Indian J. Agron. **41** (2) : 195–198 (June 1996)

Effect of tillage method on groundnut (*Arachis hypogaea*) yield in a rice (*Oryza sativa*)-based cropping system

G. PRATIBHA, V. SATYANARAYANA, M. M. HUSSAIN AND K. G. PILLAI

College of Agriculture, Andhra Pradesh Agricultural University, Hyderabad 500 030

Received: May 1993

ABSTRACT

A field experiment was conducted during 1989–91 to find out the effect of tillage practices on yield of groundnut (*Arachis hypogaea* L.) in a rice (*Oryza sativa* L.)-based cropping system on a sandy-loam soil. Stand establishment, growth and yield were improved with an increase in intensity of tillage practices. Seed bed prepared with tractor drawn M.B. plough once supplemented by rotovator resulted in 131 and 47.9% higher pod yields over zero tillage and conventional system (ploughing twice with country plough).

The yields of groundnut (*Arachis hypogaea* L.) following rice (*Oryza sativa* L.) in general are very low compared to their normal yield. There are many interrelated factors responsible for the so-called low yields of winter crops. The reduced turn around period leads to inadequate land preparation and suboptimal stand establishment of winter crops in fields preceded by rice under puddled conditions, so it is essential to provide soil physical conditions conducive to germination and field emergence. The kind and amount of tillage required to create suitable soil physical conditions for groundnut, particularly when grown in quick succession to puddled rice, remained one of the major constraints for this crop in realization of suitable stand establishment and yields. Hence an experiment was conducted to study the effect of tillage practices on stand establishment and yield of groundnut raised in a rice-based cropping system.

MATERIALS AND METHODS

A field experiment was conducted at Rajendranagar, Hyderabad, during summer season of 1989–90 and 1990–91. Six tillage treatments were laid out in randomized block design (RBD) with 4 replications. Data on plant population, growth characters and yield of each crop were analysed in RBD. The soil was sandy loam having sand 60%, silt 20% and clay 20%, with pH 7.72. It was medium in available phosphorus, low in nitrogen and rich in potassium content. 'TMV 2' groundnut as test variety was sown after rice at spacing of 30 cm x 10 cm and was fertilized with 20 kg N, 60 kg P_2O_5 and 50 kg K_2O/ha at the time of sowing as basal dose and remaining 20 kg N/ha was top-dressed. The soil samples were drawn before sowing, at different growth stages and after harvest of the crop for analysis.

Depth of ploughing with different tillage treatments were T_1, zero tillage (sowing by dibbling); T_2, ploughing (10 cm depth) twice with country plough + disc harrowing (bullock operated); T_3, ploughing (14 cm depth) twice with M. B. plough + disc harrowing (bullock operated); T_4, ploughing

Table 1. Soil structural indices and germination percentage as influenced by tillage treatments in groundnut

Treatment	Aggregate stability (%)			MWD			Initial plant stand			Final plant stand		
	1989–90	1990–91	Mean	1989–90	1990–91	Mean	1989–90	1990–91	Mean	1989–90	1990–91	Mean
T_1	42.42	44.42	43.42	30.3	32.3	31.3	42.06	48.0	45.03	49.00	51.3	50.15
T_2	45.50	47.50	46.50	29.1	31.1	30.1	51.83	57.1	52.25	52.66	60.0	56.30
T_3	55.50	57.60	56.55	28.2	29.2	28.7	60.33	65.6	62.96	62.30	68.0	65.15
T_4	61.5	63.50	62.5	26.7	26.8	26.7	67.66	72.0	69.83	68.3	74.0	71.00
T_5	47.75	49.75	48.75	28.7	31.1	29.9	55.60	60.6	58.10	57.3	66.2	61.75
T_6	57.75	59.5	58.62	25.0	25.2	25.1	76.0	87.3	81.65	73.0	79.0	76.00
CD (P = 0.05)	6.22	7.37		1.84	1.21		3.60	2.98		4.62	3.74	

Details of treatments are given in text

Table 2. Root dry matter (g/m^2) as influenced by tillage treatments at different growth stages in groundnut

