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Impact of adoption of scientific interventions in castor farming - constraints and strategies: an assessment by FLDs in central dry zone of Karnataka, India.

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Abstract: *Castor has been one of the major oilseed crops of Karnataka grown predominantly under rain fed situations, in an area of nineteen thousandhectare. However, these days, most of the dry land farmers in Karnataka are shifting from groundnut to castor during kharif season because of less yield and remunerative returns from groundnut due to South West Monsoon often experiences long dry spell mainly during mid or terminal stages of its' growth. As castor is an important industrial oilseed crop in India earning foreign exchange of Rs 1706.90 crores in 2010-11 and it was just Rs. 806.07 crores in 2000-01 which depicts a major percentage of foreign exchange to Indian government treasure. Researchers felt that for promoting castor as an alternate crop to groundnut, it is essential to increase the productivity of castor by promoting its' cultivation in kharif season. Availability of quality seeds of the most popular hybrids like DCH-177, DCH-519 and varieties like 48-1 in traditional castor growing Karnataka states was facilitated by state agricultural university (SAU) in coordination with agriculture department. In addition to the hybrids, adoption of improved technologies in production and pest and disease management are other factors responsible for the improved levels of productivity. Owing to the need of technologies to solve location specific problems that limit castor productivity.The research and on-farm (one hundred thirty five)demonstrations carried out in Karnatakaduring Kharif 2009 to 2014 proved that, in whole package/improved technology demonstrations, recorded an overall increase in seed yield 39% as compared to farmers practice with ANR of Rs 7921/ha and B:C ratio was 3.2 and 2.9 with IT and FP, respectively. This paper describes the agro techniques developed at research station level and the way kharifcastor was promoted among the farmers in Karnataka.*

Keywords: *Castor,scientific interventions, constraints and strategies*

I. Introduction

India is a paradise for oilseeds as no other country has its range of annual and perennial oilseeds grown in different agro climatic zones. Oilseeds in India constitute the principal commercial crop. Oils and fats, apart from forming an essential part of human diet, serve as important raw material for the manufacture of soaps, paints and varnishes, hair oils, Lubricants, textiles, auxiliaries, pharmaceuticals, etc. The early Egyptians used it to protect their bodies from the dry desert windstorms, while in Jamaica; it is best known as a laxative to keep the bowels clean and as a hair treatment.Castor crop continued to be preferred by the Indian farmers in traditional castor growing states due to the increasing demand and remunerative market price. Castor witnessed a marginal increase in the productivity level to 1689 kg/ha from 1653 kg/ha during 2013-14 while the total production was 1.69 mt. from an area of 1.0 mha.

The productivity of castor in Karnataka during *kharif* season in the state is low and varies from 560 to 836 kg/ ha. It is far below (Table 1) than that of Gujarat (2061 kg/ ha), Haryana (1667 kg/ ha), Rajasthan (1465 kg/ ha) and national average (1653 kg/ ha) (Anonymous, 2014). This is mainly owing to the following reasons. Crop grown under rain-fed condition without following improved package of practices, small operational land holdings with minimum external inputs (fertilizers and irrigation)and less availability of farm yard manure produces poor yields.Involvement of women is more than double compared to involvement of men in operations like harvesting, threshing, cleaning, drying etc. Women farmers complained about various health's related problems like back ache, hand injury and respiratory problems, associated with traditional methods of harvest and post-harvest handling of castor. Difficulty in further expansion of area in the state primarily due to lack of seed marketing to non-traditional areas, Lack of varietal replacement, scarcity of labour andlack of mechanizationfor any of the cultivation practices, Lack of suitable cultivars for intercropping system, Unfortunately, neither resistant/ tolerant varieties nor effectivecontrol measures are available against insect pests viz; semi-looper, spodoptera, capsule borer and dreadeddisease like wilt, botrytisare other reasons for low productivity. On the other hand, the AICRP centers have developed location specific improved technologies, which can enhance castor productivity significantly. But, the awareness and adoption of these technologies among farmers is very less. Hence focused efforts are required to transfer the existing technologies from research system to the farmers' fields through effective and efficient technology transfer programmes to realize immediate gains to the individual farmers and oilseeds production (Anonymous, 2014).

