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## Efficient and economic use of harvested rain water for sustainable crop production under rainfed agriculture

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**Abstract**

A field experiment was conducted from *kharif* 2006 to 2012 on sites at the AICRP for dry land agriculture, centre for watershed management partnership research & rural engineering, S.D Agricultural University, Sardarkrushinagar (North Gujarat) under arid and semi-arid agro-climatic zone. The different treatments viz., T<sub>1</sub>: Control, T<sub>2</sub>: Control with FYM @ 5 t ha<sup>-1</sup>, T<sub>3</sub>: One life saving irrigation, T<sub>4</sub>: One life saving irrigation with FYM@ 5 t ha<sup>-1</sup>, T<sub>5</sub>: Two lifesaving irrigation, T<sub>6</sub>: Two life saving irrigation with FYM @ 5 t ha<sup>-1</sup> were tried out in efficient and economic use of harvested rain water for sustainable crop production. The results revealed that the seed and stalk yield of castor affected significantly due to different treatment during all the years as well as in pooled results. The highest yield of castor 957.8 kg ha<sup>-1</sup> (Pooled) was recorded under treatment of two life saving irrigation with FYM @ 5 t ha<sup>-1</sup>, which is 59.92 percent higher than control (598.9 kg ha<sup>-1</sup>). It was followed by two life saving irrigation (815.2 kg/ha), which is 36.11 percent higher than control (598.9 kg ha<sup>-1</sup>), one life saving irrigation with FYM @ 5 t ha<sup>-1</sup> (795.0 kg ha<sup>-1</sup>), 32.74 percent higher than control. The stalk yield of castor was also observed highest under treatment two life saving irrigation with FYM @ 5 t ha<sup>-1</sup> (1110 kg ha<sup>-1</sup>), 64.73 percent higher than control followed by two life saving irrigation, one life saving irrigation with FYM @ 5 t ha<sup>-1</sup> and one life saving irrigation. The maximum B: C ratio (2.99) and water use efficiency (1.08) was also under treatment of two life saving irrigation with FYM @ 5 t ha<sup>-1</sup>.

**Keywords:** Efficient and economic, harvested rain water, agriculture.

**Introduction****Objectives**

- I. Effective utilization of storage water and supplemental irrigation to castor crop through drip irrigation system
- II. Economics evaluation of the system

**Materials and methods**

A field trial was conducted on loamy sand soil (*Typic usiipsammments*) during *kharif* 2006 to 2012 at the AICRP for dry land agriculture, centre for watershed management partnership research & rural engineering, S.D Agricultural University, Sardarkrushinagar, North Gujarat having semi-arid and sub-tropical climate situated in 24° 19' North latitude 72° 19' East longitude and 154.52 meter above the mean sea level and the soil of experimental field was loamy sand having high infiltration rate, poor water holding capacity (20.65%) and also low in organic carbon (0.19 %), available N (128.60 kg ha<sup>-1</sup>), Whereas medium in available P<sub>2</sub>O<sub>5</sub> (27.20 kg ha<sup>-1</sup>) and K<sub>2</sub>O (162.60 kg ha<sup>-1</sup>). The experiment were conducted with six treatments comprising viz., T<sub>1</sub>: Control, T<sub>2</sub>: Control with FYM @ 5 t ha<sup>-1</sup>, T<sub>3</sub>: One life saving irrigation, T<sub>4</sub>: One life saving irrigation with FYM@ 5 t ha<sup>-1</sup>, T<sub>5</sub>: Two life saving irrigation, T<sub>6</sub>: Two life saving irrigation with FYM @ 5 t ha<sup>-1</sup> were tested under deign RBD.

**Result and discussion**

The year wise results were shown in graph Fig.1. It was found that the highest seed yield was found in treatment T<sub>6</sub>: two life saving irrigation with FYM @ 5 t ha<sup>-1</sup> in all the years. On the other hand the stalk yield was found high in treatment T<sub>6</sub>: two life saving irrigation with FYM @ 5 t ha<sup>-1</sup> in all the years because of high yield.

