

Table 1. Economic returns due to whole package in oilseeds during 2014-15 to 2018-19

Crop	No. of demos	Mean seed yield (kg/ha)		Increase in seed yield (%)	CoC (Rs./ha)		Increase over FP (%)	GMR (₹/ha)		Increase over FP (%)	ANR (₹/ha)	B:C ratio	
		IT	FP		IT	FP		IT	FP			IT	FP
Total oilseeds mean	24035	1513	1215	24.53	24451	22084	10.72	58672	46078	27.33	10227	2.40	2.09

IT=Improved Technology; FP=Farmers Practice; CoC=Cost of Cultivation; GMR=Gross monetary returns; ANR=Additional Net Returns; B:C ratio= Benefit cost ratio

Temporal performance of castor *vis-à-vis* competing crops in Gujarat - A Markov chain analysis

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ABSTRACT

Temporal performance of castor cultivation in Gujarat for the last five decades was studied. The study divided in to five periods and transition probabilities were calculated for castor and its competing crops with respect to area and production. Results indicated that over all share of castor was very high with respect to area (84.8) and production (74.2). Castor share in area during Decade IV and V were low compared to previous periods. However, there was three-fold increase in production contribution in Decade V compared to the earlier period. This increase in production contribution despite of reduction of area retention can be attributed to the release of high yielding public sector hybrids, associated technologies and its large scale adoption by NARES during the last two decades.

Keywords: Castor, Cropping pattern, Crop substitution, Transition probability matrix

Castor is an important industrial oilseed crop grown all over the world. India is the global leader in terms of area, production and productivity and Gujarat occupies first rank in area, production and yield among the states. Cropping pattern in any region is mainly determined by preference of farmers, prices and demand apart from the agro-climatic conditions. In the present context the study analyses the probability of retention of castor cultivation area in future *vis-à-vis* its competing crops.

Area and production of castor and other major competing crops *viz.*, groundnut, rice, wheat, bajra, maize, cotton, gram, tur and others (area under rest of crops) was collected from Directorate of Economics and Statistics, Ministry of Agriculture, GOI for last 50 years (1966 - 2016).

Markov chain analysis is adopted in the present study to know the contribution of area and production by castor and other crops. Markov chain analysis develops a transitional probability matrix (TPM) 'P', whose elements P_{ij} indicate the probability (share) of crop group switching from the i^{th} crop group to the j^{th} crop group over time. Transitional probability matrix which denotes the transition probabilities for every pair of state ($i, j= 1,2,..r$) and has the following properties. (i) $0 \leq P_{ij} \leq 1$ (ii) $\sum P_{ij} = 1$ for $i = 1, 2,..r$. Its diagonal elements represent retention share of respective crop group in terms of area/production under crops. The stability of the

share of crop and their direction of change over a period of time was captured by TPM. As the diagonal elements approaches zero, the crops become less and less stable and as they approach one, they become more and more stable over a period of time (Rao, 2005; Basavaraj *et al.*, 2016).

Temporal data considered for the study was divided in to five periods (decades). Transition probabilities were computed for each decade to study the performance of castor crop over five periods and overall performance of castor also computed by considering the entire study period. The probabilities were converted to per cent values and were presented in Table 1. The results suggested that contribution of castor towards area (84.8) and production (74.2) over five decades is very high compared to other crops.

The individual decadal analyses indicate that castor share was highest in Decade II (62.2) and Decade IV (29.7) was lowest. From Decade III on wards the castor lost its major area to cotton (24.7, 57.8 and 68.9). The reason being during these periods Bt cotton released and become popular globally as well as in India. A perusal of Table 1 shows that castor area slightly gained its share in Decade V but major share was gone to cotton. However, gain in production was more than threefold and cotton lost its contribution in terms of production. This increase in production contribution despite reduction of area

retention can be attributed to the release of high yielding public sector hybrids, associated technologies and its large scale adoption by NARES during the last two decades.

This in-depth analyses reveals that the performance of castor is remarkable and to retain the status of castor in Gujarat focused technology assemblage in low productivity regions of Gujarat could improve yield and thereby increase in production contribution. Taking policy measures such as fixing MSP, establishing linkage between farmer and industry for output marketing or direct buy back by government leads to

reduction in supply chain and fetching more profit would attract the farmers for cultivating the castor.

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Table 1 Transition probabilities for Castor and competing crops

Period	Over all (1966-16)	Decade I (1966-75)	Decade II (1976-85)	Decade III (1986-95)	Decade IV (1996-2005)	Decade V (2006-16)
	Area					
Castor acreage /Retention of previous year (%)	84.8	36.8	62.2	57.8	29.7	31.1
Crop Substitution (%)	Rice (8.7) Maize(4.0) Tur (2.5)	Maize (1.6) Tur (59.6) Wheat (2)	Rice (37.8)	Cotton (24.7) Rice(17.5)	Rice(18.1) Cotton (57.8)	Cotton (68.9)
	Production					
Castor production contribution of previous year (%)	74.2	35.0	56.3	23.6	13.9	43.1
Crop Substitution (%)	Rice (25.7) Gram (0.1)	Wheat (36.0) Maize(19.0) Gram(10.0)	Rice(13.0) Maize (19.0)	Cotton (21.3) Rice(21.8) Maize(29.0) Gram(4.2)	Rice(30.8) Maize(40.2) Bajra(15.1)	Groundnut(1.1) Rice(25.1) Maize(12.3) Cotton(28.3) Tur(5.5)

Performance of oilseeds in India: A temporal study

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ABSTRACT

In India, oilseeds are cultivated on an area of 26 million ha with a production of 29.65 million tonnes primarily under rainfed conditions. Oilseeds production could not keep pace with the growing demands due to changing life style, increasing population and rising per capita income resulting to dependency on imports. The CAGR revealed that across different periods, despite fluctuations in the rate of growth in area, yield contributed to change in production thus suggesting the power of technologies operational at the farm. Multi-pronged strategy through institutional refurbishments for technology assemblage, favourable tariff policy and public private partnerships on seed production, output marketing and value chains needs strengthening for enhancing the domestic production and productivity.

Keywords: Area, Oilseeds, Population, Production

In India, oilseeds are cultivated on an area of 26 million ha with a production of 29.65 million tonnes (Quinquennium ending 2017-18). Although progress has been achieved in production of oilseeds in India, the pace in production is not commensurate to meet the rising demand of consumption and hence heavy dependency on imports has been evidenced in the country post globalization.

An attempt has been made in this paper to examine the performance of oilseeds from 1966-67 to 2017-2018. The study is divided into five periods. Compound Annual Growth Rate (CAGR) for area, production, productivity, cumulative exports earnings and imports were computed to examine performance of each period.

During Period I, the CAGR was 0.47, 3.24 and 2.76 per cent for area, production and productivity