II. Materials and methods

FLDs are conducted to disseminate information on improved production technologies among the castor growers, FLDs are being organized through Indian Council of Agricultural Research (ICAR), New Delhi. The major objective of FLDs on castor is to demonstrate the productivity potentials and profitability of the latest and improved castor production technologies under real farm conditions. The demonstrations are being conducted in a participatory mode with complete involvement of the demonstrating farmers and supervision of the scientists who developed the technologies in a minimum area of 0.4 ha, under different agro- ecological situations. The involvement of scientists/researchers and farmers provide perfect feedback about the performance of the technologies and there by gives opportunity for the refinement of the technologies, according to the felt needs of the farmers (Anonymous, 2014).The scientists of All India Coordinated Research Project (AICRP) on Castor, Zonal Agricultural and Horticultural Research Station (ZAHRS), Hiriyur, Karnataka, India have developed suitable agro-techniques for *Kharif* castor by conducting research to identify the optimum sowing time, spacing, fertilizer dose, irrigation scheduling, weed management, development of hybrids, and remunerative preceding crops, Seed production of newly released hybrids was also taken up on a large scale in order to ensure supply of good quality seeds of Hiriyur Castor Hybrid- 6 (HCH-6) was produced through farmer participatory approach under SAU and the same was sold out to the needy farmers.

Further, a total of one hundred thirty five front line demonstrations (FLDs) were conducted in different districts of central dry zone ofKarnataka. The farmers were selected from different villages and inputs like seeds, fertilizers and need based plant protection chemicals were distributed. A team of scientists including Agronomist, Breeder and Entomologist have visited and monitored the demonstration sites at an interval of 10-15 days during the crop growing period. Finally information on seed yield, cost of cultivation and returns was collected after harvesting and marketing of the produce. Field days were organized at the demonstration in different villages with a view to transfer the technology to a large group of farmers. Besides, books, pamphlets and brochures were printed in vernacular languages and distributed to the farmers in the field days and also to those who visit the research station before commencement of crop season. Information oncastor technology was disseminated regularly through mobile message, print and electronic media and mass communication tools.

III. Results and Discussion

The scientists of AICRP on Castor, ZAHRS Hiriyur, Karnataka, India, have developed and promoting following agronomic package of practices for *Kharif* castor and encouraged farmers to adopt the same for reaping higher yields from castor.

Different Agronomic interventions to enhance castor productivity:

- Sowing around onset of south –west monsoon i.e. June to July found to be optimum, sowing beyond July reduced yield significantly.
- For *Kharif* castor optimum spacing of 90 X 60 cm for rain fed and 120 X 60 cm under irrigated condition for row to row and plant to plant respectively.
- A fertilizer dose of 20:40:20 kg N, P_2O_5 and K_2O ha^{-1} is recommended. Half the doses of N, full dose of phosphorus and potash are to be applied as basal. Remaining dose of 25 kg of N after 40- 45 DAS (days after sowing) as a top dress.
- RC-8 and Aruna (NPH-1) were found suitable for central dry zone.
- Jyothi and Kranthi were identified for intercropping system.
- Hybrid castor responded to N fertilizer dose up to 150kg/ha.
- Short duration pulses and coriander can be grown as intercrops without affecting the yield of castor.
- Intercropping of finger millet, foxtail millet and sunflower found to suppress the growth and yield of castor.
- Castor crop produced significantly higher yield with the application of @ 20 kg/ha Sulphur through gypsum.
- Developed new hybrid HCH-6 to central dry zone of Karnataka.
- Pre-emergence application of pendimethalin(30EC) @ 1 kg/ha (750 liters of water)+ one inter-cultivation at 40 DAS resulted in better weed control efficiency to realize higher seed yield and net returns under rain fed conditions of Hiriyur.

To enhance the visibility of the demonstrations the above technology has been transferred to the castor growers of the state through orientation classes before sowing, organizing front line demonstrations (Table 2), field inspections during crop growth period, conduction of field days (Table 3) at fully formed primary spike stage, printing and distribution of extension folders/pamphlets/popular articles and books (Table 4).

Whole Package Demonstrations: One hundred thirty fiveFLDswere conducted on whole package during 2009 to 2014, to show the productivity potentials and profitability of proven technology under real farm situation in central dry zone ofKarnataka.Whole package includes improved variety, optimum spacing, balanced use of fertilizers and micronutrients and need based plant protection measures compared to farmer's method of crop management.The FLDs conducted over the years at various locations on whole package in castor had shown 39% increase in yield as compared to farmers practice with additional net returns (ANR) of Rs. 7921/ha. The B:C ratio was 3.21 and 2.90 with improved technology (IT) and Farmers' practice (FP) plots, respectively (Table 5).The result as obtained in the present study was also documented in the studies made by Ramajaneyulu*et al*., 2014 and similar results were also reported by Kumar Naik *et al*., 2015.

