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TECHNOLOGICAL CHANGES IN CASTOR PRODUCTION-A STUDY ON COMBINED ANDHRA PRADESH

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Abstract
Agricultural growth throughout global history has been the pro-genitor of broad based economic growth and development as linkages between farm and non-farm economies generated widely based employment, income and growth. The study of technological changes in the production of oilseeds crop, Castor becomes imperative for proper planning of agricultural development. Combined Andhra Pradesh is the Deccan Region of South India located among the rivers Godavari, Krishna and Tungabhadra. Bay of Bengal on the East, Tamilnadu on the South, Karnataka and Maharashtra on the West, Madhya Pradesh, Chhattisgarh and Orissa on North surround it. All the three regions in Andhra Pradesh contain a rich potential of human agriculture, forest, fishery and mineral resources, water resources of sea, rivers, canals, tanks and hill valleys which remained fully exploited for the past 55 years. Castor oil is a vegetable oil obtained from the castor bean. It naturally biodegrades quickly and comes from a renewable energy resource. Castor crop is raised during kharif season in Andhra Pradesh. The study of technological changes in the production of oilseeds crop, Castor becomes imperative for proper planning of agricultural development. It is proposed to examine the performance of oilseed crop, Castor, in combined Andhra Pradesh. The performance of Castor crop may be studied through growth in Castor area, production and yield.

Castor oil is a vegetable oil obtained from the castor bean. It naturally biodegrades quickly and comes from a renewable energy resource. Technically it is called as Ricinus Communis. The common name ‘castor oil’ likely comes from its use as a replacement for castoreum, a perfume base made from the dried perineal glands of the beaver. Beaver is the name of the castor in Latin. Castor seeds have been found in Egyptian tombs dating back to 4000 B.C. Herodotus and other Greek travelers have noted the use of castor seed oil for lighting body an ointments.

The castor oil plant can vary greatly in its growth habit and appearance. It is a fast growing, suckering perennial shrub. Which can reach the size of small tree, but it is not hardy. In areas prone to frost it is usually shorter and grown as if it were an annual. It can reach a height of 2 – 3 m in a year. The glossy leaves are 15 – 45 cm long, palmate, with 5 – 12 deep lobes and toothed margins. Their color varies from dark green, sometimes with a reddish finger, to dark reddish purple or bronze. The stems and the spherical, spiny seedpods also vary in pigmentation. The pods are showier than the flowers.

Castor seed is the source of castor oil, which has a wide variety of uses. The seeds contain between 40 percent and 60 percent oil that is rich in triglycerides, mainly ricinolein. They also contain ricin, a poison, which is also present in lower concentrations throughout the plant. Castor oil also contains 3 to 4 percent of both oleic and linoleic acids. Castor oil maintains its fluidity at both extremely high and low temperatures. Global castor seed production is around one million fens per year. Leading producing areas are India, China and Brazil. The use of castor seed oil in India has been documents since 2000 B.C for use in lamps and in local medicine as a laxative. Purgative and cathartic in unani, Ayurvedic and other ethno medical systems.

Castor oil and its derivatives have applications in the manufacturing at soaps, lubricants, hydraulic and brake fluids, paints, dyes. Coatings, inks, cold resistant plastics, waxes and polishes, nylon, pharmaceuticals and perfumes. In internal combustion engines, castor oil is renowned for its ability to lubricate under extreme conditions and temperatures, such as in air – cooled engines. The lubricants company Castrol takes its name from castor oil. However, castor oil tends to form gums in a short time, and its use is therefore restricted to engines that are regularly rebuilt, such as motorcycle race engines.

In the food industry, castor oil is used in food additives, flavoring candy, i.e., chocolate, as a mold inhibitor, and in packaging, Polyoxyethylated castor is also used in the foodstuff industries.

Medicinal castor oil was used for skin problems, burn, sunburns, skin disorders, skin cuts, abrasions etc. As study found that castor oil decreased pain more than ultrasound gel or Vaseline during extracorporeal shock wave application. The oil is also used as a rub or pack for various ailments, including abdominal complaints, headaches, muscle pains, inflammatory conditions, skin eruptions, lesions, and sinusitis. Cold pressed castor oil has been used or time – tested for centuries throughout the world for its anti-microbial and anti-bacterial properties long before any government agency was created to regulate medicines.

