

Impact of planting geometry on productivity and profitability of turmeric (*Curcuma longa*) and pigeonpea (*Cajanus cajan*) intercropping under rainfed condition

B Behera, S K Mohanty, A Mishra & DK Dash*

AICRP for Dryland Agriculture, Orissa University of Agriculture and Technology, Phulbani-762 001, Orissa, India

** AICRP for Spices, High Altitude Research Station, Pottangi, Koraput, Orissa*

Abstract

Six planting patterns of turmeric and pigeonpea intercropping compared with sole turmeric and sole pigeonpea at Phulbani, Orissa during 2005-06 and 2006-07 under organic environment. Turmeric cv. Lakadong (200 days) and pigeonpea cv. Asha (225 days) were selected for the experiment. Well-decomposed FYM @ 20t/ha was applied as the source of nutrient for the system. Over seasons, sole turmeric gave the maximum dry rhizome equivalent yield of 21.19 q/ha closely followed by turmeric and pigeonpea (10:2) planting in replacement series with dry rhizome equivalent yield of 19.91 q/ha. Sole turmeric gave the maximum gross return of Rs. 61,319/ha, but turmeric and pigeonpea (10:2) intercropping proved the most remunerative with net return of Rs. 17,884/ha due to lower cost of cultivation as compared to sole turmeric.

Key words: Organic turmeric, intercropping, planting geometry, productivity, profitability

Powder and dry rhizomes of organically grown turmeric are exported from Kandhamal district of Orissa to USA, UK, Japan, Denmark, Bangladesh, Egypt and Netherland. Tribal farmers grow turmeric as a sole crop or take pigeonpea, colocassia and cowpea with turmeric in mixed cropping systems (Behera *et al.* 2004). Turmeric + pigeonpea mixed cropping system gives several advantages viz. soil health build-up due to legume component, creation of favourable microclimate for turmeric due to partial shade from pigeonpea and satisfaction of domestic pulse need. The farmers grow the component crops neither in regular rows nor in proper row ratio. Yield of component crops decreases due to mutual competition. Hence the experiment has been designed to find out

suitable row ratio and planting pattern for turmeric + pigeonpea intercropping system

The 6 planting patterns of turmeric + pigeonpea intercropping compared with sole turmeric and sole pigeonpea were tried in randomized block design with three replications during 2005-06 and 2006-07 at Research farm of AICRPDA, OUAT, Phulbani. The climate was tropical hot sub humid with annual precipitation of 1396 mm. The soil was well drained alfisol with sandy loam texture, spheroidal crumb structure, FC 13.1%, PWP 5.5%, EC 0.02 d S/m and pH 5.5. Turmeric cv. Lakdong (200 d) and pigeonpea cv. Asha (225 d) were selected as the test crop. Sole turmeric and turmeric + pigeonpea intercropping systems were grown in raised beds of length 7.2 m, width 1.0 m and height of 15 cm. The

crops were grown organically. Sole turmeric and sole pigeonpea were planted with spacing of 30cm x 20cm and 60cm x 30 cm, respectively. In intercropping systems with replacement series, turmeric and pigeonpea were planted in 30 cm apart furrows in row ratios as per treatment specifications. In additive series, additional furrows were made for pigeonpea between rows of turmeric. Mother/primary rhizomes of turmeric weighing 20-25 g were used as the planting material. In case of sole pigeonpea, 15 kg seed/ha was used. Well decomposed FYM @ 20 t/ha was applied during final land preparation and planting

in sole turmeric and turmeric + pigeonpea intercropping systems. Sal leaf mulch @ 15, 5 and 5 t/ha was used at planting, 45 and 90 days after planting, respectively.

Weather

The crops were planted on 30 and 3 June during 2005 and 2006, respectively. During 2005, planting was delayed due to inadequate pre-monsoon rainfall and delayed onset of monsoon in 22 June. Land preparation and planting was possible only after receipt of monsoon rain. Pigeonpea was harvested on 12 February 2006 and 12 January 2007 during

Table 1. Yield of crops in turmeric + pigeonpea intercropping as influenced by planting geometry during 2005-06 and 2006-07

Treatments	Dry rhizome(q/ha)			Grain yield of pigeon pea (q/ha)			Turmeric dry rhizome equivalent yield (q/ha)		
	2005-06	2006-07	Mean	2005-06	2006-07	Mean	2005-06	2006-07	Mean
T ₁ - Sole turmeric	22.36	22.06	22.21	-	-	-	22.36	20.01	21.19
T ₂ - Sole pigeon pea	-	-	-	14.42	13.71	14.07	10.09	9.14	9.62
T ₃ - One row of pigeon pea after three rows of turmeric (Additive) 3:1	7.19	10.00	8.60	11.39	10.86	11.13	15.27	17.24	16.26
T ₄ - One row of pigeon pea after five rows of turmeric (Additive) 5:1	9.42	14.24	11.83	7.65	6.94	7.30	15.08	18.67	16.88
T ₅ - One row of pigeon pea after three rows of turmeric (Replacement) 3:1	8.40	12.89	10.65	9.08	8.54	8.81	14.74	18.58	16.66
T ₆ - One row of pigeon pea after five rows of turmeric (Replacement) 5:1	11.29	13.35	12.32	6.59	5.34	5.97	15.89	16.91	16.40
T ₇ - Two rows of pigeon pea after six rows of turmeric (Replacement) 6:2	9.36	11.68	10.52	9.26	7.30	8.28	15.86	16.55	16.21
T ₈ - Two rows of pigeon pea after ten rows of turmeric (Replacement) 10:2	15.31	18.30	16.81	4.27	4.81	4.54	18.30	21.51	19.91
SEM±	1.28	1.50	-	1.03	1.16	-	1.48	1.51	-
CD(0.05)	3.95	4.64	-	3.17	3.58	-	4.53	4.64	-

