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Economic Impact of Front Line Demonstrations on Castor (Ricinus communis L.) in Chitradurga districts of Karnataka

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Abstract: *Hiriyur is one of the major castor growing taluk in Chitradurga districts of Karnataka. 85 frontline demonstrations (FLDs) were conducted by Zonal Agricultural and Horticultural Research Station (ZAHRS), Hiriyur in Chitradurga district of Karnataka from 2012-13 to 2014-15 to demonstrate the improved castor production technologies suitable for eco –system. An attempt was made to analyze the impact of demonstrations in vertical and lateral spread of the technologies and the resultant improvement in yield and income of the castor growers. Eighty –five FLD and the corresponding non- FLD castor growers were selected through proportionate random sampling procedure. There was a no significant difference between the FLD and non-FLD farmers in their knowledge, adoption and yield levels. This shows the impact of FLDs in lateral spread of the improved technologies of castor crop. The castor area of the districts has increasing slowly and production by about three times during the period 2011-12 to 2014-15.the FLDs had an overall expost –facto impact of 50.1% increase in yield and Rs.9234/ha in net returns. The B:C ratio was 3.2 with improved technology is higher as compared to farmers practice which was 3.1. There is a vast scope available for increasing the yield levels of castor in the district. Non- availability of quality seeds is the major constraint for the castor growers of the study area. There is a need of intensive extension efforts by department of agriculture, through constructive collaborations with Zonal Agricultural and Horticultural Research Station, Krishi Vigyan Kendras, Hiriyur and local Non- Governmental Organizations to improve the yield and the production levels of castor in Chitradurga district.*

Keywords: *Castor, Frontline demonstrations, Impact study*

I. Introduction

Front line demonstration (FLD) is a long term educational activity conducted in a systematic manner in farmer's fields to worth of a new practice/technology. Farmers in India are still producing crops based on the knowledge transmitted to them by their forefathers leading to a grossly unscientific agronomic, nutrient management and pest management practices. As a result of these, they often fail to achieve the desired potential yield of various crops and new varieties. In India, Castor (*Ricinus communis* L.) crop is grown in an area of 1000 lakh ha, with a production of 1689 lakh tones and productivity of 1689 kg/ha (Anonymous,2015). Gujarat, Andhra Pradesh and Rajasthan are the major castor producing states.

Castor in Karnataka is mainly grown as rain fed crop, in some pockets as irrigated crop and sporadically as border crop/ inter crop in the fields of groundnut, finger millet. The districts namely Chitradurga, Davangere, Hasan, Shivamogga, Tumkur, Bangalore rural and Chikkamangalore are important in their contribution to the increase in the area and production of castor in Karnataka. Development/ identification of superior castor hybrids, generation of production technology and dissemination of improved technology through FLD resulted in enhancement of castor area, production and productivity in the last five years (Anonymous, 2008). However area, production and productivity of castor in Karnataka are fluctuating widely, which could be understood from table 1.

Eighty five FLDs were conducted in Chitradurga district of Karnataka from 2012-13 to 2014-15 to demonstrate the improved castor production technologies that are suitable for that particular eco-system. The concurrent impact of such demonstrations is given in table 2. An attempt was made to analyze the impact of the demonstrations in vertical and lateral spread of the technologies and the resultant improvement in yield and income of the castor growers, with the following objectives: (a) to document the profile characteristics of castor growers; (b) to assess the knowledge and adoption level of castor growers in Chitradurga district of Karnataka as an impact of FLDs; (c) to assess the impact of frontline demonstrations on yield and income obtained by the oilseed growers; (d) to delineate the constraints encountered by the castor growers in Chitradurga district of Karnataka and (e) to suggest strategies to improve the castor cultivation scenario in Karnataka.

II. Materials And Methods

Locale of the study: Chitradurga is one of the districts of Karnataka state in southern India, It receives low to moderate rain fall was selected as the locale of the study area and Zonal Agricultural and Horticultural Research Station (ZAHRS), Hiriyur, conducted the FLDs on castor. Chitradurga is located at 14.23°N 76.4°E. It has an average elevation of 732 meters. Average annual rainfall ranges 610 mm, the minimum temperature was noticed during the month of December 15.6 oC and maximum temperature 32-34oC. In general soil types are clay loam; the fertility status of the soil is low to medium in nitrogen, medium in phosphorus and medium to high in potash.

Sampling design: The study area covers three taluks of Chitradurga district, namely, Hiriyur , Hosadurga and Challakere taluk- comprising of three villages from each taluk for study, were namely- Iddilanagenahalli, Vanivilasa sagar and Kurubarhalli respectively, where FLDs were conducted during 2012-13 to 2014-15 and corresponding non-FLD castor growers were selected through proportionate random sampling procedure. The final sample of the study included 25 each FLD and non-FLD castor growers.