Castor oil has over 1000-patented industrial applications and is used in automobile, aviation, cosmetics, electrical, electronics, manufacturing, pharmaceutical, plastics, and telecommunications. The following is a brief list of castor oil uses in the above industries: adhesives brake fluids, Caulks, dyes, electrical liquid, dielectrics, humectants, inks, lacquers, leather treatments, lubricating greases, machining oils, paints, pigments, refrigeration lubricants, rubbers textiles, washing powders and waxes. Castor oil's high lubricity is superior to petroleum, based lubricants, for instance, it really clings to metal, especially hot metal and is used in racing and jet engines, castor oil is non – toxic and quickly biodegrades. Castor oil is non – drying oil, thus, it remains liquid for a long time. As a result, it's naturally a good lubricant, and was a fuel for lamps before alternating current electricity was invented. In India, it is used as the best lamp, giving an excellent white light, vying in brilliancy with electricity, far superior to petroleum, rape seed, and all other oils, whether vegetable animal or mineral.

Pure cold pressed castor oil is really tasteless and odorless. When additives are added to pure cold pressed castor oil, the oil becomes adulterated and the taste and smell can change according to the additives. Also, pure cold pressed castor is potent and can be an eye irritant similar to pepper spray. So avoid contact with eyes. A castor oil pack is made by soaking a piece of flannel in castor oil, then putting it on the area of complaint and placing a heat source, such as a hot water bottle.

Castor crop is raised during kharif season in Andhra Pradesh. The area under castor during 2004-05 is 2, 71,600 hectares and the production and yield of this crop during the same period is 1, 05,437tones and 453 Kgs/hectare respectively.

Review

Badals and Singh's [1] study on 'technological changes in Maize Production' reveals that the technological change was attributed for 30 per cent of total yield increase by HYV's technology in Maize production. Mimmat Singh[2] examined the nature structure and growth of agricultural sector in Punjab. Khatri[3] and other's study on groundnut yield, reveals that the crop yield could be satisfactory

predicted by the end of September with forecast error of 2.48 per cent. Krishna Mohan[4] analyzed the impact of new technology on agrarian structure and agriculture production. ParthaSaradhy[5], Singh's study [6] reveals that there is the main factor for the total growth of production of oilseeds crops. SubbaRamaraju[7] and other's study indicates that the return to scale under irrigated area was found to be significant.

Methodology

The study of technological changes in the production of oilseeds crop, Castor becomes imperative for proper planning of agricultural development. It is proposed to examine the performance of oilseed crop, Castor, in combined Andhra Pradesh. The performance of Castor crop may be studied through growth in Castor area, production and yield. It is also examined, the variability in production of Castor and the effect of technological changes on Castor output. Therefore, the main objectives of the study are:

1. To determine the trends in area, production and yield of Castor crop in Andhra Pradesh.
2. To study the variability in the production and technological changes in Castor production.

The study was conducted for the period of forty years (1965-66 to 2004–2005). The study period was divided into two sub periods.

1. Pre-green revolution and green revolution period (1965-85)
2. Post-green revolution and TMO's period (1985 – 2005)
3. Over all period (1965 – 2005).

To fulfill the first objective, compound growth rate was estimated by fitting the exponential function for the three periods. The adopted exponential function is:

$$Y = AB^t \qquad (1)$$

Where Y = Area/ production/yield, A = Constant, B = Coefficient of time , t = time (Years), r = Compound growth rate

The percentage of compound growth rate r = (B-1) .100

The coefficient of variation was used to know the instability in oilseed production.

$$CV = \frac{\text{standerd deviation}}{\text{Mean}} X100$$

To examine the technological changes for groundnut crop in each region, the following exponential production function has been adopted.

$$Y = \alpha X^{\beta} e^{\lambda t} \mu \qquad (2)$$

Where Y = Production, X = Area, t = Time period

α, β, λ have their usual meanings and μ is the disturbance term, distributed normally and independently. Equation (2) is a non-linear equation. It is not possible to estimate as it is; we have to convert this function into linear form by adopting logarithms.

$$\text{Log } Y = \log \alpha + \beta \log X + \lambda t \qquad (3)$$

To study the technological change in agricultural production before and after the green revolution, two functions were estimated separately.

$$\left.\begin{aligned}\log\ Y_1 &= \log \alpha_1 + \beta_1 \log X + \lambda_1 t \\ \log\ Y_2 &= \log \alpha_2 + \beta_2 \log X + \lambda_2 t\end{aligned}\right\} \quad (4)$$

To study the change in production due to the change in period, the following equation was fitted.