Treatment	1989–90				1990–91			
	30 days*	60 days	90 days	Harvest	30 days*	60 days	90 days	Harvest
T_1	2.50	15.66	24.0	20.0	2.80	18.26	25.66	22.00
T_2	3.03	17.50	26.3	24.0	3.30	19.10	28.00	26.00
T_3	6.10	19.76	28.76	23.66	6.60	22.06	30.30	26.30
T_4	8.73	21.60	33.13	30.33	9.40	24.26	35.00	33.00
T_5	3.73	17.83	27.33	26.00	4.10	19.03	26.66	27.30
T_6	8.96	23.20	33.66	30.00	9.70	26.03	35.66	33.00
CD (P = 0.05)	0.272	3.73	4.13	5.40	1.34	4.50	5.60	5.25
CV	7.89	10.7	7.90	11.6	12.40	11.70	10.40	10.43

*Days after sowing

Details of treatments are given in text

(20 cm depth) once with M.B. plough + disc harrowing (tractor drawn); T_5, ploughing (8 cm depth) with cultivator twice (tractor drawn); and T_6, ploughing (20 cm depth) with M.B. plough once supplemented by rotovator twice (tractor operated)

RESULTS AND DISCUSSION

The tillage practices had marked influence on seedling emergence of groundnut. It was found maximum under seed-bed preparation performed by tractor M.B. ploughing once followed by rotovating twice and it was closely followed by the treatments T_4 and T_3. High percentage of small-sized clods and lower mean weight diameter of soil resulted from intensive tillage had provided fine tilth that reduced the impedence at the seed soil water contact, thereby increasing the moisture availability to seeds. Fine soil tilth with smaller clods might have also offered less resistance vis-a-vis seedling emergence and provided a chance for even the weaker seedlings to

Table 3. Yield components and yield as influenced by tillage treatments in groundnut

Treatment	Pods/ plant		Mature pods/ plant		Test weight (g)		Peg : pod ratio (%)		Pod yield (kg/ha)		Haulm yield (kg/ha)	
	1989–90	1990–91	1989–90	1990–91	1989–90	1990–91	1989–90	1990–91	1989–90	1990–91	1989–90	1990–91
T_1	10	11	5.0	8.0	35.6	36	60.6	62.66	1,180	1,260	184.0	1,999.0
T_2	11	12	7.0	9.0	38.9	39	64.6	66.60	1,840	2,005	3,045.8	3,181.2
T_3	14	14	9.0	10.0	36.8	37	68.6	69.0	1,986	2,340	3,381.5	3,984.2
T_4	20	21	10.0	11.0	36.0	37	74.3	76.0	2,250	2,640	3,878.9	4,129.2
T_5	12	13	8.0	9.0	35.6	36	67.0	68.0	1,680	1,814	2,780.9	3,224.8
T_6	18	19	11.0	12.0	38.6	39	77.6	79.3	2,750	2,940	3,908.3	4,310.0
CD (P = 0.05)	1.19	1.65	0.85	1.37	2.12	1.51	2.90	2.84	472.3	258.7	604.0	867.3
CV (%)	4.60	6.00	5.00	7.60	3.10	2.23	2.20	2.20	13.4	6.5	10.4	13.6

Details of treatments are given in text

emerge from the soil. Such an increased seedling emergence with decreased clod size and MWD was also reported by Khan and Datta (1983).

Root growth

Among the various tillage treatments, a fine tilth characterized by smaller clods and low MWD under T_6 tillage treatment caused lower soil-bulk density which in turn had favoured better growth, proliferation and ramification of the root-system, by reducing the mechanical impedence of the soil (Table 2). Similar observations were reported earlier by Sharma *et al.* (1988).

Yield components and yield

Loose and friable soil with low-bulk density facilitated easy peg penetration in treatment T_6 and also an increase in the quantum of nutrient absorption, due to better root development that reflected in better development and expression of yield components in T_6. The increase (%) in pod yield, when seed-bed was prepared with treactor drawn MB plough supplemented with rotovating twice, was 18.2 and 57.1 compared with the treatments T_4 and T_1, also reported by AICRP-SPCIP, (1987).

REFERENCES

AICRP-SPCIP, Hyderabad. 1987. *Annual Progress Report for 1986-87*, All-India Co-ordinated Research Project on Improvement of Soil Physical Conditions to increase Agricultural Production in Problem Areas. Hyderabad Centre, Hyderabad. pp.29–36.

Khan, A. R. and Datta, B. 1983. Effect of aggregate size on water uptake by pea nut seeds. *Soil Tillage Research* **3** : 171–184.

Sharma, P. K., De Datta, S. K. and Redulla, C. A. 1988. Response of maize and mung bean to tillage in relation to water depth in tropical low land rice. *Soil Tillage Research* **12** (1) : 65–79.