Price: Turmeric dry rhizome- Rs. 2800 (2005-06), Rs. 3000/q (2006-07)

Pigeon pea grain- Rs. 1960 (2005-06), Rs. 2000 (2006-07)

respective seasons. Turmeric digging was delayed in both seasons due to absence of rainfall at maturity stage of the crop. The crop was harvested on 19 April 2006 and 14 May 2007 in respective seasons. Both the component crops received rainfall of 1468 mm during the 1st season. Turmeric and pigeonpea received rainfall of 1997 mm and 1889 mm, respectively during the second year. Pre-mature senescence of turmeric occurred due to complete absence of rainfall during November, December and January in both the years leading to inadequate development of rhizomes and poor yield.

Yield of turmeric

Sole turmeric gave maximum dry rhizome yield during both the years with mean of 22.21q/ha (Table 1). All turmeric + pigeonpea intercropping systems recorded significantly less dry rhizome yield during 2005-06, but during the second year, sole turmeric and turmeric + pigeonpea (10:2) intercropping were at par for dry rhizome yield, while all other intercropping systems gave significantly less dry rhizome yield than sole turmeric. Avilkumar and Reddy (2000) reported similar decrease in rhizome yield of turmeric due to maize intercrop. The planting geometry 3:1 and 6:2 caused greater reduction in turmeric yield as compared to 5:1 and 10:2, respectively. Row ratios in additive series caused greater reduction in yield than the

corresponding row ratios in replacement series.

Yield of Pigeonpea

Sole pigeonpea gave the maximum grain yield during both the years with mean of 14.07 q/ha. Among intercropping systems, turmeric + pigeonpea (3:1) in additive series recorded the maximum grain yield of pigeonpea and remained statistically at par with sole pigeonpea. Turmeric + Pigeonpea (10:2) intercropping in replacement series gave the minimum seed yield of pigeonpea.

System performance

Sole turmeric gave the maximum turmeric dry rhizome equivalent yield during both the years with mean of 21.19 q/ha. Turmeric + Pigeonpea (10:2) during 2005-06 and all intercropping systems during 2006-07 were at par with sole turmeric for turmeric dry rhizome equivalent yield. Sole pigeonpea gave the minimum turmeric dry rhizome equivalent yield during both the years.

Economics

Sole turmeric under organic environment gave the maximum gross return during both the years with mean of Rs. 61,319/ha, but turmeric + pigeonpea (10:2) in replacement series gave the maximum net return of Rs. 17,884/ha due to lower cost of cultivation as compared to sole turmeric (Table 2).

It is concluded that Turmeric + pigeonpea

Table 2. Effect of treatments on economics of turmeric + pigeon pea during 2005-06 and 2006-07

Treatments	Gross return (Rs/ha)			Cost of cultivation (Rs/ha)			Net return (Rs/ha)		
	2005-06	2006-07	Mean	2005-06	2006-07	Mean	2005-06	2006-07	Mean
T1	62,608	60,030	61,319	44,470	44,650	44,650	18,138	15,380	16,759
T2	28,252	27,420	27,836	10,532	14,441	12,487	17,720	12,979	15,350
T3	42,756	51,720	47,238	45,820	46,324	46,072	3,388	5,396	4,392
T4	42,224	56,600	49,412	45,280	45,699	45,490	3,295	10,901	7,098
T5	41,272	55,750	48,511	40,357	37,900	39,129	3,552	17,850	10,701
T6	44,492	50,730	47,611	41,459	40,086	40,773	4,586	10,644	7,615
T7	44,408	49,640	47,024	40,357	37,900	39,129	6,688	11,740	9,214
T8	51,240	64,520	57,880	41,459	40,086	40,773	11,334	24,434	17,884

Price: Turmeric dry rhizome Rs. 2800/q (2005-06), Rs. 3000/q (2006-07)

Pigeonpea (grain) Rs. 1960/q (2005-06), Rs. 2000/q (2006-07)

(10:2) intercropping in replacement series may be advocated for maximizing productivity and profitability under organic environment of hilly and tribal dominated districts in Eastern Ghats, Orissa.

References

Behera B, Mohanty S K & Rao J V 2004 Spread,

adaptability, merits and demerits of traditional mixed/intercropping systems prevalent in tribal belt of Orissa. e-plant et. 2(2): 109-112

Avilkumar K & Reddy M D 2000 Integrated weed management in maize+ turmeric intercropping system. Indian Journal of Weed Science. 32 (1&2): 59-62.