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PRODUCTION POTENTIAL AND ECONOMICS OF CEREAL BASED CROPPING SYSTEM IN RED LATERITIC SOILS OF PUDUKKOTTAI DISTRICT

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ABSTRACT

Field experiments were conducted in 1986 and 1987 *kharif* seasons to assess the production potential and economics of maize and *varagu* based intercropping system under rainfed conditions in red lateritic soils of Pudukkottai district of Tamil Nadu. Among different intercrops tested, black gram is the best intercrop for maize based intercropping system and *varagu* based intercropping system. Further analysis showed that yield equivalent, land use efficiency and net profit were significantly increased by grain legumes intercrop and more than compensated the losses in main crops (maize and *varagu*). Maize and *varagu* normal sowing + one row of black gram (1:1) proved to be the best combination by recording maximum grain yield equivalent, LER and net profit.

KEY WORDS : Maize, *Varagu*, Intercropping, Production Potential, Economics

Cultivation of intercrops is a part of intensive agriculture to obtain possible means of better income under rainfed condition. Earlier experimental evidences go to show that intercropping increased maize yields upto 103 per cent, 16 to 82 per cent and 68 per cent with cowpea, mungbean and urdbean respectively (Gunasena *et al.*, 1979). Growing of green gram, black gram and cowpea has stimulating effect on maize growth and the dry matter accumulation in

War and Kalra, 1981). On the other hand Searle *et al.* (1981) reported that maize had depressive effect on the dry matter yield of its intercrop. Enyi (1973) observed that grain and straw yields were reduced in maize when intercropped with cowpea, peas and pigeonpea. Mishra *et al.* (1994) observed that maize + pigeonpea at 1:1 ratio produced highest net return and LER. The present study was undertaken to assess the best legume intercrop for *varagu* and maize for augmenting the income of farmers.

MATERIALS AND METHODS

Field trials were conducted during *kharif* season of 1986 and 1987 at the National Pulses Research Centre, Vamban (Tamil Nadu). The soil of the experimental plots was alfisol with a pH of 5.4, low in available N, P and K content, rich in iron and alumina. The experiments was laid out in split plot design in which maize and *varagu* were the main plot treatments and intercrops as sub-plot treatments.

In the maize based intercropping system experiment, the main plot treatment comprised of normal (60 x 20 cm) (P1) and paired row (45/60 x 20 cm) system (P2). The intercrops *viz.*, red gram (Co-5), black gram (Vamban-1), green gram (Vamban-1) and cowpea (NPRC-2) were the sub-plot treatments. The treatments were replicated four times. A plant population of 83,333 plant/ha of the main crop was maintained in both sowing methods. Fertilizers *viz.*, 125 kg N/ha, 62.5 kg P 205/ha and 50 kg/ha K20 were applied just before sowing. The main and intercrops were sown during the second half of July. Protective irrigations were given to maize at the time of germination and tassling stages since the receipt of rainfall failed.

Varagu based intercropping system was laid out in split plot design with four replications. *Varagu* was sown in normal (45 x 15) and paired

row (30/45 x 15 cm) system. The intercrops were red gram (Co-5), black gram (Vamban-1), greengram (VBN 1) and cowpea (NPRC-2). Main crop population was maintained with 1,48,148 plants/ha in both sowing systems. Both main crop as well as intercrops were sown during the second half of July. The intercrops were harvested between 75 to 85 days after sowing and the main crop was harvested during the second week of November. The rainfall received during the cropping season was 311.4 mm in 15 rainy days and 494.5 mm with in 23 rainy days for 1986 and 1987 respectively.

RESULTS AND DISCUSSION

Maize based intercropping system

The grain yield of maize, intercrops, grain yield interm of maize (grain yield equivalent), net profit and land equivalent ratio under various intercropping combinations are furnished in table 1. The grain yield of main crop maize did not differ significantly between systems of sowing in both years. Among four intercrops studied, red gram was highly suppressed by the proliferous growth of maize. The crop did not flower and set seed even after the harvest of maize crop. It is, therefore, evident that red gram is highly susceptible to shading. Among the other three grain legumes, cowpea recorded maximum grain yield under systems of sowing in both years. With respect to

