

## CONTRIBUTION OF PRODUCTION FACTORS TO YIELD AND INCOME OF RAINFED CASTOR

G. SUBBA REDDY, P. SESA SAILA SRI, and V. MARUTHI

Central Research Institute for Dryland Agriculture, Santoshnagar, Hyderabad 500 059.

### ABSTRACT

The yield levels of castor in rainfed environment in farmer's field were very low (+ 180-250 kg/ha) and widely fluctuate due to vagaries of rainfall, use of local seed and poor management. To achieve stability of castor in farmer's fields, the Farm Science Centre of 'CRIDA' organized skill oriented trainings and also demonstrations after assessing the gaps in production of castor for the farmers in Ranga Reddy district. The results of crop cutting survey in both trainees and non-trainees fields indicated that use of improved seed (GCH-4) alone on an average increased the seed yield by 41 per cent compared to the local 'Aruna'; while top dressing of 20 kg N/ha through urea recorded additional income of Rs.1150/ha compared to basal application of 10-30-0 over years. Under moisture stress situations, 20 kgN/ha as top dressing along with basal application of 10-30-0 NPK kg/ha was found optimum. Sowing of castor in second fortnight of June recorded the highest bean yields of castor. Delayed sowing of castor by 15,30 and 45 days after first fortnight of June reduced yield by 9, 30 and 40 per cent respectively. Control of weeds with two harrowings recorded additional cost-benefit ratio of 11.5 as against the recommended practice of two blade harrowings followed by one hand weeding over the years. Use of improved seed, recommended dose of fertilizer and control of semilooper by the farmers increased the bean yield of castor by 95 per cent compared to the traditional practices adopted by the farmer.

**Keywords :** Production factors, Yield, Income, Castor.

### INTRODUCTION

Castor (*Ricinus communis* L.) is an important non-edible oilseed crop grown widely in rainfed Alfisols of Andhra Pradesh. The productivity of this crop in rainfed environment ranged from 180 to 250 kg/ha (Anon, 1989). The yield levels of castor quite often fluctuate due to vagaries of monsoon, use of non-descriptive cultivars and poor management practices (Anon, 1990). The seed yield of castor in the farmers' fields can be enhanced atleast by 200 per cent with adoption of improved genotypes, moderate levels of nutrients, timely sowing and control of semilooper (Anon, 1986). Hence there is a need to assess the effect of factors of production on yield and income gains in the farmers' fields for rapid spread of the technologies.

### MATERIALS AND METHODS

For this study, the castor growing farmers in

Yacharam and Ibrahimpatnam Mandals of Ranga Reddy District of Andhra Pradesh were selected randomly. The practices adopted by the farmers and the need to enhance the castor production were assessed by the rapid rural survey methods. About 60 farmers from different villages of varied size holdings in each year were trained in improved technologies at Farm Science Centre, CRIDA from 1990 to 1995 from February-May. In addition, the frontline demonstrations on castor to quantify the benefits of critical inputs (improved seed (GCH-4), Top dressing of N @ 30 kg/ha and control of semi-looper) were also conducted in the farmers' fields along with controls in all the years. At the time of harvest, the yields of castor in both demonstrations and non-demonstrations were recorded through crop cutting surveys. The economic analysis of input and output relationships were also worked out to quantify the benefits of technologies in all years.

The castor crop in demonstration sites

received about 718, 519, 410, 495, 594 and 726 mm rain in 1990, 1991, 1992, 1993, 1994 and 1995 respectively as against the normal of 553 mm during the crop growth periods. Dry spells of >13 days during vegetative phase was noticed in 1991, 1992 and 1994. The early withdrawal of monsoon in 1993 and 1995 affected the seed yields of secondary and tertiary spikes of castor (Table 1).

## RESULTS AND DISCUSSION

### *Contribution of production factors*

The use of hybrid castor (GCH-4) on an average recorded additional bean yield of 283 kg/ha compared to local Aruna (295 kg/ha). The additional investment of Rs.185/ha on hybrid seed offered Rs.1525/ha over the variety (Fig.1 and 2). The difference in the seed yield of castor with hybrid over Aruna increased with moisture stress conditions in years of erratic distribution of rainfall (Rao *et al.*, 1986).

