Mysore J. Agric. Sci., 53 (3) : 49-53 (2019)

Constraints in Castor Production and Strategies to Bridge Yield Gap in Traditional and Non-traditional Tract of Karnataka

R. Mohan Kumar and Yamanura
All India Co-ordinated Research Project on Castor, Zonal Agricultural research Station, UAS, GKVK, Bengaluru - 560 065
E-mail : mohankumarr@uasbanagalore.edu.in

Abstract

A study was conceptualized to know the farmer's perception about castor based farming vis-à-vis to study the reason for yield gap in traditional and non-traditional tract of Karnataka. It was known from the status report of Directorate of Economics and Statistics, Government of Karnataka 2017-18 that, Karnataka is having an immense potentiality of castor especially in the agro-ecosystems which are often threatened by the vagaries of monsoon. However, a total of 9527 ha farm land was occupied by castor with an average productivity of 522 kg/ha as against the national average productivity of 1713 kg/ha. With this, Karnataka could able to contribute 4722 tons of castor to national production. Concurrently, a study was initiated through purposive sampling techniques to understand the probable reasons for huge gap in yield. The sample unit in traditional castor growing areas consisted of the farm units of Tumkur, Chitradurga, Ramanagar, Hassan, Bengaluru Rural and Kolar Districts where annual rainfall ranges from 550-700 mm whereas non-traditional castor growing tract which receives fairly higher amount of rainfall (850-2000 mm) coupled with time bound irrigation facilities included Mandya, Mysore and Chamarajanagar Districts. From the study, it was observed that an average productivity of castor in traditional and non-traditional tracts seldom exceeds 500 kg/ha except in Chitradurga district (1875 kg/ha). Further, it was also observed that more than 70 and 92 per cent of the farmers in traditional and non-traditional areas respectively were not been exposed to present day improved cultivars and production technologies, the important factors which discouraged the castor farmers were inadequate rainfall, lack of farm gate procurement, longer duration of crop, lack of fodder value, lack of quality seed material in state seed chain with subsidized distributionand biotic stresses like gray-mold and capsule borer infestation *etc.* There factors are limiting the farmers to adopt improved technologies as a result of which gap in the yield is widening over the years.

Keywords: Castor, Productivity, Production, Strategies and Yield gap

Castor oil is an indispensable source of raw material for a huge group of aeronautical, automobile and pharmaceutical industries. Although India being figured as a global leader in castor production and export, achieving sufficiency is still a formidable task before the country. Out of nine oilseeds crops, castor is the only non-edible oilseed crop showing positive compound annual growth rate along with soybean and rapeseed mustard (Anon., 2017). In-spite of its non-edible nature castor has assumed a prime position in the country, which itself signifies the importance of castor in domestic and global market. Even though good numbers of states are involved in castor cultivation, remunerative production is just confined to a few northern states like Gujarat, Rajasthan and Haryana (Anon., 2016). The states which come in southern part of India are giving countable acreage whereas with meager productivity potential contribution towards total production is negligible. However, Karnataka is one such state which is contributing 10.84 per cent to total area where as production and productivity are significantly lower due to several production constraints *viz*., impotent genotype, non-adoption of improved technologies, biotic stress and market related problems. It was evident from front line demonstrations conducted across the major castor growing areas that the exploitable yield gap observed was about 70 per cent (Anon., 2018 and Jha *et al*., 2011). Hence, a need

was felt to chalk out location specific production constraints in order to enhance the productivity of castor in traditional and non-traditional areas of Karnataka.

Material and Methods

The study area is geographically located in the southern part of Karnataka which falls in the coordinates as follows; Bangalore Urban (12.9700° N, 77.6536° E), Bangalore Rural (13.2847^{0}N, 77.6078^0 E), Chamarajnagar (12.0526^{0}N, 77.2865^0 E), Chitradurga (14.1823^0 N, 76.5488^0 E), Hassan (13.0753^0 N, 76.1784^0 E), Kolar(13.1770^0 N, 78.2020^0 E), Mandya (12.5644^0 N, 76.7337^0 E), Mysore (12.1873^0 N, 76.3637^0 E), Ramanagar (12.6003^0 N, 77.4702^0 E), Tumkur (13.3710^0 N, 76.6413^0 E) and Chikmagalur (13.4045^0 N, 75.6208^0 E). Climatologically the study area comes under the semi-arid tropical climate with annual rainfall ranging from 573 mm to 1031 mm.Some of the important crops of this apart from castor are rice, sugarcane, finger millet, maize, coconut, mulberry and mango.

