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EFFECT OF SUMMER CROPPING AND FALLOWING ON THE PRODUCTIVITY OF RICE LANDS

Summer fallowing in rice fields is the characteristic land use pattern in Kerala. Excess moisture in the period from June to November facilitates only wet crops of rice and the subsequent dry spell limits the possibilities for crop cultivation. Enforced fallowing from January to April is one of the reasons for low returns per unit area of land. Singh and Ashwathi (1978) have reported that fallowing decreases fertility of soils. Simultaneous measures for increasing the intensity of cropping and soil productivity alone can improve the returns from these infertile soils.

Fodder crops are ideal for cultivation in situations of probable water stress as at least some yield of fodder is ensured. Hence, six fodder legumes were raised in an experiment at the Agricultural Research Station, Mannuthy, Trichur to study their yield characteristics as well as their influence on soil properties, in relation to a control plot of fallow.

Sannhemp cv. Co-1. rice bean cv. Co-1, velvet bean cv. Co-1, cowpea cv. C-152 and black gram cv. Co-1, were the six fodder legumes grown in the summer rice fallows.

Table la. pH, bulk density and aggregate stability of soil as influenced by the preceding legume crops and fallows

Treatment	pH of soil		Bulk density of soil, g cm^{-3}		Water stable aggregates, %	
	Initial value	Crop effect	Initial value	Crop effect	Initial value	Crop effect
Sannhemp	5.55	4.32	1.49	1.37	57.56	62.44
Soybean	5.55	4.78	1.49	1.41	57.56	61.61
Rice bean	5.55	4.72	1.49	1.35	57.56	62.51
Velvet bean	5.55	4.38	1.49	1.40	57.56	63.77
Cowpea	5.55	4.65	1.49	1.36	57.56	63.85
Black gram	5.55	4.67	1.49	1.38	57.56	64.03
Fallow	5.55	4.58	1.49	1.38	57.56	63.04
Mean		5.37		1.54		56.99
CD (0.05)		0.69		0.18		5.85
SEm		0.23		0.06		1.95

An uncropped fallow, left uncultivated, was included as one of the treatments. A randomized block design replicated thrice, was adopted. The experimental area was lateritic loam in texture and acidic in pH. The fodder legumes were sown in the 4th week of January, and harvesting was done thrice, at 40 DAS, 60 DAS and 90 DAS. They were fertilized with 25 kg N and 60 kg P_2O_5 per hectare oae month after sowing.

Composite soil samples were taken at two depths (0-15 cm and 15-30 cm) from each plot prior to the sowing of fodder legumes as well as after the harvest of the crops. Physical constants of the soil as well as chemical characteristics were determined and the data are presented in Tables 1a and 1b.

Comparison of pre and post experiment data showed that fallowing reduced the organic C and pH of soil as well as the available P status at 15-30 cm depth. A comparison of soil properties between fallow and cropped areas showed that cropping led to significant improvement in all the attributes studied except soil reaction. Acidity of the soil increased due to cropping, probably due to the addition of residues by the crops and their oxidation. Corresponding increase was noticed in the organic C content of the soil. The improvement of available P due to crop cultivation has been marked both at 15 and 30 cm depth. Available K content of the soil increased due to fallowing, especially in the top soil. Soil in fallow plots is subject to higher rates of weathering due to higher soil temperature and higher content of available K appears to be due to the release of native potassium.

Fallowing in summer also led to a degradation of physical properties such as water stable aggregates and bulk density of soil, compared to cropped areas. The decline in bulk density is an index of increased pore space and improvement in air and water relations, permeability and soil aggregation. These improvements are the direct effect brought about by the crop and its residue on soil as reflected in organic C content.

Table 1b. Organic C, available P and available K in the top 0-15 cm and 15-30 cm of soil as influenced by the preceding legume crops and fallow

Treatment	Organic C, %				Available P, kg ha^{-1}				Available K, kg ha^{-1}			
	0-15 cm		0-30 cm		0-15 cm		0-30 cm		0-15 cm		0-30 cm	
	Initial value	Crop effect	Initial value	Crop effect	Initial value	Crop effect	Initial value	Crop effect	Initial value	Crop effect	Initial value	Crop effect
Sannhemp	0.55	1.05	0.66	0.69	24.64	54.50	32.86	46.66	168.00	177.34	149.34	149.34
Soybean	0.55	0.89	0.66	0.72	24.64	42.18	32.86	37.34	168.00	177.34	149.34	186.66
Rice bean	0.55	1.29	0.66	0.88	24.64	47.04	32.86	36.58	168.00	149.34	149.34	168.00
Velvet bean	0.55	1.14	0.66	0.78	24.64	50.78	32.86	36.96	168.00	177.34	149.34	196.00
Cowpea	0.55	1.38	0.66	0.80	24.64	54.14	32.86	46.30	168.00	121.34	149.34	158.66
Black gram	0.55	1.37	0.66	0.77	24.64	56.38	32.86	48.54	168.00	205.34	149.34	196.00
Fallow	0.55	1.19	0.66	0.77	24.64	50.84	32.86	42.06	168.00	168.01	149.34	175.78
Mean		0.48		0.42		25.02		25.02		186.66		168.00
CD (0.05)		0.34		0.34		14.65		14.65		74.50		74.50
S Em		0.12		0.12		5.04		5.04		25.69		25.69

The results also bring out the fact that fodder legumes vary among themselves in their influence on soil properties. Black gram brought about a significantly higher organic C and available K status in the surface soil. Changes in soil reaction due to the crops were marginal though the velvet bean cropped plot recorded the lowest pH value. Varying residual influence of crops on soil properties are related to their nutrient removal and residue addition patterns. However, in sequential cropping, these individual crop effects will not be of much relevance.

Thus, the results show that summer fallowing will lead to steady soil degradation through oxidative losses of organic C and adverse effects on soil physical properties.

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