The farmers in selected villages normally use 10-30-0 NPK kg/ha as basal dose for castor. Top dressing of urea at 30-60 days after sowing @ 20 kg N/ha along with basal (10-30-0 NPK kg/ha) as critical input recorded additional seed yields of castor by 221, 40, 170, 203 and 212 kg/ha compared to the normal practice adopted by the farmers in 1991, 1992, 1993, 1994 and 1995, respectively. Additional application of 40 kg N/ha gave increased bean yields of castor by 190 and 360 kg/ha in 1992 and 1993, respectively. However, application of 20 kg N/ha as top dressing was found economically optimum while considering additional cost benefit ratios although higher bean yields were achieved with 40 kg N/ha (Fig.3). Castor with 50-30-0 NPK kg/ha gave higher seed yields under rainfed conditions in favourable environment in sole and intercropping with clusterbean (Reddy, 1986 and Venkateswarlu, 1989).

Timely sowing and precision are critical factors in stepping up the seed yields of castor in

Table - 1: Rainfall quantum and distribution in experimental sites during crop growth period.

Years	Rainfall (mm)						Total rainfall (mm)	Time of sowing
	July	Aug.	Sep.	Oct.	Nov.	Dec.		
1990	138 (11)	212 (12)	61.4 (5)	256 (10)	51.2	--	718 (42)	1st week of July
1991	65 (5)	42 (5)	292 (5)	82 (3)	38 (5)	--	519 (33)	2nd week
1992	64 (7)	95 (9)	110 (9)	52 (5)	89 (4)	--	410 (34)	"
1993	126 (9)	79 (6)	135 (9)	110 (11)	--	45 (2)	455 (29)	"
1994	65 (7)	151 (10)	62 (4)	279 (9)	37 (4)	--	594 (40)	"
1995	183 (10)	103 (5)	186 (9)	242 (11)	11.8 (1)	--	726 (50)	"
Normal (Average)	195	118	136	80	19	5	553	"

