

## Influence of organic inputs on the yield and economics of *rabi* sorghum, soil moisture and microbial status of soil under rainfed agriculture

B.D. BHAKARE, S.R. SHELKE AND J.R. KADAM

### ABSTRACT

A field experiment was conducted continuously for twenty years during the *rabi* seasons of 1987-88 to 2006-07 at AICRP for Dryland Agriculture, Solapur to assess the effect of recycling of crop residues in the soil and its subsequent effect on performance of *rabi* sorghum. During twentieth year of cropping the data reveal that the significantly highest grain and stover yield were obtained in treatment 25 kg N ha<sup>-1</sup> through crop residue + 25 kg N ha<sup>-1</sup> through *Leucaena*. The higher CUM was observed in the treatment 25 kg N ha<sup>-1</sup> - crop residue +25 kg N ha<sup>-1</sup> -urea while MUE for grain and stover was higher in the treatment 25 kg N ha<sup>-1</sup> -CR +25 kg N ha<sup>-1</sup> -*Leucaena* loppings. The N uptake was higher in treatment 25 kg N ha<sup>-1</sup> -CR +25 kg N ha<sup>-1</sup> -*Leucaena* loppings. The organic carbon content of soil was highest in the treatment 25 kg N ha<sup>-1</sup> -*Leucaena* loppings +25 kg N ha<sup>-1</sup> -urea (0.73%). Among the treatments 25 kg N ha<sup>-1</sup> -CR +25 kg N ha<sup>-1</sup> -*Leucaena* loppings gave higher gross monetary returns (Rs. 22906 ha<sup>-1</sup>) as well as the net returns (Rs.11957 ha<sup>-1</sup>) and showed the best B:C ratio of 2.09. Effect of recycling of different organics on the biological properties of soil at different crop growth stages revealed that the count of bacteria, fungi, 'P' solubilizing fungi *Actinomycetes* and *Azotobacter* across different treatments except fertilizer alone was maximum at the time of flowering stage of *rabi* sorghum than the count taken at sowing, and it decreased at harvest stage of the crop. The addition of organic matter, supported the increase of the microbial count than fertilizer treatments. Among the organic matter, FYM, showed highest mean bacterial counts followed by crop residue + *Leucaena* loppings and FYM + Urea. The total fungal count was highest in FYM treatment followed by CR + Urea and *Leucaena* + Urea treatment. The P solubilizing fungi and *Azotobacter* count was maximum in CR + *Leucaena* treatment followed by *Leucaena* + Urea for P-solubilizing fungi and *Leucaena* alone for *Azotobacter*. The total microbial count was more when of FYM or crop residue were added and *Azotobacter* count was more, particularly under *Leucaena* application either alone or with crop residue/urea. The treatment with 25 kg N ha<sup>-1</sup> -CR +25 kg N ha<sup>-1</sup> -*Leucaena* loppings was superior with respect to grain and stover yield, moisture use efficiency, soil chemical and physical properties, total microbial count and gross monetary returns.

See end of the article for authors' affiliations  
.....

Correspondence to :  
**B.D. BHAKARE**  
All India Co-ordinated  
Research Project for Dryland  
Agriculture, Krishak Bhavan,  
SOLAPUR (M.S.) INDIA

Accepted : April, 2008  
.....

**Key words :** Recycling, *Leucaena*, Crop residue, Dryland, Nutrient management.

The use of organic manures and crop residue alongwith fertilizer is receiving attention in dryland agriculture partially substitute to inorganic fertilizers. The renewable source of energy through farm waste can profitably be utilized for soil improvement and crop production (Shinde *et al.*, 1984). The total nutrients recycled are much less than the amount removed from the soil by intensive cropping with high yielding varieties. High yielding varieties leave behind a large amount of drymatter for disposal. So there is a need to utilize these plant residue with complementary use of inorganic fertilizers to maintain a satisfactory level of soil fertility. The recycling of crop residue is therefore essential for supplementing plant nutrients and returning at least a part

of the nutrients drawn from the soil. Soils of drylands are deficient in nitrogen which necessitate application of N fertilizers to sustain acceptable and economic crop yields. It is, therefore imperative to take full advantage of on farm organic material to meet the nitrogen requirement of dryland crops. Under predominant *rabi* cropping tract, land is kept fallow during *kharif* season. This period could be utilized for *in situ* decomposition of crop residue in soil during *kharif* and to assess its subsequent effect on the yield of *rabi* sorghum the study was taken up.

### MATERIALS AND METHODS

A field experiment was conducted on black soils (Vertic Ustropept) at Dry Farming Research Station, Solapur for successive 20 years from 1987-88 to 2006-07 under rainfed condition. The experiment was laid out in randomized block design with 10 treatments and three