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Prediction of Area Under Castor Crop in the Major Castor Growing Districts of Gujarat State

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ABSTRACT

The crop statistics for the period 1965-66 to 1986-87 showed increasing trend in the area and production of castor crop in Gujarat. More than 85 per cent of the total castor area in Gujarat is shared by Ahmedabad, Banaskantha, Mehsana, Saarkantha and Kutch districts. Analysis showed that lag one year area under castor crop had positive significant influence on castor area. The other important variables influencing castor area are lag one year harvest price of castor for Ahmedabad, Mehsana and Sabarkantha districts, relative profitability of castor over cotton for Mehsana district, lag one year productivity and variation in castor price for Ahmedabad district; total rainfall for Kutch district and lag one year Jower area for Banaskantha district. The precised prediction equations were developed for predicting castor area in major castor growing districts of Gujarat State.

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INTRODUCTION

Castor (*Ricinus communis*, L.) is one of the importnat oilseed crops grown in arid and semi-arid areas of the country. It is one of the important hard currency earners for the country. India is the second largest producer after Brazil and accounts for nearly 25 per cent of the total world castor production (George *et al.* 1985). In India this crop is grown in Andhra Pradesh, Gujarat, Orissa, Karnataka and Tamil Nadu (Table 1).

TABLE 1

Area ('000 ha), production ('000 tonnes) and productivity (kg/ha) of castor for the year 1986-87.

State	*Area*	*Production*	*Productivity*
Andhra Pradesh	270.3	53.1	196
Gujarat	208.8	129.3	619
Orissa	34.8	18.5	532
Karnataka	28.1	23.0	818
Tamil Nadu	21.6	6.6	306
India	592.2	236.6	400

Source : Agricultural situation in India, Vol. **43** (2) : 187.

The cultivation of castor in Gujarat is largely concentrated in North Gujarat and Kutch regions covering Ahmedabad, Banaskantha, Mehsana, Sabarkantha and Kutch districts (Fig. 1), which accounted for more than 85 per cent and about 90 per cent production. Castor is a drought tolerant crop. Area statistic of this crop in Gujarat State (Table 2) shows continuous increasing trend (2.18 per cent). The present study was therefore undertaken (i) to study the influence of price and non-price variables on hectarage of castor crop in five major castor growing districts of Gujarat State and (ii) to develop hectarage response model for castor crop based on price and non-price variables.

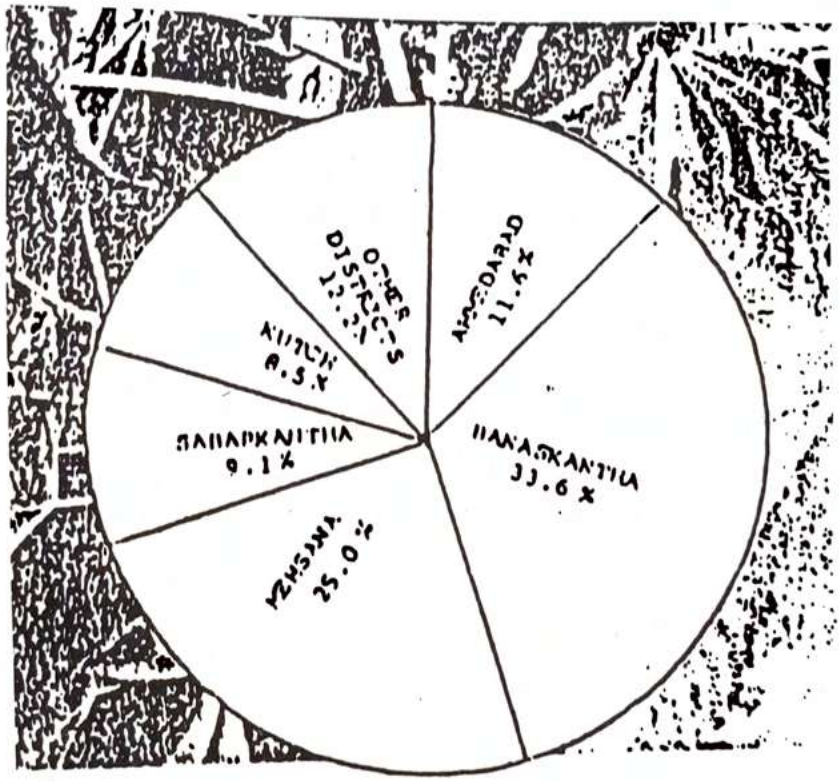

Fig. 1: Castor growing area in Gujarat.

TABLE 2

Area ('00 ha) under castor crop in five districts and Gujarat State for the period 1965-66 to 1986-87.

Year	*Ahmedabad*	*Banaskantha*	*Mehsana*	*Sabarkantha*	*Kutch*	*Gujarat*
1965-66	25	145	206	35	63	555
1970-71	23	166	157	44	103	577
1975-76	38	314	323	41	108	938
1980-81	147	490	585	120	242	1810
1985-86	218	679	650	220	322	2399
1986-87	243	705	521	189	177	2088

Source : Season and crop reports, Directorate of Agriculture, Gujarat State, Ahmedabad.