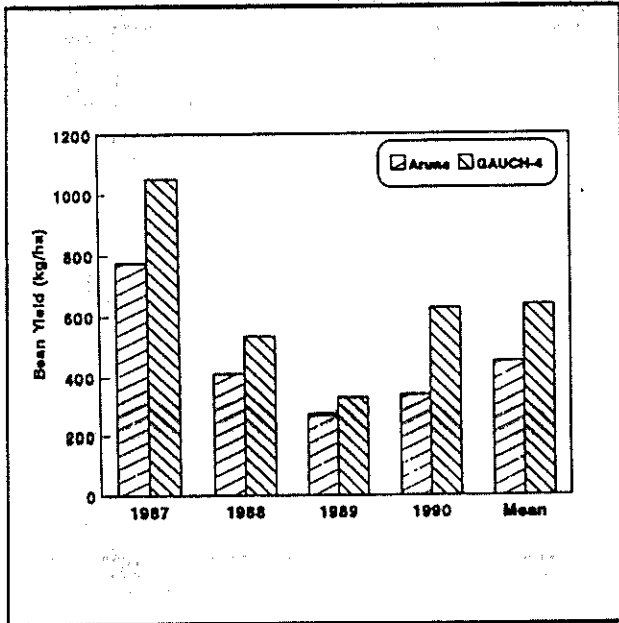


Fig - 1: Contribution of improved seed on bean yield of castor

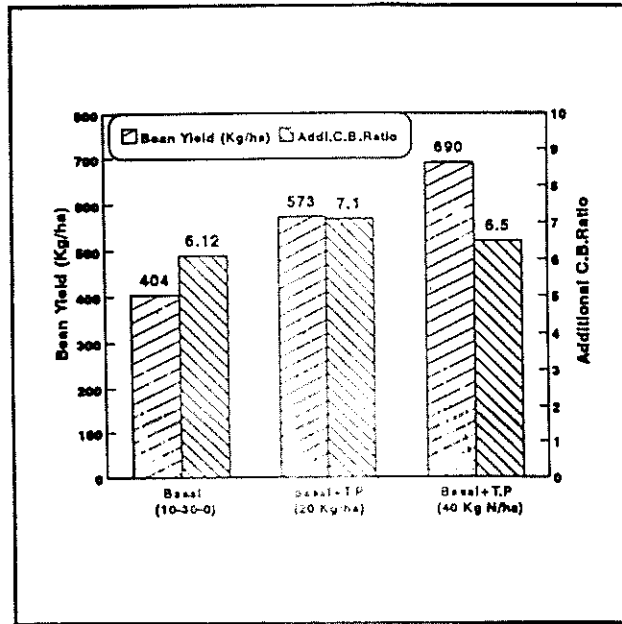


Fig - 3: Economies of fertilizer use in rainfed castor

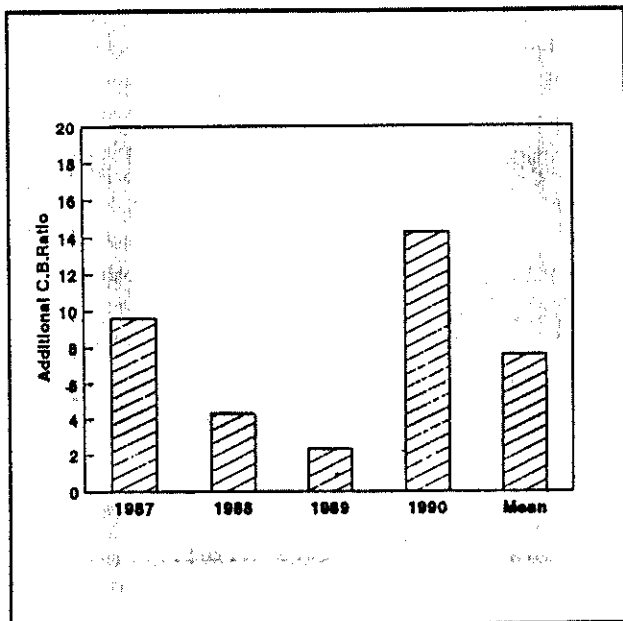


Fig - 2: Effect of hybrid castor on additional C.B. Ratio over Aruna

rainfed environment. Sowing of castor in farmers' fields in second fortnight of June gave on an average bean yield of 672 kg/ha over the years (Table-2). While castor sown in first and second fortnight of July and first fortnight of August recorded 9, 30 and 40 per cent reduction in bean

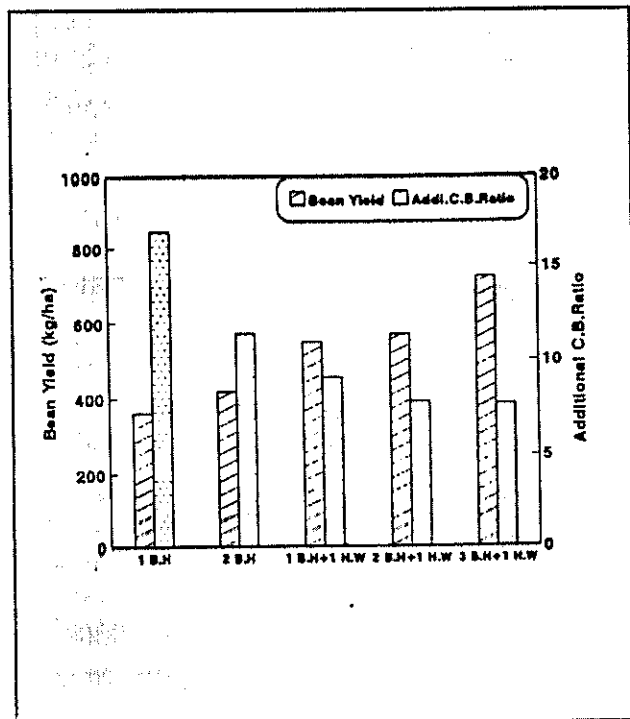
yield and also reduced income of Rs.992, 2234 and 2882/ha respectively than second fortnight of June. Thus, castor can be sown in the farmers' fields upto first fortnight of July with marginal reduction in income. Early sowing of castor was found advantageous in the years of normal distribution of rainfall and also in case of early withdrawal of monsoon. Weed control in inter rows is a common practice adopted by the majority of the farmers. Hand weeding to control intra row weeds is a rare practice in castor fields. The results showed that controlling of intra row weeds with hand weeding with investment of Rs.600/ha alongwith two blade harrowing gave on an average additional seed yield of 150 kg/ha than farmers' practice of weed control. Intra row weed control in castor has marginal/no benefit in stressed environment while considering additional cost benefit ratios (Fig. 3).