Exploitable yield Reservoir: In India, castor is mostly confined to Gujarat, Rajasthan and Andhra Pradesh. Although other states like, Karnataka, parts of Maharashtra and Madhya Pradesh cultivate castor, their contribution to either area or production is limited. Despite the phenomenal increase witnessed in the production and productivity of castor over the last three decades, still there exists wide gap in the per hectare yields of castor across states (Table. 1).It was estimated that castor production in the country could be increased from 16.89 lakh tones to 21.31 and 23.96 lakh tones by bridging the yield gaps I (yield gap between improved technology and farmers' practice) and II (yield gap between improved technology and state average yield), respectively. Under rain fed conditions in Karnataka castor production could be increased from 0.12 lakh tones to 0.17 and 0.22 lakh tones by bridging the yield gap I and II, respectively. Similarly in Andhra Pradesh, castor production could be increased from 0.81 lakh tones to 1.09 and 1.77 lakh tones by bridging the yield gap I and II, respectively. Under irrigated conditions of Gujarat, castor production could be increased from 12.92 lakh tones to 15.13 and 18.02 lakh tones by bridging the yield gap I and II, respectively. Whereas in Rajasthan, it could be increased from 2.86 lakh tones to 3.49 and 7.16 lakh tones even without increasing the area (Table. 6).

IV. Constraints encountered:

1. Technological constraints

- It is very complex situation for clear –cut difference between improved technology and local/farmers' practice, more so in whole package demonstrations, since the farmers are either partial or complete adopters in the traditional areas.
- Lack of an organized seed-chain mechanism hinders the implementation of the promising technologies.
- Poor resource-base of the farmers affects the adoption of the technology.
- Non-availability of critical agricultural inputs is major factors for non-adoption of the recommended technology by the farmers is fully convinced of the potential benefits of the improved technology.
- The perpetual nature of the marginal and scattered size of holdings is a hindrance for obtaining reliable data for quantifying the worthiness of local practices/farmers' with precision.

2. Operational constraints

- Difficulties in appropriate sampling of the farmers
- Non-availability of data on biotic and abiotic stresses during the demonstrations
- Lack of access to weather data especially rainfall, for providing situation-specific guidance to farmers
- Lack of appropriate feedback from the farmers on the constraints in implementation of the recommended technologies.
- Non-conduct of FLDs in roadside areas results in poor impact of demonstrations.

Strategies for making the FLDs more effective tool for transfer of technologies to farmers:

- Cluster area approach in transfer of castor crop technologies, organizing FLDs cluster in one or two villages for making the demonstrations more effective.
- Use of ICTs particularly mobile phones for dissemination of knowledge on castor production technologies to farmers.
- Organizing field day on FLD plots to enhance the visibility of the demonstrations.
- More popularization/replication of success stories under real farm situations and use of mass media viz., video programmes, print media, radio or television for popularizing these success stories.
- Appropriate/proven technologies that are economically viable and social acceptable are to be focused upon and demonstratrated.
- At each centre, impact of demonstrations has to be studied. After assessing the situation of temporal and spatial variations in adoption of the technologies, the constraints in spread of technologies have to be worked out to give an effective feedback to the scientists for fine tuning/refining the technologies.

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References

[1]. Anonymous.2014, NMOOP, Frontline demonstrations on oilseeds, Indian Institute of Oilseeds Research,P.72-79.
[2]. Kumar Naik, A.H., Umamaheshwarappa, P and Hanumantha Naik, G. 2015, Economic Impact of Front Line Demonstrations on Castor (Ricinuscommunis L.) in Chitradurga districts of Karnataka.IOSR Journal of Agriculture and Veterinary Sciences **8**(8):1-5.
[3]. Ramanjaneyulu, A.V., Dharma Reddy, K., Vishnuvardhan Reddy, A., Nagesh Kumar, M.V. KhayumAhammed, S., Gouri Shankar and Neelima, T.L., 2014,Upscaling and Outsclaing of Rabi Castor in Andhra Pradesh- Opportunities and Limitations, International Journal of Bio-resource and Stress Management,**5**(1):138-142

Table: 1. Area, production and productivity trends of castor in major states during 2013-14.

State	Area (‘000 ha)	Production (‘000 tones)	Yield (kg/ha)
Gujarat	627	1292	2061
Rajasthan	195	286	1465
Andhra Pradesh	128	81	633
Karnataka	19	12	560
Maharashtra	14	5	357
All India	**1000**	**1689**	**1689**

(Source: FLD on Oilseeds, 2014)

Table: 2. Frontline demonstrations conducted in central dry zone of Karnataka.

