



## Production Potential and Economics of Groundnut (*Arachis hypogaea* L.) Based Intercropping Systems in Rainfed Alfisols of Southern Agro-climatic Zone of Andhra Pradesh

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### ABSTRACT

Field experiments were conducted for three years to study groundnut based intercropping in alfisols of southern agro-climatic zone. The study revealed that groundnut pod yield showed significant variation under different intercrops. Reduced population and competition from intercrops reduced groundnut pod yield, however, compensated through intercrop yield. Among different groundnut based cropping systems, groundnut and pigeonpea in 7: 1 gave higher pod equivalent, followed by 11: 1. Groundnut with sorghum and pearl millet in 6: 2 resulted in lower groundnut pod equivalent.

**Key words :** Castor, Groundnut, Intercrops, Pearl Millet, Pigeonpea, Sorghum

Intercropping has been recognized as a potentially beneficial system of crop production in the dryland environment. When crops of different growth habits are put together in an intercropping system, it provides greater opportunity for temporal and spatial crop intensification besides ensuring stability in yield (Rao and Willey, 1980). Groundnut, a popular rainfed crop in kharif season in the southern agroclimatic region of Andhra Pradesh, often results in unremunerative returns due to weather aberration. Selection of an appropriate intercrop enhances the productivity of system by virtue of best use of available resources. Therefore, the present investigation was undertaken to find out the most productive and remunerative intercrop with groundnut under rainfed conditions.

### MATERIAL AND METHODS

Field experiments were conducted during *kharif* season of 2002, 2003 and 2004 at Regional Agricultural Research Station Farm, Tirupati. The experimental fields were sandy loam, neutral in soil reaction (pH 7.0-7.3), low in organic carbon (0.38%) and available N (160 kg ha<sup>-1</sup>), medium in available of P<sub>2</sub>O<sub>5</sub> (24.7 kg ha<sup>-1</sup>) and K<sub>2</sub>O (190 kg ha<sup>-1</sup>). There were eight treatments comprising T1: Sole groundnut, T2: Groundnut + pigeonpea (7:1), T3: Groundnut + pearl millet (6:2), T4 : Groundnut + sorghum (6 : 2), T5: Groundnut + field bean (3:1). T6: Groundnut + castor (7:1), T7: Groundnut + field bean (7:1) and T8: Groundnut + pigeonpea (11:1). The experiment was laid out in randomized block design with three replications. The varieties were Narayani, Haritha, LRG - 41, ICTP - 8203, JKSH - 1

and local, for groundnut, castor, pigeonpea, pearl millet, sorghum and field bean, respectively.

Sole groundnut was sown at an inter- and intra-row spacing of 30 X 10 cm and the seed rate was regulated according to the proportion of area under each crop component in different cropping situations. Recommended dose of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O of 20, 40, and 50 kg ha<sup>-1</sup>, respectively were applied as basal to groundnut where as no supplementary fertilizers were given to intercrops. All the crops were sown together as per the treatments in kharif season of 2002, 2003 and 2004, respectively during 2nd fortnight of June. During the crop period (June - December) total rainfall received was 524.5 mm in 38 days during 2002, 872.1 mm in 39 days during 2003 and 616.4 mm in 41 rainy days during 2004. There was a dry spell of 29 days (from June 24 to July 22), 20 days (from August 8 to August 27) in 2002 and 17 days (from June 13 to June 29) and 28 days (from August 10 September 5) in 2004. For comparison between different intercropping systems, groundnut pod equivalent yield was worked out by converting the yield of intercrops to the yield of groundnut on the basis of prevailing market price of each crop. Data of three years were pooled and statistically analyzed.

### RESULTS AND DISCUSSION

#### Main crop yield

Groundnut pod yield has shown significant variation under different intercropping systems during the three years of experiment. Pooled data showed 12-27% of reduction in groundnut yield in intercropping systems (Table 1) depending on nature

Table 1. Yield of component crops as influenced by groundnut based cropping systems during *kharif* 2002, 2003, 2004 and pooled

