

The Role of Crop Residues to Meet the Fertilizer Shortage

By

V. S. SHANMUGASUNDARAM¹, N. ARUNACHALAM², C. RAMASWAMI³,
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ABSTRACT

Crop residues contribute considerably to the soil organic matter and other plant nutrients. An attempt was made to gather this information on various crop residues. It was observed that finger millet stubbles add more of N P K than rice, samai, maize, panivaragu gingelly, cowpea and lucerne. It is recommended that finger millet could be included in multiple cropping sequences for maintaining soil fertility.

INTRODUCTION

Information on the amount of organic residues left by a crop after harvest is important as crop residues contribute considerably to the soil organic matter and other plant nutrients. The nitrogen in organic matter is in the form of humus protein and is resistant to microbial attack. But it ensures a continuous supply of ammonia and nitrate during the growing season of a crop. The phosphorus compounds in humus are also available gradually by decomposition of humus. As sufficient data are not available, an attempt was made to gather this information by collecting and analysing the stubbles left over in various fields of Tamil Nadu Agricultural University farm at Coimbatore.

MATERIALS AND METHODS

In various fields of Tamil Nadu Agricultural University farm soon after the harvest of rice, sorghum, maize, finger millet, thenai, panivaragu,

kuthiraivali, gingelly, cowpea and lucerne stubbles in an unit area of one square meter were dug out and collected. The stubbles were washed well to remove the soil, dried in the sun and weighed on oven dry basis and analysed for total N P K and organic matter contents (Jackson, 1967).

RESULTS AND DISCUSSION

Finger millet crop residue added nearly 43 kg of total N/ha followed by 20.16 kg by samai, 17 kg by rice and 11 kg by thenai (Table 1). In the case of P, finger millet stubbles added 3.7 kg followed by rice (2.9 kg) sorghum (2.6 kg) and panivaragu (2.2 kg/ha). In case of K 25 kg/ha was added by rice stubbles, 20 kg by finger millet and 16 kg by panivaragu and samai. In general it is seen that finger millet stubbles added to the soil maximum N P K elements followed by rice and samai, than other crops. Maximum organic matter was added (1764 kg/ha) by rice stubbles followed by finger millet (899 kg/ha).

1. Assistant Professor, 2 and 3. Instructors, 4. Assistant soil Chemist, 5. Deputy Agricultural Officer (Chemistry), and 6. Professor and Head, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641003.

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TABLE 3. Yield of crops and proportion of crop residues to other parts as percentage

Crop	Grain yield (kg/ha)	Straw yield (kg/ha)	Total (kg/ha)	Stubble weight (kg/ha)	Total plant weight (kg/ha)	Stubble to straw	Stubble to aerial part	Stubble to whole plant
Rice	7286	8250	15536	4200	19736	51.20	27.03	21.28
Sorghum (Co. 19)	650	4500	5150	2889	8039	64.20	56.09	35.93
Maize	4250	10700	14950	667	15617	6.20	4.40	4.20
Finger millet	4800	14000	18800	3111	21911	22.22	16.54	14.19
Thenai	500	6000	6500	1200	7700	20.00	18.40	15.50
Panivaragu	500	5000	5500	1200	6700	24.00	21.80	17.90
Samai	500	6500	7000	3200	10200	49.20	45.70	31.30
Kuthiraivali	400	4200	4600	800	5400	19.04	17.39	14.81
Gingelly	500	—	500	778	1278	—	—	—
Cowpea	750	—	750	444	1194	—	—	—
Lucerne	—	30000	30000	333	30333	1.11	1.11	1.08

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Gingelly	500	—	500	778	1278	—	—	—
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Varadarajan and Samuel (1956) stated that rice crop residues added on an average 534 pounds of organic carbon and 9.7 pounds of nitrogen per acre. Assuming an average C:N ratio of 10:1, about 45 pounds of N will have to be supplemented according to their statement. This amount of N is necessary as the high amount of lignin contained in these crop residues that are transformed into humus, require greater quantity of N for conversion of dry matter into humus. If the requisite quantity of N is not available, there will be a partial N starvation owing to the activity of micro organism that will utilise the available nitrogen of the soil. Such a condition would lead to crop failure. Menon and Menon (1953) stated that the reduction in yield of cotton was caused by the poor nitrogen supply, as the available soil N was immobilised by the activity of micro organisms which acted upon the sorghum stubbles, left behind by the preceding crop.

Most of the crop residues left behind only small quantity of N/ha to the soil (Table 1). Hence, the addition of crop residues cannot become a substitute for fertiliser application but at best it can be considered as a supplement to the fertiliser application. In order to avoid crop failure, N can be supplied through nitrogenous fertiliser or supply of N can be effected by growing a leguminous green manure crop and incorporating it in places where water is available. Further, suitable crop rotation by including crops which add more of N P K elements through stubbles could be adopted for successful raising of crops with lesser fertiliser application.

Stubbles of finger millet contain more of N followed by thearai, kuthiravali, gingelly and cowpea, while P content is more in stubbles of lucerne followed by finger millet, gingelly, sorghum and K content is more in maize as well as in kuthiravali followed by rice, finger millet and cowpea (Table 2). In general, finger millet stubbles consist more of N, P and K contents than others.

Rice crop yielding about 7,286 kg of grain and 8,250 kg of straw per hectare will leave about 4,200 kg of residues in the form of stubbles. This works out to 51.2 per cent on the straw yield or 27.03 per cent to the total aerial portion, harvested as grain and straw. If computed on the whole plant, the quantity of roots and stubbles come to about 21.28 per cent or about 1/5th of the total weight of crop (Table 3). Varadarajan and Samuel (1956) also stated that the quantity of stubbles come to about 18.37 per cent when computed to the whole plant. However, the quantity of stubbles added per hectare is likely to vary according to the variety, seed rate, spacing, manuring and other agronomic practices like method of harvesting.

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