Data collection and statistical tools: a well structured interview schedule was utilized to collect the data from the selected respondents with the help of the key informants of the respective villages and the scientific team from ZAHRS, Hiriyur. The collected data were analyzed using standard statistical tools viz., mean standard deviation, percentage and t-test analysis, to have meaningful interception of the data.

III. Results And Discussion

Profile characteristics of the respondents: Majority of the FLD and non-FLD castor growers were middle aged (35 to 55 years). Majority the FLD castor growers were illiterate to high school level educated, whereas non-FLD castor growers were illiterate to primary level (Table 3). The farming experience of the FLD farmers was low to medium, whereas that of the other category was also low to medium. Both the FLD and non – FLD castor growers had medium level of castor cultivation. Majority of the FLD farmers were possessing small size to marginal size of farm holdings, whereas majority the other category farmers had marginal – semi-medium size of farm holdings. As far as the area under castor cultivation is concerned, the FLD and non- FLD farmers were marginal to small in nature.

Factors responsible for castor cultivation: Suitability of the crop to the prevailing environment of the study area is the foremost factor that contributed for the initiation and spread of castor cultivation. There are other crops like finger millet, groundnut, vegetables, etc., are grown in the study area and this crop according to the respondents has less cost involved, which is the second important factor that contributed for castor cultivation. Also, the damage due to pests and diseases is comparatively lower and that forms third important factor that contributed for castor cultivation. Local availability market and processing facilities for the castor seeds are the further important contributing factors that enhance the further growth of castor cultivation in the study area. Availability of credit facilities for borrowing loans for incurring the cultivation cost and possibility of having castor based cropping systems also the factors that contributed to the castor cultivation in the study area.

Concurrent impact of the frontline demonstrations: A total of 85 FLDs were conducted by the ZAHRS, Hiriyur during the period of 2012-13 to 2014-15 on whole package technology, improved hybrids, recommended dose of fertilizers and plant protection measures. The impact of whole package technology on the seed yield increase was 16% under rain fed situation, with corresponding additional net returns of Rs 7574/ha. Similarly the seed yield increase was 92, 15 and 55.3% for irrigated condition (Rs 26752/ha), recommended dose of fertilizers (Rs 6477/ha) and plant protection measures with corresponding additional returns of Rs 8930/ha. (Table 2).

Expost- facto adoption behavior of the respondents (lateral spread of the technologies): Majority of the FLD and non –FLD castor growers were medium in knowledge and adoption level of recommended castor cultivation practices and the resultant yield level of their castor crop. FLD farmers and non- FLD farmers were compared with respect to the adoption, knowledge and yield level by employing t –test. The results indicated that there was no significant difference between the FLD and non- FLD farmers in their knowledge, adoption and yield levels. This shows the impact of FLDs in lateral spread of the improved technologies of castor crop (Table 4). The overall such impact is mainly due to the faster spread of the technologies in Iddilanagenahalli and Vanivilas sagar villages (Table 5).

Vertical growth of the crop: The vertical spread of castor in Chitradurga district of Karnataka could be visible very well from Table 1. The castor area of the district slowly increasing and production by about three times (Table 1) during the period 2011-12 to 2013-14. However the overall productivity of the district is a matter of concern and there is a vast scope for further improvement of the same (Table 1).

Expost- facto impact of FLDs in yield and economics: It could be understood from Table- 5 that the seed yield increase, as an impact of FLDs obtained by FLD farmers in Iddilanagenahalli village was 45.1% more than that of the non – FLD farmers and the additional net returns obtained by the farmer was Rs 10640/ha. The B:C ratio was 3.9 and 3.6 for FLD and non- FLD farmers, respectively. Contrastingly, In Vanivilas sagar village also, the seed yield increase obtained by the FLD farmers was to the tune of 50.1%, with a meager additional net returns of Rs 8117/ha. Here, B:C ratio was 3.1 for both FLD and non- FLD farmers. In Kurubarahalli village, the seed yield increase obtained was 55.3%, with additional net returns of Rs 8930/ha. The B:C ratio was 2.7 and 2.6 for FLD and non- FLD farmers showing that the lateral spread of the technology was better in Iddilanagenahalli, followed by Vanivilas sagar and Kurubarhalli village. This may be because reason that the in Iddilanagenahalli and vanivilas sagar villages are located on the main road and have easy approach for the development personnel and researchers to visit there frequently and impart the improved cultivation practices.

Constraints in castor cultivation: Non –availability of good quality seeds, inadequate electricity supply for irrigation are the major constraints for the castor growers. Higher cost of the labour and their unavailability and occurrence of more male flowers in the genotypes grown are some of the constraints that follow the major constraints as felt by the respondents. Erratic rainfall pattern, fluctuation in the market price, high cost of inputs and the poor quality of the irrigation water is the next important constraints. Damage due to sucking pests, termites and wild animals are the biotic stresses that affect castor cultivation in the study area apart from extension constraints like unawareness towards improved production technology, lack of sufficient subsidy programmes and wider extension personnel, farmer's ratio are to be overcome to improve the castor cultivation in the study area (Padmaiah *et al*., 2012).