In the farm units coming under University of Agricultural Sciences, Bengaluru jurisdiction was used for descriptive statistics and the explanatory study.The secondary data pertaining to status of castor over the years was procured from Directorate of Economics and Statistics, Government of Karnataka. Primary data on various socio- economic, crop husbandry and marketing details were collected by formulating a questionnaire comprising various aspects of castor production to solicit response from the farm units of University of Agricultural Sciences, Bengaluru jurisdiction. Hundred farm units were subjected in to critical discussion about various aspects of castor production. Of the total hundred respondents, 85 were selected from traditional area in which 73 were male and 12 were female among which 15 male farmers were selected from non-traditional area.

Results and Discussion

Present scenario of castor in Karnataka

From the perusal of the secondary data obtained from Directorate of Economics and Statistics, Government of Karnataka it could be observed that in Karnataka totally about 9527 ha farm land is under castor cultivation (Table 1 and Fig. 1) of which about 66.53 per cent of area comes under southern Karnataka.

Table 1

Area, production and yield of castor in various districts of Karnataka

District	Area (ha)	Production (tones)	Yield (kg/ha)	% contribution to total area	Difference in productivity as compared with state average
Bangalore urban	95	47	520	1.0	-2.0
Bangalore rural	77	38	523	0.81	1.0
Chamarajanagar	360	44	130	3.78	-392.0
Chitradurga	657	1170	1875	6.90	1353.0
Hassan	797	402	531	8.37	9.0
Kolar	60	30	522	0.63	0.0
Mandya	367	182	522	3.85	0.0
Mysore	796	178	236	8.36	-286.0
Ramanagara	1253	888	746	13.15	224.0
Tumkur	1587	196	130	16.66	-392.0
Chikmagalur	289	143	522	3.03	0.0
Study area	6338	3318	569	66.53	47.0
Karnataka	9527	4722	522	100.00	-

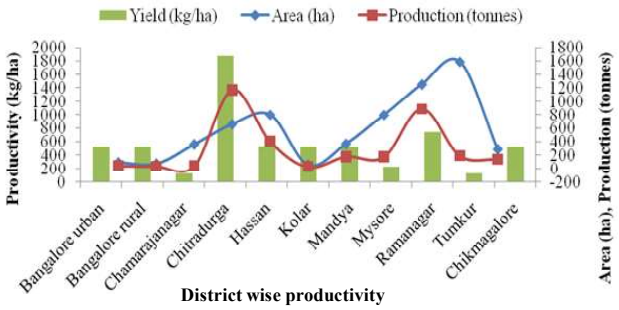

Fig. 1 : Area, production and yield of castor in various districts of southern Karnataka

The average productivity of castor is significantly lower in major castor growing districts of Karnataka when compared with national average (1572 kg/ha), except in Chitradurga district of Karnataka which in rest of the places the productivity of castor seldom exceeds 500 kg per hectare (Fig. 1). Concurrently, reasons for such a substantial yield gap was studied and it was observed from the perception survey that, all most all the castor growers were habituated with local cultivars with poor management practices.Similar opinions were emerged earlier by Dhandhalya and Shiyani, 2009 from their study conducted at Saurashtra region. Further, the farmers expressed concern over seed replacement in castor seed which was almost nil and the reason could be attributed to non-availability of castor seeds in seed chain and also due to lack of subsidies unlike in case of cereals and pulses. Chitradurga district comparatively fared better over other districts (Table 1) in spite of bad weather phenomenon and could able to elevate its average productivity up to 1170 kg/ha which was significantly higher over rest of the districts. The very pertinent reason observed was the active functioning of All India Co-ordinated Research Project on Castor at Hiriyuru centre since three decades that might have contributed by way of exposing castor growers to improved cultivars and other good production practices. Again, from the study it was known that farmers were completely unaware of hybrid technology in castor. The lack of seed replacement rate in castor and its subsidized non-availability were the major hurdles in unlocking the castor productivity. Since, castor being a highly cross pollinated crop, routine seed retention might have built up the inbreeding depression in their