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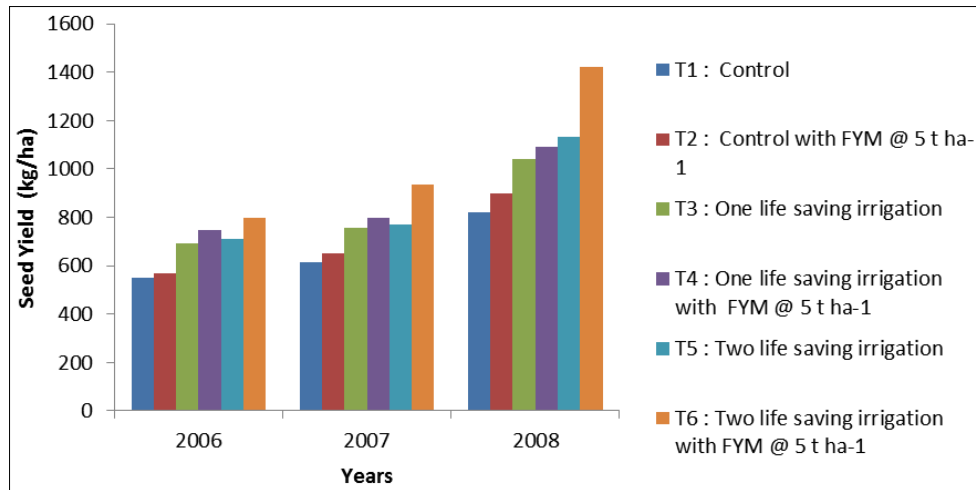


Fig 1: Effect of different treatments on seed yield of castor (Year wise)

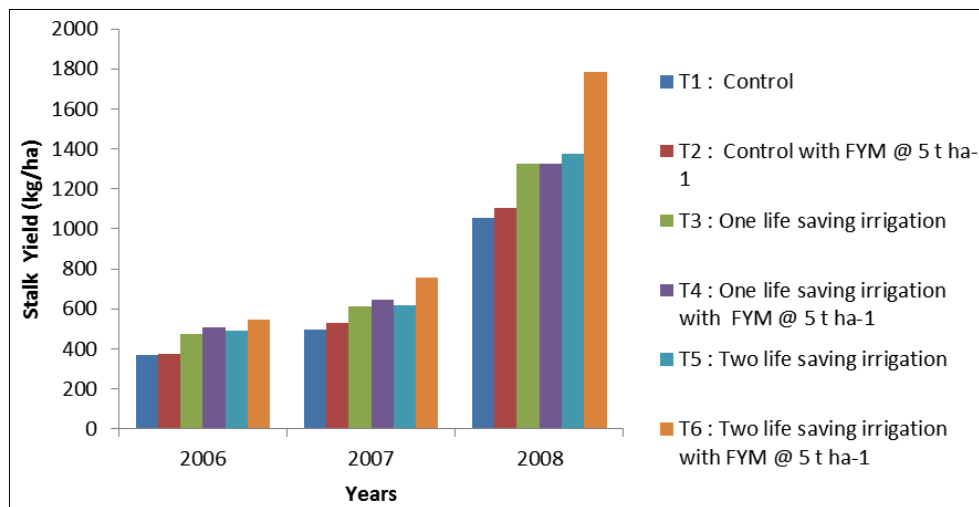


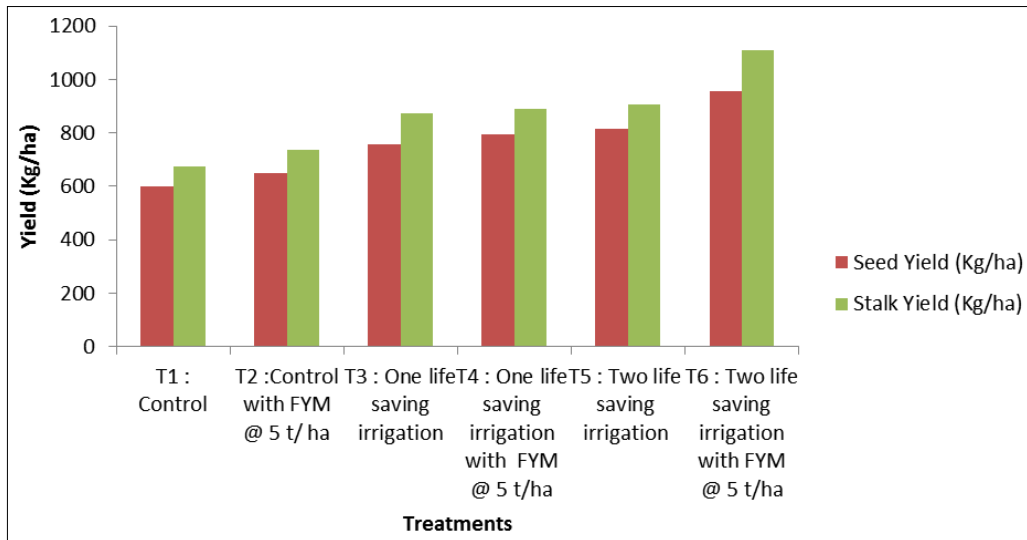
Fig 2: Effect of different treatments on stalk yield of castor (Year wise)

