

## Cotton-based cropping system for Coimbatore Region

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An experiment was conducted for a period of two years from 1977 to 1979 to study the performance of different cropping systems under gardenland conditions with varying levels of soil fertility. Four cropping systems were raised under three levels of fertility and economics worked out. The results indicated that sorghum + greengram – cotton + onion – radish – blackgram gave the highest net income of Rs. 13,100/ha/year followed by ragi – cotton + onion – sorghum + lablab systems (Rs. 6860/ha/year). Wherever facilities for marketing the vegetable exists, the former can be recommended and in other places the latter can be recommended. There was no difference in yield of crops due to fertility levels indicating that by including legumes in the cropping system and with proper residue management, it is possible to save about 25 % of NPK recommended to the crops included in the systems.

With expanding population and increasing pressure on land, possibility of extensive agriculture is limited. The available land has to be more intensively utilised for increasing the agricultural production. Our country is blessed with moderate temperature and adequate solar radiation throughout the year making it possible to raise two or more crops in a year in the same piece of land, provided water is available for irrigation. Work has been going on in several parts of India to develop multiple, relay and intercropping systems suitable for the given agroclimatic and soil conditions of the region. Cotton is the most important commercial crop grown in the gardenlands of Coimbatore region in the winter season. Hence any cropping system developed for Coimbatore region should have cotton as the main crop. Earlier work done at Coimbatore has indicated that cotton – sorghum – ragi is the most profitable and viable cropping

system for the gardenlands of Coimbatore region (Palaniappan *et al.*, 1978) and Venugopal, (1979). This study was initiated to find out whether further intensification of the cropping system is possible so that the farmer's income could be increased.

### MATERIALS AND METHODS

The experiment was conducted for a period of two years from August, 1977 to August, 1979 under gardenland conditions in a black clay loam soil at the Agricultural College and Research Institute, Coimbatore. Initial soil analysis indicated that the soil was low in available N (102 kg/ha), medium in available  $P_2O_5$  (12.2 kg/ha) and high in available  $K_2O$  (860 kg/ha) with a pH of 7.8. The experiment was laid out in split plot design with three replications. The gross plot size was 5 × 4 m. Four cropping systems were included in the main plots and three fertility levels in

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sub-plots. The treatment details are given below:

1. Main plots-Cropping systems:

Cropping system	Crop	Variety	Season
	Ragi	CO 10	June—August
	Maize (Fodder) +	Local	Aug.—Oct.
	Cowpea (Fodder)	CO 1	
	Wheat +	HD 2189	Nov.—Jan.
	Mustard	Local	*
	Greengram	CO 2	Feb.—April
	Radish (Relay)	White	April—June
	Bhendi	CO 1	April—June
	Sunflower (Relay)	EC 101495	June—Aug.
	Blackgram (Relay)	CO 2	Aug.—Oct.
	Wheat +	HD 2189	Nov.—Jan.
	Mustard	Local	
	Sorghum (Fodder) +	Local	Feb.—March
	Cowpea (Fodder)	CO 1	
	Sorghum +	CO 22	May—Aug.
	Greengram	CO 2	
	Cotton +	MCU 9	Aug.—Feb.
	onion	CO 2	
	Radish	White	Feb.—March
	Blackgram	CO 2	March—May
	Ragi	CO 10	June—Aug.
	Cotton +	MCU 9	Aug.—Feb.
	Onion	CO 2	Aug.—Oct.
	Sorghum +	CO 22	Feb.—May
	Lab-lab	CO 9	Feb.—May

2. Sub-Plots—Fertility levels

F<sub>1</sub> — Recommended level of NPK to each crop in the system

F<sub>2</sub> — 25% less than the recommended level of NPK to each

crop in the system

F<sub>3</sub> — 25% more than the recommended level of NPK to each crop in the system.

The recommended level of NPK to the crops included in the study is shown below:

Crop	N	P <sub>2</sub> O <sub>5</sub> (Kg/ha)	K <sub>2</sub> O
Cotton	60	30	30
Sorghum	90	45	45
Ragi	90	45	45
Wheat	100	50	50
Greengram	10	25	0
Blackgram	10	25	0
Sunflower	40	60	40
Bhendi	90	60	30
Radish	40	20	20
Fodder maize	60	0	0
Fodder sorghum	45	0	0

Irrigation and plant protection were given as per the requirement. Care was taken to incorporate the residues of the previous crop before planting the subsequent crop. Minimum tillage practices were adopted so that the gap between two successive crop was minimum. In case of relay planting, the subsequent crop was sown in between rows of the existing crop, 15 to 20 days before harvest. Yields of crops were assessed from the net plot area, leaving border rows. Economics was worked out by taking into account the current market prices of the produce and cost of cultivation incurred for raising the crops. Net return per rupee invested was worked out by dividing the gross returns by the cost of cultivations.