*Potential effects of critical inputs on seed yields.*

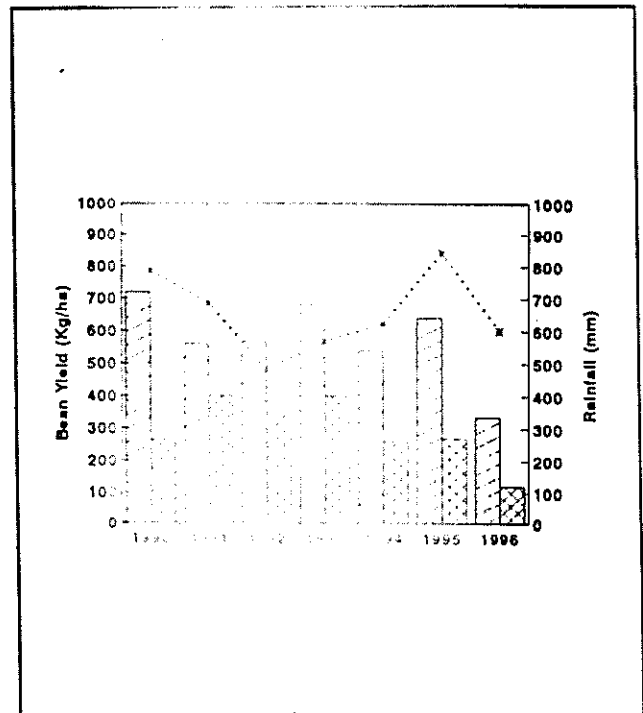
The Front Line Demonstrations conducted in the farmers' fields in some villages showed that use of hybrid (GAUCH-4), top dressing of 40 kg N/ha

**Table 2: Influence of time of sowing on seed yield and income in rainfed castor (1990-95)**

Time of sowing	Seed Yield (kg/ha)	Gross Income (Rs./ha)	C.B. Ratio	
			Seed yield (kg)	Income (Rs./ha)
2nd fortnight of June	672	6482	--	--
1st fortnight of July	610	5490	9.0	992
2nd fortnight of July	472	4248	5.00	2234
1st fortnight of August	400	3600	4.0	2882

**Fig - 4: Effect of weed management practices on bean yield and income of rainfed castor**

and control of semilooper by chemicals on an average recorded an additional seed yield of 283 kg/ha and gross income of Rs.2660/ha (cost benefit ratio of 3.7) compared to no critical inputs (Fig.5). The differences in yield and income increased (4.34 to 6.83 CB ratio) in years of good rainfall distribution (Fig.5). The decreased cost benefit ratios of critical inputs in 1991 and 1992 was due to deficit of 136 and 70 mm of rainfall at

**Fig - 5: Potential of critical inputs on yield and income in rainfed castor**

vegetative period. In 1995 and also excess rainfall of 136 mm in 1991 and 70 mm in 1992 of secondaries which resulted in the outbreak of *Botrytis grey rot* on capsules. The use of critical inputs of improved seed (GCH-4), top dressing of N and plant protection measures to control semilooper gave highest yield and income gains (Rs.4100-280/ha) in good rainfall distribution years like 1990, 1995, 1993

Table -3 : Yields of rainfed castor as influenced by fertilizer

Practice	Castor Bean yield (kg/ha)					
	1991	1992	1993	1994	1995	Mean
Basal (10-30-0)	324	490	340	370	495	404
Basal (10-30-0) + 20 kg N/ha top dress	545	530	510	573	707	573
Basal (10-30-0) + 40 kg N/ha top dress	--	680	700	--	--	690

and 1994. While in severe drought years like 1991 and 1996, the additional income ranged from Rs.900-1950/ha. In years of normal rainfall improved seed (hybrid GCH-4), sowing of castor in the second fortnight of June, use of 10-30-0 NPK kg/ha and intra row weed control by hand weeding contributed to enhance the seed yields of castor by 150,210,170 and 155 kg/ha, respectively over the traditional practices of the farmers. While the combination of hybrid seed, top dressing of urea and semilooper control in castor enhanced the seed yields by 370 to 455 kg/ha in the farmers' fields as compared to the farmers methods of cultivation. While in drought years, hybrid seed followed by top dressing of 20 kg N/ha contributed to get higher seed yields of 275 and 100 kg/ha, respectively than a variety and basal application of (10-30-0 NPK kg/ha) as practiced by the farmers.

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