total of 4 kg of N, 1 kg of P, 20 kg of K and 2 kg of Ca and removal of few centimeters of soil as runoff may take off all the nutrient. It is being observed that grass system will improve soil health by its binding capacity and positive impact on soil chemical properties including organic matter, nitrogen, phosphorus, potassium, pH value, and cation exchange capacity. This change should be useful for the improvement

of other soil properties (soil physical and biological properties for example) related to soil erosion control, slope stabilization, and food production. Carbon stocks varied with production system and showed significant interaction with soil type. Growing grasses for 2 years increased SOC content of a degraded Alfisols. Improved earthworm activity in grass strips add up approximately 25-30% more moisture than the top 20 cm of soil in which the worm is living.

The use of grass strips on upside and downside along the slope in fields has a long term effect on productivity and sustainable agriculture. Usual practice of planting grass strip down the slope may restrict soil loss at the end of the field but strip cropping at both the sides of the field reduces the rainfall intensity at the upper part thus flow of water as runoff within the cropped field can be reduced, thereby improving the overall nutrient status (soil quality) and conserving soil moisture of the field. Thus this new concept of growing grasses on both side of the field (in a strip of one meter) improves soil health and significantly reduces runoff from cropped field.

Corresponding author's email: Pushpanjali@icar.gov.in.