$Y = \alpha X^{\beta} e^{\lambda t}\ e^{\delta D} \mu$ (5)

After taking logarithms, the above exponential function is

$\log Y = \log \alpha + \beta \log X + \lambda t + \delta D$ (6)

Where 'D' is the dummy variable, which takes values 'zero' and 'one' respectively, representing the two periods. The dummy variable 'D' takes 'zero' during the period 'I' and 'one' during the period II. Here 'zero' is meant for the effect of no new technology, while 'one' is meant for the effect of new technology.

The t-test was used for testing the significance of estimated co-efficient. $t = \frac{\hat{B}}{SEofB}$;

(SE = Standard Error) (7)

The collective effect of all explanatory variables on explained variable is denoted by R^2. It is called as the multiple correlation coefficients.

$R^2 = 1 - \sum e_i^2 / \sum y_i^2$ (8)

For the significance of R^2, F-test statistic was been adopted.

$$F = \frac{R^2/(K-1)}{(1-R^2)(N-K)} \quad (9)$$

Where N=No. of observations, K= No. of variables

Data

The data relating to area, production and productivity of Castor crop in Andhra Pradesh region was obtained from various issues of Seasons and Crop Reports of Andhra Pradesh issued by The Director, Bureau of Economics and Statistics, Hyderabad.

Analysis

The study of growth and instability in agriculture is an important concept in estimating the future production, yield and area. With the help of these estimates it is possible to take policy decisions to meet the future demands of the country. The increasing population creates demand to oilseed commodities. To meet the forth-coming demand for oil and oilseeds, it is necessary to study the growth and performance of Castor crop. Equation (1), was fed with the data and the results are given in the following table for the three periods in Andhra Pradesh andanalyzed accordingly

The Estimated Growth Rates and Instabilities (Andhra Pradesh)

	Period	Intercept	Regression Coefficient	SE	CGR	CV
Area	I	138.6099	0.7992	2.6678	-20.816	19.34
	II	1832.336	0.7201	1.2539	-27.9861	18.48
	III	8866.789	0.6036	2.0701	-39.6362	18.97
Production	I	31.7285	0.8841	1.5920	-11.5852	41.29
	II	2.0393	1.2705*	1.1453	27.0483	31.66

	III	0.0070	2.0088*	1.3972	100.8844	38.83
Yield	I	17.3622	0.8686	1.9249	-13.1355	25.84
	II	0.9796	1.8419*	1.1330	84.1934	24.91
	III	0.0178	3.5003*	1.4741	250.0276	31.00

Area

From the above table, the estimated coefficient of variation in castor area is 19.34 percent, 18.48 percent, 18.97 percent during the periods I, II and III respectively. i.e, during the first period, the highest instability in area under castor crop was recorded.

The estimated regression coefficients of castor area in Andhra Pradesh are less the one, during the three periods. It reveals a decreasing tendency in area under castor crop. The coefficient of time is 0.80 during the first period, 0.72 during the second period and 0.60 during the third period. It shows, during the three periods, i.e, pre-green revolution and green revolution period, post-green revolution and TMO's period and over all 40 years period, every year some percent area is increasing, but it is not significant increase. That means, an insignificant increase in castor's area was noticed. This is because of unfavorable market prices, low demand for the production, lack of irrigation facilities may influence the farmers to allocate less area under castor crop in Andhra Pradesh.

A negative compound growth rates were noticed during the three periods under the castor area Andhra Pradesh. These negative growth rates were –20.08 percent, -27.99 percent and –39.64 percent in periods I, II and III respectively. The effect of green revolution and TMO may not affect positively the increase in castor's area in Andhra Pradesh. It is inferred that, the technological effect on castor is absent.

Production

In the case of castor's production in Andhra Pradesh the 41.29 percent, 31.66 percent, 38.83 percent of instability was recorded in period I, II and III respectively. The less percentage of variation was noticed in period II, i.e., post green revolution and TMO period. The highest percentage of variation was noticed in period I, i.e., pre-green revolution and green revolution period.

The estimated regression coefficient of castor production is less than one during the pre-green revolution and green revolution period. It is 0.88. This leads a decreasing growth in castor's production. But this decrease is not a significant decrease. The average annual increase over the previous period is maximum (2.01) in period III, i.e. over all period. This increase is a significant increase. Similarly, during the period II, i.e., post-green revolution and TMO's period also, a positive and significant increase was observed. This significant annual increase may be due to use of high yielding varieties of seeds, fertilizers and pesticides. From the above analysis TMO's operations may affect the castor's production in period II.

Observing the compound growth rates, a negative growth rate was recorded during the first period, i.e., pre-green revolution and green revolution period. It is –11.59 percent. This negative growth may be due to lack of technology and lack of water resources etc. Hence, the compound growth rate is positive during the period II and III.