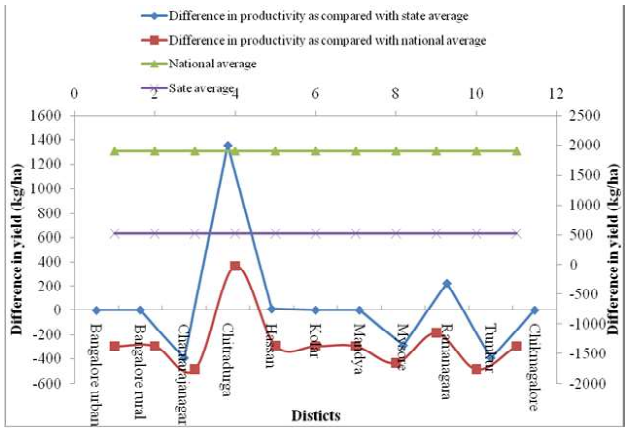

Fig. 2 : Extent deviation in productivity compared with national and state average

local cultivar and was very much pronounced during examination of floral part during field visits, undesirable proportion of male to female ratios in spikes which could have contributed to more than 80 per cent yield reduction in-spite of good crop management practices.

Constraints in castor cultivation

Respondents opinions were raked based on their frequency (Table 3). Inadequate and erratic rainfall, lack of procurement at farm gate, longer duration of crop, lack of fodder value, less remunerative production activity, lack of quality seed material, labor intensive harvesting and post harvesting operations, lack of mechanization, gray-mold incidence and capsule borer incidence were in the order of merit. In general due to change in climatic phenomenon over the decade, commercially cultivable farm lands were receiving substantially subnormal rainfall.Under such situations, due to lack of contingent options farmers were often facing loss in the cropping season. Castor being the long duration crop, under late onset of

TABLE 2

Sample size considered for perception survey in traditional and non-traditional agro-ecosystem

Agro-eco system	Male	Female	Total	Total sampling unit
Traditional	73	12	85	100
Non-traditional	15	0	15	

TABLE 3

Constraints in castor cultivation expressed by castor growers of traditional and non-traditional areas

Sl. No.	Constraints	Traditional agro-ecosystem			Non- traditional agro-ecosystem		
		Frequency of response	%	Rank	Frequency of response	%	Rank
1	Inadequate and erratic rainfall	76	18.8	II	0	0.0	VI
2	Lack of door step procurement	53	13.1	IV	10	9.2	III
3	Longer duration of crop	35	8.6	V	6	5.5	IV
4	Lack of fodder value	85	21.0	I	15	13.8	I
5	Less remunerative	23	5.7	VII	5	4.6	V
6	Lack of quality seed material	56	13.8	III	15	13.8	I
7	Labor intensive harvesting and post harvesting operations	32 II	7.9	VI	15	13.8	I
8	Lack of mechanization	11	2.7	X	13	11.9	II
9	Gray-mold incidence	13	3.2	IX	15	13.8	I
10	Capsule borer incidence	21	5.2	VIII	15	13.8	I

monsoon, successive delay in sowing dates significantly declines the yield due to terminal drought coupled with higher temperature which results in floral abnormalities and reversion in sex ratio resulting in huge yield loss. Further, farmers in both traditional and non-traditional tracts expressed their opined that castor hadnofodder value which limited the farmers to adopt castor as a pure crop over large area. Again it was observed that due to lack of knowledge about improved crop cultivars and hybrid technology in the state seed chain farmers were not able to get good seed material. As a result, seed replacement wasalmostnil, which is not advocated in highly cross pollinated crop like castor. Fragmented land holdings lead to limited quantum of production as a result of which farm gate procurement system was lacking which in turn discouraging the farmers to view castor as an economically viable crop.Similar production constraints were earlier identified and reported by Choudhary*et al.* (2009) at Mandi district of Himachal Pradesh in oilseeds crop.

Yield gap

Based on the component technology *i. e.,* hybrid castor (DCH-519) demonstrated over the 25 acres of farmer's field in comparison with their local cultivar,the gradient of yield at various situations (potential yield, experimental station and farmer's field) was presented in the Figure 3. The gap in yield between potential yield of the castor hybrid DCH-517 and the yield realized at experimental station was 127 kg/ha (8.45 %). Whereas, difference in yield between potential yield and average yield obtained with farmers field was 941 kg/ha (62.73 %). Similarly, 814 kg/ha (59.28 %) was the difference in yield between experimental station and the yield observed at farmers field. The difference in yield potentiality of any crop genotype could be due to variation in environment and management practices which might have adversely influenced the productivity of castor in farmers field. Similar reports were earlier expressed by Jha *et al*. (2011) and Kumar *et al*. (2015).