Table 1: Effect of different treatments on yield of castor crop

Treatments	Castor yield (kg/ha)													
	Seed							Stalk						
	2006	2007	2008	2009	2010	2011	Pooled	2006	2007	2008	2009	2010	2011	Pooled
T <sub>1</sub> : Control	548	615	820	480	590	541	598.9	370	497	1054	590	618	610	673.8
T <sub>2</sub> : Control with FYM @ 5 t ha <sup>-1</sup>	567	653	898	540	645	602	650.8	373	527	1107	698	670	680	736.4
T <sub>3</sub> : One life saving irrigation	692	756	1041	615	752	701	759.5	473	611	1326	795	815	827	874.8
T <sub>4</sub> : One life saving irrigation with FYM @ 5 t ha <sup>-1</sup>	748	799	1092	623	779	729	795.0	506	646	1328	850	812	802	887.6
T <sub>5</sub> : Two life saving irrigation	712	772	1132	715	805	755	815.2	491	617	1378	890	822	830	907.4
T <sub>6</sub> : Two life saving irrigation with FYM @ 5 t ha <sup>-1</sup>	800	937	1420	765	940	885	957.8	545	754	1786	996	1005	1009	1110
Mean	678	755	1067	623	752	702	762.9	460	609	1330	803.2	790	793	865.04
SEM ±	29.88	30.3	50.5	41.5	41.5	40.0	16.7	21.2	32.17	69.8	57.4	57.4	56.8	28.7
C.D. @ 5%	90.01	91.3	152.2	125.0	125.0	120.5	46.8	63.8	96.95	210.5	173.1	173.1	171.3	83.6
Y X T														
SEM ±							39.3							51.8
C.D. @ 5%							NS							145.8
CV %	8.82	8.03	9.48	13.3	13.3	11.39	10.31	9.22	10.57	10.5	14.3	14.3	14.34	12.80
Rainfall(mm)	1096.7	670	574	391.6	1066.9	915.3	785.75	1096.7	670	574	391.6	1066.9	915.3	785.75

The final results revealed that the seed and stalk yield of castor affected significantly due to different treatment during all the years as well as in pooled results. The highest yield of castor 957.8 kg ha<sup>-1</sup> (Pooled) was recorded under treatment of two life saving irrigation with FYM @ 5 t ha<sup>-1</sup>, which is 59.92 percent higher than control (598.9 kg ha<sup>-1</sup>). The findings corroborated the results of Xianshi, *et al.* (1998) [2]. It was followed by two life saving irrigation (815.2 kg ha<sup>-1</sup>), which is 36.11 percent higher than control (598.9 kg ha<sup>-1</sup>), one life saving irrigation with FYM @ 5 t ha<sup>-1</sup> (795.0 kg ha<sup>-1</sup>), 32.74

percent higher than control. Results fall in line with finding of Balaswamy *et al.* (1986) [1]. The stalk yield of castor was also observed highest under treatment two life saving irrigation with FYM @ 5 t ha<sup>-1</sup> (1110 kg ha<sup>-1</sup>), 64.73 percent higher than control followed by two life saving irrigation, one life saving irrigation with FYM @ 5 t ha<sup>-1</sup> and one life saving irrigation. The maximum B: C ratio (2.99) and WUE (1.08) was also under treatment of two life saving irrigation with FYM @ 5 t ha<sup>-1</sup>.



**Fig 3:** Effect of different treatments on seed and stalk yield of castor (Pooled)

**Table 2:** Effect of different treatments on yield and economics of castor crop

Treatments	Castor pooled yield (kg/ha)		Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net Income (Rs/ha)	B : C ratio	WUE (kg/ ha /mm)
	Seed	Stalk					
T <sub>1</sub> : Control	599	674	8000	21298	13298	2.66	0.76
T <sub>2</sub> : Control with FYM @ 5 t ha <sup>-1</sup>	651	736	8500	23146	14646	2.72	0.83
T <sub>3</sub> : One life saving irrigation	759	875	10700	27020	16320	2.53	0.91
T <sub>4</sub> : One life saving irrigation with FYM @ 5 t ha <sup>-1</sup>	795	888	11200	28269	17069	2.52	0.95
T <sub>5</sub> : Two life saving irrigation	815	907	10900	28986	18086	2.66	0.92
T <sub>6</sub> : Two life saving irrigation with FYM @ 5 t ha <sup>-1</sup>	958	1110	11400	34078	22678	2.99	1.08
Mean	763	865	Castor seed 35.0, Castor stalk 0.5, FYM: Rs 500 /ton				
SEM ±	17	29					
C.D. @ 5%	47	84					
Y X T							
SEM ±	39	52					
C.D. @ 5%	NS	146					
CV %	10.31	12.80					
Price(Rs./kg)							
Average rainfall (mm)	785.75						

## Conclusion

Sowing of castor with two life saving irrigation with FYM @ 5 t ha<sup>-1</sup> for getting higher yield and monetary return.

## References

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