Suggestion to improve the castor cultivation:

- The existing castor seed production and supply system in the study area was not meeting the demands of castor growers and farmers have to depend on the outside seed supplying agencies. The hybrid DCH-177 developed at IIOR, Hyderbad need to be included in the seed supply chain. There is a wide scope for production of hybrid DCH-177 in collaboration with the DOA, National seeds corporation (NSC) and Karnataka state seeds corporation (KSSC) which ensures the timely supply of quality seed to the castor growers of the area.
- Intensive training programmes need to be organized for the farmers particularly on efficient water management.
- DOA should also take advantage of the expertise of KVKs and other voluntary organizations for disseminating the improved castor production technologies like integrated packages for management of insect pests and diseases, integrated nutrient management and frost injury that affect castor crop. So that the collaborative efforts will reduce the extension gap between the farmers and extension personnel and better dissemination of technologies.

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Table 1 Castor area, production and productivity in Chitradurga and Karnataka.

	Area (ha)		Production (tonnes)		Productivity (kg/ha)	
	Chitradurga	Karnataka	Chitradurga	Karnataka	Chitradurga	Karnataka
2011-12	4275	12000	1978	12000	1183	1000
2012-13	3417	11000	3840	7000	1026	836
2013-14	5970	19000	6709	16000	1183	842

Table 2 Concurrent impact of frontline demonstrations on castor in Chitradurga district of Karnataka.

Technology	Situation	No. of demos.	Mean seed yield (kg/ha)		% increase in yield	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		Additional net returns (Rs/ha)	B:C ratio	
			IT	FP		IT	FP	IT	FP		IT	FP
Whole package	Irrigated	25	1780	923	92.8	18300	14200	64080	33228	26752	3.5	2.3
	Rainfed	50	1617	1393	16	18663	18173	58212	50148	7574	3.1	2.7
Fertiliser	Irrigated	5	1543	1342	15	12908	12149	55548	48312	6477	4.3	3.9
Plant protection	Irrigated	5	1080	695	55.3	14250	9320	38880	25020	8930	2.7	2.6

Table 3 Distribution of respondents according to their socio –personal characterstics.

Category	FLD farmers (%)	Non – FLD farmers (%)
Age (years)		
Young (35)	08	10
Middle (35 to 55)	76	80
Old (55)	16	10
Educational status		
Illiterate	41	58
Primary level (upto 5th Std)	10	18
Middle level (6 -8th Std)	09	06
High level (9 – 10th Std)	24	15
Secondary level (11 -12th Std)	12	03
College level	14	0
Farming experience (years)		
Low	46	54
Medium	35	40
High	19	06
Castor cultivation experience (years)		
Low	08	12
Medium	46	63
High	44	25
Farm size		
Marginal (1 ha)	25	40
Small (1-2 ha)	45	35
Semi- medium (2.01 – 5 ha)	20	20
Medium (5.01 – 10 ha)	10	5
Large (10ha)	0	0
Area under castor		
Marginal (1 ha)	60	65
Small (1-2 ha)	25	30
Semi- medium (2.01 – 5 ha)	15	05
Medium (5.01 – 10 ha)	0	0
Large (10ha)	0	0

Table 4 Distribution of respondents according to their adoption behavior and yield.

Category	**FLD farmers (%)**	**Non – FLD farmers (%)**
Knowledge level		
Low	10	25
Medium	65	70
High	25	05
SD	28.43	33.29
‘t’ value	2.03 NS	1.73 NS
Adoption level		
Low	15	36
Medium	68	45
High	17	19
SD	30.03	13.2
‘t’ value	1.92 NS	4.37 NS
Yield level		
Low	05	38
Medium	75	52
High	20	10
SD	36.85	21.38
‘t’ value	1.56 NS	2.70 NS

Table 5 Economics of castor production under frontline demonstrations and farmers practice in Chitradurga district

Village	Year	Mean seed yield (kg/ha)		% increase in yield	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		Additional net returns (Rs/ha)	B:C ratio	
		FLD	NFLD		FLD	NFLD	FLD	NFLD		FLD	NFLD
Iddilanagenahalli	2012-13	1235	851	45.1	11000	8200	43225	29785	10640	3.9	3.6
Vanivilasasagar	2013-14	988	658	50.1	11300	7537	35568	23688	8117	3.1	3.1
Kurubarhalli	2014-15	1080	695	55.3	14250	9320	38880	25020	8930	2.7	2.6
Overall		1101	734	50.1	12183	8352	39195	26130	9234	3.2	3.1