These positive growth rates are 27.05 percent and 100.88 percent. During the third period, an abnormal growth was noticed in castor production.

Yield

The highest instability in yield under castor crop was recorded during the third period. It is 31 percent. Only 24.91 percent of variation was recorded during the second period. i.e., post-green revolution and TMO's period. During the first period, the instability in castor yield is 25.84 percent.

The estimated regression coefficients of castor yield are less than one during the first period. This is 0.8686. It expresses a decreasing tendency in yield under castor crop. But, the decrease in castor's yield during the period I is not significant. Hence, during the periods II and III, the average annual increase over the previous period is 1.84 and 3.50 respectively. This increase is significant increase. This significant increase may be due to use of high yielding varieties, fertilizers and pesticides and favorable weather conditions etc.

A negative compound growth rate in castor's yield was recorded only during the first period, i.e., pre-green revolution and green revolution period and it is –13.16 percent. During the II and III periods, a positive growth rates were observed and these are 84.19 percent and 250.03 percent respectively. These positive growths may be due to use of new technology, high yielding varieties, fertilizers, favorable weather conditions, favorable government attitudes etc. Finally, it is concluded that the yield under castor crop may affect the area and production growth in Andhra Pradesh

Castor – Andhra Pradesh

The technological changes in Castor production in the state of Andhra Pradesh was studied with the help of equation (3). It is estimated and the estimated parameters of the variables area and time were given in table 5.4. The coefficients are tested by t-test statistic it is also shown in the table along with F-test statistic

Table 5.4,The Estimated Regression Coefficients Of Castor in Andhra Pradesh

Parameter	Estimation	SE	t	R^2	F
no=20					
α	-9.0628	4.2246		0.5768	11.5873*
β	1.5908	0.3352	4.7433*		
λ	-0.0200	0.0110	1.8182**		
no=20					
α	-6.1930	2.4094		0.7889	31.7707*
β	1.3603	0.1906	7.1384*		
λ	0.0351	0.0063	5.5662*		
no=40					
α	-7.2606	2.6389		0.6334	31.9579*
β	1.4305	0.2093	6.8333*		
λ	0.0181	0.0035	5.2243*		

* : Significant at 5% Probability level
**: Significant at 10% Probability level.

From the given table 5.4, it is noticed that the estimated coefficient of area under castor is (1.5908) positive. It established a positive relationship between castor area and production during the period I, in Andhra Pradesh i.e., every one hectare increase in area will raise the castor production by 1.59 tones. This increase is a significant increase, proved by t-test statistic. The estimated value of λ is (-

0.0200) negative. Every year, the castor production is decreased by 2.0 percent. Here, this decrease is a significant decrease. Therefore, castor production is responded by area, but not by time during the pre-green revolution and green revolution period. Hence, the technological effect is negative and significant. It reveals that the technology may be miss used or excessively used. There is some possibility to raise the production by appropriate usage of new agricultural technology during the period I in Andhra Pradesh state. From the value of R^2, the combined effect of explanatory variables on explained variable, castor production is 0.5768. More than 57 percent of variation in castor production was observed by these two variables area and time. The estimated value of F-test statistic shows that this collective effect is a significant effect. The intercept value is (-9.0628) negative.

During the period II, in Andhra Pradesh, the coefficient of area is (1.3603) positive and significant. A positive and significant relationship was established between area and production. An increase of one hectare in castor area will increase the castor production by 1.36 tones. The area is significantly influencing the castor's production in Andhra Pradesh. The coefficient of time variable (λ) is (0.0352) positive. It reveals that, every year, the castor production is increased by 3.5 percent. This increase is significant. The multiple correlations co-efficient R^2 is 0.7889. Nearly 79 percent of variation in castor production was recorded. It is observed that the collective effect of all independent variables on castor production is 79 percent. From F-test statistic, this collective effect is found to be significant. The intercept value is (-6.1930) negative.

From the table 5.4, it is observed that the co-efficient value of area is (1.4305) positive. It means a positive relationship was noticed between castor area and production. For every one-hectare increase in castor area, will increases 1.43 tones of castor production and this increase is a significant increase. The coefficient of λ is (0.0181) positive. Every year, the castor production is increased by 2.00 percent. From t-test statistic, this increase is a significant increase. Here, the effect of technology on castor was observed. Therefore, castor production is responded by both the variables area and time. The value of R^2 is 0.6334. It means the aggregate effect of explanatory variables on explained variable, castor production, is 63 percent. Here, these two observed 63 percent of variation in castor production exogenous variables are and time. This collective effect is a significant effect. The intercept value is (-7.2606) negative.