MATERIALS AND METHODS

The data on area, production, productivity and harvest price of castor as well as competitive crops (cotton, bajri and jowar) and rainfall for the period 1965-66 to 1986-87 were collected from the Directorate of Agriculture, Gujarat State. These data were used to derive variables like lag area, lag year productivity, lag year price, risk variables (worked out by standard deviation), relative risk variables (worked out by C.V.%) and ratio type variables (relative profitability). The data were subjected to regression analysis including step-wise regression.

RESULTS AND DISCUSSION

The results (Table 2) indicated that the atea under castor crop in Gujarat State has increased from 55,500 ha in 1965-66 to 2,08,800 ha in 1986-87 (i.e. 3.8 times). During the same period, the increase in area under castor was from 2500 ha to 24,300 ha in Ahmedabad district (9.7 times), from 14,500 ha to 70,500 ha in Banaskantha district (4.9 times), from 20,600 ha to 52,100 ha in Mehsana district (2.5 times), from 3500 ha to 18,900 ha in Sabarkantha district (4.5 times), from 6300 ha to 17,700 ha in Kutch district (2.8 times). The increasing trend in crop area could be attributed to increased damand of oil in national as well as international market and low risk in cultivation of crop being drought tolerant (George *et al.*, 1985).

The correlation analysis revealed that the area under castor crop in current year (CA_t) was significantly influenced by the lag one year area under castor (CA_{t-1}) in all the districts (Table 3). The trend was linear ($r < 0.90$). These results are akin to those reported by Boom-Raung *et al.* (1971) and Acharya and Bhatiya (1974). Similarly CA_t had positive significant association with lag one year castor price (CP_{t-1}) and productivity of castor in lag one year (CY_{t-1}).

TABLE 3

Estimates of correlation coefficients between a under castor (CA_t) and other variables.

Variables	*Ahmedabad*	*Banaskantha*	*Mehsana*	*Sabarkantha*	*Kutch*
CA_{t-1}	0.9602**	0.9725**	0.9630**	0.9220**	0.7493**
CY_{t-1}	0.5853**	0.8803**	0.8054**	0.5319*	0.1189
CP_{t-1}	0.9160**	0.8412**	0.8455**	0.8883**	0.6537**
$C\hat{G}P_t$	0.5949**	0.5734**	0.4114	0.7793**	0.2098
$B.A_{t-1}$	-0.5433**	-0.6118**	-0.7097**	-0.4304*	-0.1915
$CO.A_{t-1}$	-0.4679*	—	-0.5326*	-0.2580	—
$CO.Y_{t-1}$	-0.1790	—	0.0992	-0.7428**	—
$CO.P_{t-1}$	0.8664**	—	0.8845**	0.7738**	—
$J.A_{t-1}$	—	-0.2304	—	—	—
$J.P_{t-1}$	—	0.8367**	—	—	—
RT	0.0641	-0.0700	0.1035	-0.1101	0.3362

Legend : * and ** indicate significat ant 5 and 1 per cent level of significance respectively.

The latter was not significant for Kutch district. The CA_t had negative association with area under bajra crop in previous year (BA_{t-1}). Like Bajra, cotton in Ahmedabad, Mehsana and Sabarkantha district and jowar in Banaskantha district were the competing crops for castor crop.

The results (Table 3) showed that some of variables had no significant impact or low effect on CA_t indicating that inclusion of such variables in models may not be much useful from simplicity as well efficiency view points. The step-wise regression analysis helps in determining appropriate model. The following prediction models for major castor growing districts were obtained through step-wise regression analysis having high predictability (as well as simplicity).

District	*Model*	R^2
Ahmedabad	$C\hat{A}_t = 0.7045\ CA_{t-1} + 0.2896\ CP_{t-1} - 29.9323$ $(0.0927)\quad\quad (0.0673)$	0.96
Banaskantha	$C\hat{A}_t = 0.9852\ CA_{t-1} - 0.2054\ JA_{t-1} + 241.0655$ $(0.0472)\quad\quad (0.0772)$	0.96
Mehsana	$C\hat{A}_t = 0.7916\ CA_{t-1} + .0954\ CY_{t-1} - 3.7725$ $(0.0726)\quad\quad (0.0310)$	0.95
Sabarkantha	$C\hat{A}_t = 0.6168\ CA_{t-1} + .2562\ CP_{t-1} - 16.3425$ $(0.0951)\quad\quad (0.0518)$	0.93
Kutch log	$C\hat{A}_t = 0.7370 \log CA_{t-1} + 0.4890 \log R_t - 0.6035$ $(0.1143)\quad\quad (0.1185)$	0.75

(**Note** : Figures in parenthises given with each equation indicate S.E. of regression coefficient)

$C\hat{A}_t$ = Predicted castor area in the year 't' ('00 ha)

CA_{t-1} = Actual castor area in the year 't-1' ('00 ha)

CY_{t-1} = Productivity of castor in the year 't-1' (kg/ha)

CP_{t-1} = Harvest price of castor in the year 't-1' (Rs/q)

JA_{t-1} = Jowar area in the year 't-1' ('00 ha)

R_t = Total rainfall in the year 't' (mm)

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