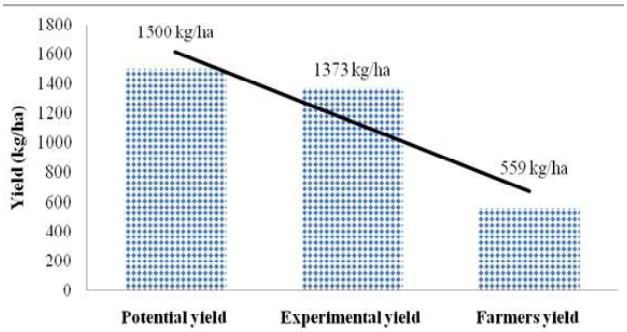

Fig. 3 : Yield gap of castor in Karnataka

TABLE 4

Results of front line demonstration executed by AICRP on Castorfor the year 2018-19

Yield in improved technology(kg/ha)	Yield in farmers practice(kg/ha)	Increase in yield over farmers practice(%)	Cost of cultivation (Rs. ha^{-1})		Gross return (Rs. ha^{-1})		Net return (Rs. ha^{-1})		Benefit cost ratio	
			IT	FP	IT	FP	IT	FP	IT	FP
795.5	559.5	27.7	21600	19545	37390	26290	15790	6745	1.73	1.35

IT-Improved technology (Hybrid castor) ; FP-Farmers practice (Local cultivar)

Strategies to explore area under castor

Based on the results obtained from the front line demonstrations conducted over 25 acres in farmers field indicated that, a mere intervention of hybrid castor over local cultivar alone could able to bridge the gap in yield up to 27.7 per cent (Table 4). Hence, based on various technological gap identified in castor agro-ecosystems, following are the important strategies to be followed to unlock the productivity potential of traditional and non-traditional areas of castor in Karnataka.

In traditional tracts, castor is the inevitable option in cropping system because of lower rainfall, poor soil fertility and less soil depth. In such situation introduction of high yielding cultivar with best crop management practices like soil and moisture conservation, balanced crop nutrition, bio-fertilizer technology may be promoted. In addition to this existing promising cropping systems may be diversified horizontally and vertically with castor so that cropping intensity increases.

In non-traditional tracts, supply of good quality seed material coupled with training cum demonstration of best crop management practices concentrating on biotic stress management such as gray-mold and capsule borer. Fairly higher amount and distribution of rainfall results in prolonged humid periods which harbors the crop especially in Chamarajnagar, Mysore and parts of Hassan & Chikkamanagalore districts.

REFERENCES

ANONYMOUS, 2016, *Agricultural Statistics at a Glance*, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India.

ANONYMOUS, 2017, *http://faostat.fao.org/site/567/default.aspx.*Food and Agriculture Oraganisation of the United Nations.

ANONYMOUS, 2018, *Annual Report, All India Co-ordinated Research Project on Castor*, ICAR-Indian Institute of Oilseeds Research, Hyderabad P-208.

CHOUDHARY, A. K., YADAV, D. S. AND SINGH, A., 2009. Technological and extension yield gaps in oilseedsin Mandi district of Himachal Pradesh. *Indian J. Soil Conserv.,* **37** (3) : 224 - 229.

DHANDHALYA, M. G. AND SHIYANI, R. L., 2009. Production potentials, yield gaps and research prioritization of production constraints in major oilseed crops of Saurashtra region. *Indian J. Agri. Res.*, **43** (1) : 18 - 25.

JHA, G. K., BURMAN, R. R., DUBEY, S. K. AND SINGH, G., 2011, Yield Gap Analysis of Major Oilseeds in India. *J. Comm. Mobilization and Sust. Develop.,* **6** (2) : 209 - 216.

KUMAR, R. M., NADAGOUDA, B. T. AND HIREMATH, S. M., 2015, Studies on farmers perception about maize based cropping system in irrigated ecosystem of Gataprabha Left Bank Cannel. *Plant Archives*, **15** (2) : 959 - 961.

(*Received :* June, 2019 *Accepted :* September, 2019)