Table 1. Performance of maize based cropping system in alfisol

Treatments	Grain yield kg/ha				Grain Equivalent kg/ha			Net Profit Rs.			Land Equivalent ratio		
	Maize		Intercrops		1986	1987	Mean	1986	1987	Mean	1986	1987	Mean
	1986	1987	1986	1987									
Maize Sole Normal planting	2337	2094	-	-	2337	2094	2216	2563	2003	2283	1.00	1.00	1.00
Maize/Pigeonpea (1:1)	2365	2099	0.0	0.0	2365	2099	2332	2619	2013	2316	1.02	1.00	1.01
Maize/Black gram (1:1)	2350	2048	275	217	3030	2591	2811	3949	2997	3473	1.36	1.53	1.05
Maize/Green gram (1:1)	2350	2047	106	115	2615	2335	2475	3119	2485	2802	1.19	1.40	1.30
Maize/Cowpea (1:1)	2294	2022	409	291	2908	2459	2684	3705	2733	3218	1.36	1.44	1.40
Maized paired row Planting	2182	2122	-	-	2182	2122	2152	2253	2059	2156	1.00	1.00	1.00
Maize/Pigeonpea (2:1)	2512	2188	0.0	-	2512	2188	2350	2913	2191	2552	1.09	1.03	1.06
Maize/Black gram (2:2)	2269	2050	122	202	2574	2555	2665	3037	2925	2981	1.14	1.48	1.31
Maize/Green gram (2:2)	2424	2125	48	155	2544	2513	2391	2977	2841	2910	1.13	1.58	1.33
Maize/Cowpea (2:2)	2511	2115	340	300	3021	2565	2793	3931	2945	3438	1.39	1.53	1.46
SE +					98.5	66.0		184.7	135.5				
CD (P=0.05)					311.2	208.6		583.6	428.0				

Prevailing prices (Rs./q) : Maize - 200, Black gram - 500, Green gram - 500, Cowpea - 300

Table 2. Performance of *varagu* based intercropping system in alfisol

Treatments	Grain yield kg/ha				Grain Equivalent kg/ha			Net Profit Rs.			Land Equivalent ratio		
	Varagu		Intercrops		1986	1987	Mean	1986	1987	Mean	1986	1987	Mean
	1986	1987	1986	1987									
<i>Varagu</i> Sole Normal planting	1836	1717	-	-	1836	1717	1777	1114	987	1051	1.00	1.00	1.00
<i>Varagu</i> /Pigeonpea (1:1)	1659	1475	0.00	0.00	1659	1475	1567	879	624	751	0.88	0.90	0.89
<i>Varagu</i> /Black gram (1:1)	1633	1510	242	302	2440	2517	2479	2050	2187	2119	1.13	1.49	1.31
<i>Varagu</i> /Green gram (1:1)	1757	1480	212	237	2464	2270	2367	2086	1816	1951	1.30	1.46	1.38
<i>Varagu</i> /Cowpea (1:1)	1333	1293	615	365	2563	2023	2293	2235	1446	1841	1.14	1.37	1.26
<i>Varagu</i> paired row Planting	1982	1984	-	-	1982	1984	1983	1363	1387	1375	1.00	1.00	1.00
<i>Varagu</i> /Pigeonpea (2:1)	1716	1532	0.00	0.00	1716	1532	1624	964	709	837	0.91	0.80	0.86
<i>Varagu</i> /Black gram (2:1)	1795	1557	189	262	2425	2430	2428	2028	2056	2042	1.15	1.32	1.24
<i>Varagu</i> /Green gram (2:1)	1879	1620	157	188	2402	2247	2334	1994	1782	1888	1.27	1.30	1.29
<i>Varagu</i> /Cowpea (2:1)	1453	1570	490	328	2433	2226	2330	2040	1750	1895	1.11	1.34	1.23
SE m +					111.6	120.7		167.8	183.8				
CD (P=0.05)					352.6	381.5		530.2	580.9				

Prevailing prices (Rs./q) : *Varagu* - 200, Black gram - 500, Green gram - 500, Cowpea - 300

grain yield equivalent (GYE), among the four intercrop combinations, was maximum in maize + black gram (1:1) normal sowing during 1986 and 1987 with 3030 kg/ha and 2591 kg/ha respectively. The next best intercrop combinations was maize + cowpea (1:1) normal sowing and paired row (2:2) wherein the GYE was 2684 kg/ha and 2793 kg/ha respectively (Table 1).