## RESULTS AND DISCUSSION

Data on yield and economics of the different cropping systems tested are presented in Table I. System II had a field duration of 395 days and hence this system could not be completed in a year. As a result, raising the crops in the second year got delayed, affecting the performance of the crops. Also the net returns obtained and return per rupee invested were very low. Hence this system can not be adopted. System III gave the highest net income (Rs. 13,100 / ha / year) and net return per rupee invested (Rs. 3.23). This system provides fodder, grain, vegetables, pulses and a cash crop. Hence this system could be adopted. However, it may be seen from the table that the total field duration of the system is 365 days. Unless all the operations are carried out in time, it may not be possible to complete the system within a year. Another prerequisite for the adoption of this system is the marketability of vegetables, particularly radish. About 15 tonnes of radish tubers were produced per ha and unless there is a ready market nearby, the vegetable can not be sold at profitable prices. Hence this system can be recommended only for places nearby towns where the vegetable can be easily marketed. The next best system in terms of net return and return per rupee invested was system IV involving ragi, Cotton + onion and sorghum + lab-lab. The total field duration of the system is only 340 days and the farmer could easily adjust the field operations with in

a year. This system provides grain, fodder, vegetable and a cash crop and so can be easily adopted by the farmers.

With regard to fertility treatments there was no significant yield difference among the treatments. In all the systems legumes were included and they would have fixed atmospheric N in their nodules and would have contributed part of it to the associated crops. The soil was medium in P and high in K. Besides the residues of all the crops were incorporated in the soil and this would have contributed considerable amount of nutrients to the crops. Hence there was no response to higher level of fertilization. From this it can be inferred that by including legumes in the cropping system and by proper residue management, it is possible to save about 25% of recommended level of fertilizer NPK to the cropping system.

In conclusion, it may be stated that sorghum + greengram - cotton + onion - radish - blackgram system would give higher profits if there are marketing facilities for the vegetable. If marketing facilities for the vegetable are lacking, ragi - cotton + onion - sorghum + lab-lab system can be adopted. By including legumes in the cropping system and proper residue management about 25% of fertilizer NPK recommended to the crops included in the system can be saved.

#### REFERENCES

- PALANIAPPAN, SP., D. R. THIRUNAVUKKARASU and E. SUBBIAH. 1978. Studies on multiple cropping system in gardenland. *Madras agric J.* 65: 287-89.
- VENUGOPAL, K. 1979. Studies on multiple cropping with cotton based cropping systems. Ph. D. THESIS, Tamil Nadu Agric. Univ., Coimbatore (Unpub.)

TABLE I. Yield and Economics of cropping systems (Average of two years)

Cropping system No.	Crops	Variety	Field duration (days)	Yield of economic produce (kg/ha)	Net return (Rs/ha)	Return per rupee invested (Rs.)
I	Ragi	CO 10	75	2270	320	
	Maiza (Fodder) + Cowpea (Fodder)	Local	85	12750+6700	1225	
	Wheat + Mustard	HD. 2189+ Local	95	1415+195	445	
	Greengram	CO 2	65	605	210	
	Radish (Relay)	White	45	12800	3795	1.78
				365	5995	
II	Bhendi	CO 1	80	3220	110	
	Sunflower (Relay)	EC. 101495	85	1705	525	
	Blackgram (Relay)	CO 2	65	550	210	
	Wheat + Mustard	HD. 2189+ Local	95	1250+205	315	
	Sorghum (Fodder) + Cowpea (Fodder)	Local	70	12900+6900	1600	1.57
				395	2760	
III	Sorghum + Greengram	CO 22+ CO 2	90	3885+450	2425	
	Cotton + Onion	MCU 9+ CO 2	165	1120+2265	4865	
	Radish	White	45	15050	5550	
	Blackgram	CO 2	65	580	260	3.23
				365	13100	
IV	Ragi	CO 10	75	2050	290	
	Cotton + Onion	MCU 9+ CO 2	165	1135+2175	4850	
	Sorghum + Lab-lab	CO 22+ CO 9	100	3090+1720	1720	2.03
				340	6860	