Treatments	2002			2003			2004			Pooled		
	Ground-nut Yield (kg ha <sup>-1</sup> )	Intercrop Yield (kg ha <sup>-1</sup> )	Groundnut Pod Equivalents (kg ha <sup>-1</sup> )	Ground-nut Yield (kg ha <sup>-1</sup> )	Intercrop Yield (kg ha <sup>-1</sup> )	Groundnut Pod Equivalents (kg ha <sup>-1</sup> )	Ground-nut Yield (kg ha <sup>-1</sup> )	Intercrop Yield (kg ha <sup>-1</sup> )	Groundnut Pod Equivalents (kg ha <sup>-1</sup> )	Ground-nut Yield (kg ha <sup>-1</sup> )	Intercrop Yield (kg ha <sup>-1</sup> )	Groundnut Pod Equivalents (kg ha <sup>-1</sup> )
T1: Groundnut sole	926	-	926	1980	-	1980	1908	-	1908	1608	-	1605
T2: Groundnut + pigeon pea (7:1)	686	2337	3023	1756	1111	2645	1483	3078	4151	1308	2175	3273
T3: Groundnut + pearl millet (6:2)	632	2022	1440	1423	551	1607	1536	1466	2024	1197	1346	1690
T4: Groundnut + sorghum (6:2)	521	2326	1451	1486	435	1631	1506	1666	2029	1171	1476	1704
T5: Groundnut + field bean (3:1)	622	1653	1204	1643	1291	2173	1728	3086	2756	1331	2110	2144
T6: Groundnut + castor (7:1)	602	2522	3124	1774	868	2352	1175	3534	4238	1184	2308	3238
T7: Groundnut + field bean (7:1)	679	1833	1457	1611	747	1860	1157	5331	3534	1149	2637	2284
T8: Groundnut + pigeon pea (11:1)	733	1945	2678	1902	679	2445	1599	1756	3123	1411	1461	2749
SEM $\pm$			139			158			240			250
CD (P=0.05)			422			479			728			757

Table 2. Economics of groundnut based intercropping systems (pooled data of 2003, 2004 &amp; 2005)

Treatments	Groundnut pod equivalent Yield (kg ha <sup>-1</sup> )		Cost of cultivation (Rs. ha <sup>-1</sup> )	Gross returns (Rs. ha <sup>-1</sup> )	Net returns (Rs. ha <sup>-1</sup> )	B:C ratio
	Main crop	Inter crop				
T1: Groundnut sole	1605	-	11820	19260	7440	1.62
T2: Groundnut + pigeon pea (7:1)	1308	2175	14320	39276	24956	2.74
T3: Groundnut + pearl millet (6:2)	1197	1346	13820	20280	6460	1.47
T4: Groundnut + sorghum (6:2)	1171	1476	13820	20448	6628	1.48
T5: Groundnut + field bean (3:1)	1331	2110	15320	25728	10408	1.68
T6: Groundnut + castor (7:1)	1184	2308	14320	38856	24536	2.71
T7: Groundnut + field bean (7:1)	1149	2637	15320	27408	12088	1.79
T8: Groundnut + pigeon pea (11:1)	1411	1461	14320	32988	18668	2.30
SEM $\pm$						
CD (P=0.05)						

of competition from the component crop species. Due to competition from intercrops lower groundnut pod yields were registered in intercropping compared to crop yield in accordance with Jat and Ahlawat (2005).

#### **Groundnut pod equivalent yield**

Groundnut pod equivalent yield was significantly influenced by different cropping systems during the three years period. From the pooled data, it was observed that among different groundnut based intercropping systems, groundnut and pigeonpea with 7:1 row proportion proved to be more productive with significantly highest pod equivalent yield (3273 kg ha<sup>-1</sup>), which remained at par with groundnut and castor in 7:1 ratio (3238 kg ha<sup>-1</sup>) and groundnut and pigeonpea in 11:1 proportion (2749 kg ha<sup>-1</sup>) (Table 1). Effective utilization of resources and lesser competition between component crop species might have resulted in higher productivity per unit area. Similar results were also reported by Padmavathi and Raghavaiah (2004) and Vedprakash *et al.*, (2005). Groundnut with pearl millet or sorghum in 6:2 ration resulted in the lowest groundnut pod equivalent yield which might be owing to higher intensity of inter-specific competition between the component crops.

#### **Monetary returns**

Different groundnut based intercropping systems under different planting patterns enhanced the monetary returns over sole crop of groundnut. The highest net returns (Rs. 24,956) and B.C ratio (2.74) were obtained with groundnut and pigeonpea in 7:1 which was also closely comparable with

groundnut and castor in 7:1 followed by groundnut and pigeonpea in 11:1 proportion (Table 2). Fairly good yields of groundnut along with an extra yield of intercrops of pigeonpea and castor has given better returns and higher benefit cost ratio.

Hence, it was concluded that intercropping of groundnut either with pigeonpea or castor in 7:1 ratio is more compatible productive and economically sustainable intercropping system for rainfed situation in alfisols of southern agro-climatic zone of Andhra Pradesh.

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