The effective land use efficiency as reflected by the land equivalent ratio increased considerably with intercropping systems. The range of increase was 30 to 46 per cent. The maximum land equivalent ratio (1.46) was recorded in maize + cowpea (2:2) paired row system followed by maize + black gram (1:1) normal sowing (1.45). The net returns of the above intercropping systems were Rs.3438 /ha and Rs.3473 /ha. The profits derived by these systems were maximum and significantly superior to either sole cropping of maize or other intercrop combinations.

Varagu based intercropping system

In *varagu* based intercropping system, with respect to main crop (*varagu*), the difference in grain yield was noticed, between normal and paired row systems of sowing. The difference was significant during 1987. Out of the four intercrops tried, red gram (Co 5) failed to produce any yield, due to severe competition. Of the remaining three, cowpea performed better and recorded the

maximum grain yield of 535 and 347 kg/ha during 1986 and 1987 respectively.

The GYE of *varagu* land equivalent ratio and net profit are given in table 2. *Varagu* grain yield equivalent revealed significant differences between various intercrop situations. Intercropping *varagu* with pigeonpea under normal (1:1) or paired row (2:2) systems reduced *varagu* yield considerably and yet the intercrop pigeonpea failed to produce any grain yield because of competition and resulting in very low returns (Rs.751 and Rs.837 /ha) respectively in 1986 and 1987.

varagu + black gram, *varagu* + green gram and *varagu* + cowpea both under normal and paired row sowing recorded significantly more GYE and net profits than either sole *varagu* or *varagu* + pigeonpea system. Maximum GYE of 2479 kg/ha under normal sowing and 2428 kg/ha under paired row were recorded by *varagu* + cowpea intercropping systems (Table 2). The land use efficiency under intercropping system ranged from 23 to 38 per cent. Maximum land equivalent ratio of 1.38 was recorded in *varagu* + green gram (1:1) followed by 1.31 in *varagu* + black gram (1:1).

Thus, it could be concluded that among the two intercropping systems studied, maize based cropping system will fetch higher net profit and remunerative to the farmers of Pudukkottai district. The best intercrop for maize is black gram

(Vamban-1) and cowpea (NPRC-2) and for *varagu* (Co-3) it is cowpea (NPRC 2).

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SEED DEVELOPMENT AND MATURATION IN FENUGREEK

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ABSTRACT

Seed maturation studies in fenugreek cv. Co 1 indicated that the seeds attained harvestable maturity 45 days after anthesis as evident from maximum germination and vigour. The seed moisture content at this stage was around 20 per cent. The seeds attained physiological maturity 40 days after anthesis as indicated by maximum dry weight of seed.

KEY WORDS : Fenugreek, Seed, Development, Maturity

Physiological maturity is the developmental stage at which seeds achieve maximum vigour and viability, since nutrients are no longer entering the seed from the plant and there after seed senescence begins (Harrington, 1972). Prolonged field exposure beyond physiological maturity may lead to reduction in viability and vigour. Physiological changes might set in, if the seeds are retained on the mother plant for longer duration after physiological maturity which would lead to the development of hard seeds or off colour seeds in pulse crops (Dharmalingam and Ramakrishnan, 1978). A study was conducted in fenugreek to trace the seed maturation with a view to determine the optimum stage of harvesting.

MATERIALS AND METHODS

The experiment was conducted at the Department of Seed Technology, Tamil Nadu Agricultural University, Coimbatore using fenugreek cv. Co 1 under irrigated conditions adopting the recommended package of practices. At the time of anthesis, flowers were tagged and the pods collected at five days interval up to 50 days.

breadth, volume and moisture content of pod; those of seeds excepting length and breadth, percentage germination, root and shoot length, dry matter production of seedlings and vigour index were assessed from four replicates of 25 pods (and the seeds from them) taken at random. The volume was measured by water displacement method. The moisture content and percentage germination (based on normal seedlings) in between paper medium, were assessed (ISTA, 1985). The root and shoot lengths were measured in ten randomly selected seedlings. The seedlings were dried in a hot air oven maintained at 85°C for 24 h, cooled in a desiccator for 3 days for drymatter estimation and expressed as mg per seedling. The vigour index was calculated by multiplying the percentage germination with the total length of seedling (Abdul Baki and Anderson, 1973).

RESULTS AND DISCUSSION

A rapid increase in the physical characters of pods and seeds like length, breadth, fresh and dry weight and volume was observed from 10th day and reached a maximum on 30th day (Table 1). The
was 66.8 per cent for