Year	Conducted	Cultivars	Major impact of FLD in the region
2009-10	20	DCS-9	Farmers accepted the castor crop in view of more remunerative returns and less water requirements besides,further introduction of drip irrigation technology saves 30% water requirement and castor is the best alternative to other crops like groundnut and sunflower in terms of net returns. Of course, wild boar menace is totally absent on castor.
2010-11	20	DCS-9	
2011-12	20	DCH-177	
2012-13	25	DCH-177	
2013-14	25	DCH-177, DCH-519	
2014-15	25	DCH-177, DCH-519	

Table: 3. List of field day organized to popularize Kharif castor in central dry zone of Karnataka.

Date	Venue of the field day conducted	Purpose	No. of beneficiaries
21/10/2010	Yaraballi village, Hiriyur tehsil	To popularize castor production technology	95
28/10/2011	Abbinahole village, Hiriyur tehsil	Agronomic practices on Hybrid castor	124
15/12/2012	Iddilanagenahalli village, Hiriyur tehsil	Factors responsible for enhancing castor production under rain fed condition	85
15/09/2013	Jogihatti village, Nayakanahattihobli, Challakere tehsil	Enhancing the productivity of Kharif castor through agronomic practices	78
16/10/2013	Babbur farm, Hiriyur tehsil	To popularize castor production technology and hybrid DCH-177	246
21/10/2014	Gudihalli village, Challakere tehsil	Castor Production technology through organic practices	94
23/10/2014	Chattekamba village, Challakere tehsil	To popularize castor production technology	73
16/10/2015	Mayasandra village, Hiriyur tehsil	Agronomic practices on Hybrid castor	118

Table: 4. Printed materials distributed and radio telecast.

Pamphlets	Castor package of practices for increasing production
	IPM in castor
Books	Improved castor production technology
	Castor Varieties and Hybrids suitable to Karnataka
	FAQs on Castor
Radio talk - Chitradurga FM (**102.6**)	Improved cultivation methods of Castor,

Table: 5.Productivity potential and profitability of component technologies demonstrated through frontline demonstrations on castor in central dry zone of Karnataka.

Year	No. of demos	FLD average yield (kg/ha)		% increase in yield	Cost of cultivation (Rs/ha)		Gross returns (Rs/ha)		ANR (Rs/ha)	B:C ratio	
		IT	FP		IT	FP	IT	FP		IT	FP
2009-10	20	967	654	47.8	9650	8506	34812	23544	10124	3.61	2.77
2010-11	20	923	795	16.1	10500	9236	34151	29415	3472	3.25	3.18
2011-12	20	1020	836	22	11000	9458	37740	30932	5266	3.43	3.27
2012-13	25	987	657	50.2	11300	9673	36519	24309	10583	3.23	2.51

2013-14	25	1080	695	55.4	14250	9320	39960	25715	9315	2.80	2.76
2014-15	25	1206	853	41.38	15260	10963	44622	31561	8764	2.92	2.88
Total/Mean	**135**	**1031**	**748**	**39**	**11993**	**9526**	**37967**	**27579**	**7921**	**3.21**	**2.90**

IT=Improved technology; **FP**=Farmers' practice; **ANR**=Additional net returns.

Table:6. Exploitable yield reservoir in castor.

State	No. of FLDs	FLD average yield (kg/ha)		Yield gap-I (%)	Average yield (kg/ha)	Yield gap-II (%)	Production ('000 t)	Expected production ('000 t)	
		IT	FP					EP-I	EP-II
Andhra Pradesh	63	1384	1027	35	633	119	81	109	177
Gujarat	63	2883	2463	17	2061	40	1292	1513	1807
Rajasthan	25	3666	3008	22	1465	150	286	349	716
Karnataka (2012-14)	75	1031	748	39	560	85	12	17	22
All India	**259**	**2396**	**1899**	**26**	**1689**	**42**	**1689**	**2131**	**2396**

(Source: FLD on Oilseeds, 2014)

IT=Improved technology; **FP**=Farmers' practice; **Yield gap-I**= Increase in IT over FP expressed in percentage; **Yield gap-II**= Increase in IT over state average yield expressed in percentage; **EP-I**= Expected production if Yield gap-I is bridged through complete adoption of improved practices; **EP-II**= Expected production if Yield gap-II is bridged through complete adoption of improved practices;