Comparing the estimated values, during Pre-green revolution and green-revolution period and post-green revolution and TMO period, castor production was positively responded by its area. A significant response of area on production was recorded during the both periods. From the co-efficient of time, it is observed a positive and significant effect in both periods. Here, technology effect on castor production is favorable. In period II, the effect of time factor is positive and significant. It expresses that the new technology may be used sufficiently. In over all period, both the endogenous variables influencing the castor production positively and significantly. Hence, a positive technological effect on production may be recorded in Andhra Pradesh state.

In regression analysis it frequently happens that the dependent variable is influenced, not only by variables which can be readily Quantified on some well – defined scale, but also by variables which are essentially Qualitative in nature. Since such Qualitative variables usually indicate the presence or absence of a "Quality" or an attribute. Such variables or attributes is by constructing artificial variables which take on values of 1 or 0, 0 indicating the absence of an attribute and 1 indicating the presence of that attribute. Variables, which assume such 0 and 1 values, are called dummy variable. Alternative names are indicator variable, binary variable, categorical variables, Qualitative variable and

dichotomous variable. Here, to determine the net effect of technology on castor production, a dummy variable 'D' was introduced in the Cobb – Douglas model, during the two periods, i.e., Pre – green revolution and green revolution period and Post – green revolution and TMO's period. The dummy variable takes "zero" during the period 'One' and 'one' during the period two. It the value of 'δ' value is low positive expresses that, the technological effect on output is absent. If the value of 'δ' is negative/low value, the technological influence may be negative on castor's output. It 'δ' value is very low; it is a negligible effect of technology. If the 'δ' value is negative and significant, the impact of new technology was not observed on crop production.

The equation (6) was fed with the data relating to Castor crop for three regions Rayalaseema, Coastal Andhra and Telangana and entire state of Andhra Pradesh. The coefficients from the estimated equations were given in table 5.5.

Table 5.5,The Estimated Coefficients of Castor

	no=40					
Andhra Pradesh	α	-7.1264	2.7107		0.6342	20.8083*
	β	1.4208	0.2145	6.6247*		
	λ	0.0163	0.0071	2.2973*		
	δ	0.2477	0.1018	2.4332*		

* : Significant at 5% Probability level
**: Significant at 10% Probability level.

The coefficient of dummy variable is positive and it is significant at 5 percent probability level in the state of Andhra Pradesh. The value of δ is 0.2477. The effect of new technology is positive on castor's production. The castor production is increasing by the effect of new agricultural technology. The collective effect of three independent variables on castor's production in Andhra Pradesh was 0.6342, which observed by the value of R^2. It means 63.42 percent of variation in castor's output was noticed by the independent variables. This aggregate effect was significant at 5 percent probability level. The coefficient of land, i.e., the value of 'β' is 1.4208. It is positive and significant at 5 percent probability level. For every one-hectare increase in castor's area, 1.42 tones production will be raised. The coefficient of time, i.e., the value of λ is (0.0163) positive. Every year, the castor's production may be increased by 0.0163 tonnes. This increase is a significant increase. The significance of λ is proved by t-test statistic. The value of constant term (α) is (-7.1264). It is negative. Here, three variables influence the crop positively and significantly.

Observing the Andhra Pradesh the Castor production is positively significantly influenced by the new agricultural technology. Later, time and area factors were also significantly influence.

References

1 Acharya, S.S., and Bhatia, S; "Acreage Response to price, yield and Rainfall Changes in Rajasthan", Agricultural Situation in India Vol. 29, No. 4, July 1974.

2 Ashok Parikh and Pravin, Trivedi., "Impact of Irrigation and Fertilizers on the Growth of output in Andhra Pradesh", A Bayesian approach. Indian Journal of Agricultural Economics, Page No. 159-170.

3 Acharya S.S. "Oilseeds and Pulses – Price Policy and production performances", Indian Journal of Agricultural Economics, 1993, Vol: 48, No: 3, July. Sept. Pp 317-333.
4 Jan. R. Wills; "Green Revolution and agricultural employment and income Distribution in farm sector of Bangaldesh", Economic Affairs, Vol:30. June 1985, Pp 129-135.
5 Krishan Mohan. P. "New Technology and its impact on Agrarian structure and Agricultural production. A case study of Andhra Pradesh", Agricultural Situation in India. May 1985.
6 Sen S.R; "Growth and Instability in Indian agriculture", A address to the twentieth conference of the Indian Society of Agriculture statistics, Jan 10- 12, 1967.