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Impact of Technological Developments on Oil Seeds in Combined Andhra Pradesh

Dr.V. Mary Madhuri

Lecturer in Economics
K.S.N Government Degree College (W)(A), Anantapur, Andhra Pradesh.

Abstract:
When we observed globally, it clearly shows that no country has moved from the stage of chronic stagnation to the take-off stage of economic development without first achieving a substantial increase in agricultural production. In Andhra Pradesh a large proportion of labour force depends on agriculture in the state when compared with all India level (56.2%). In case of oilseeds, India is the fourth largest producer, in terms of output and second in terms of area. Oilseeds, sharing 14 percent of the gross cropped area and accounting for nearly 5 percent of gross national product and 10 percent of the value of all agricultural productivity. Oil seeds production programme has been implementing in Andhra Pradesh, under central sponsored scheme under TMO since 1986. the main objective of the study is to examine the technological change in the Sesamum crop in Combined Andhra Pradesh.

Keywords: Oil seeds, Agriculture, Technology

1. Introduction:

Historical records clearly show that no country has moved from the stage of chronic stagnation to the take-off stage of economic development without first achieving a substantial increase in agricultural production. So, Agriculture worldwide is a vital determinant of the livelihoods of smallholder's farmers and rural communities. In India, Andhra Pradesh is one of the most important agrarian economies. In Andhra Pradesh a large proportion of labour force depends on agriculture in the state when compared with all India level (56.2%).

Combined Andhra Pradesh state, Telugu State before bifurfication 2014, is the fifth largest economy in the country after Maharashtra, Uttar Pradesh, Tamil Nadu and West Bengal. Andhra Pradesh is known as a "River State f India". Irrigation has grown from 2.90 million hectares in 1960-61 to 4.29 million hectares in 1999-2000 changes in cropping pattern gross cropped area is 121.8 hectares in 1958-59, 125.1 hectares in 1978-79 and 130.6 hectares in 1998-1999. Andhra Pradesh is well known as a rice-bowl of South India. Andhra Pradesh accounts for 7.54 percent of the country's food-grain production. In fact the state was known as the granary of the South India till recently.

In case of oilseeds, India is the fourth largest producer, in terms of output and second in terms of area. Oilseeds, sharing 14 percent of the gross cropped area and accounting for nearly 5 percent of gross national product and 10 percent of the value of all agricultural productivity. Being employment intensive, about 14 million persons are engaged in the production of oilseed industries and another 5

million in the oilseed processing industries. But in India, because of increasing population, increasing demand of oil, unfavourable weather conditions, lack of irrigation and marketing facilities, lack of new technology, the production of oilseeds is decreasing in India. So agricultural development, mainly, oilseeds productivity depends largely on the extent of new technology used by the farmers.

Sesamum thought to have originated in Africa is considered to be the oldest oilseed crop known to man and is now grown in many parts of the world. Today, it is mostly grown in India and the Far East. The name Sesamum and most of its pendants in present day. European languages go back to Greek Sesamon, which is a non-Indo-European loan. Sesamum seeds can be off-white, brownish, grey or black. The leaves of the Sesamum plant are not used in Kitchen. Seeds, which are either simply dried or dried and toasted. The dried seeds taste nutty; toasting dramatically increases their flavour. Dark Sesamum oil has a strong.

Sesamum seed is an important source of edible oil and is also widely used as a spice. The seed contains 50 to 60 percent oil, which has excellent stability due to the presence of natural antioxidants such as Sesamolin, Sesamin and Sesamol. In Andhra Pradesh, Sesamum crop is cultivated both Karif and Rabi seasons. Total world production of Sesamum in 1986 was 2.4 million metric tons, 65 percent of which was produced in Asia. Small farmers in developing countries in the Southern latitudes primarily grow Sesamum. Sesamum yields are highly variable depending upon the growing environment. Cultural practices and cultivar. A major contributing factor to low yield in Sesamum is that the seed capsules shatter causing a loss of large amounts of seed. Particularly when the crop is machine harvested. The area, production and yield of Sesamum crop during the 2004-05 is 209284 hectares, 37664 tonnes and 180 kgs / hectare respectively.

The extent use of new technology refers the extent of new technology to the adoption of high yielding varieties of seeds, fertilizers and pesticides, modern irrigation facilities, efficient crop management and plant protection practices in respect of all important oilseed crops grown by the farmers. Technology is one of the most important forces, which alter the structure of an economy. The technological break-through in agriculture, which witnessed the nation during late sixties, benefited the forming community to a considerable extent. It helped in increasing the farm income, which ultimately affected the consumption and saving pattern of the farm families. Side-by-side the farmers would be motivated to increase the efficiency of production and make such adjustment in their investment pattern, as to meet fully the consumer's demand

The Oil seeds production programme has been implementing in Andhra Pradesh, under central sponsored scheme under TMO since 1986. To provide flexibility to the states in implementation of this programme based on regionally differentiated approach, to promote crop diversification, to provide focused approach to the programmes and in view of the suggestions of the planning commission, the oilseeds production programme has been modified by the Government of India and merged in to one centrally sponsored scheme namely Integrated scheme of Oilseeds, pulses, Oil palm and Maize (IS0 POM) during the 10^{th} five year plan. The ISOPOM for oilseed crops is being implemented during 2004-05 in all districts of Andhra Pradesh. Groundnut, Castor, Sesamum, Sunflower, Linseed are the important Oilseed crops in Andhra Pradesh.

To analyse the technological development of oilseed crops in the state, it is considered the exponential functions. Therefore, the main objective of the study is:

- To examine the technological change in the Sesamum crop in Combined Andhra Pradesh.

For this the following exponential production function has been adopted.

$Y=\alpha x^{\beta} e^{\lambda t}\ \mu$

where Y= Production (in tonnes)

X= Area (in hectares)

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.

$\log y = \log \alpha + \beta \log x + \lambda t$

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

$\log Y_1 = \log \alpha_1 + \beta_{21} \log X + \lambda_1 t$

$\log Y_2 = \log \alpha_2 + \beta_2 \log X + \lambda_2 t$

The subscripts 1 and 2 were used to represent the two periods.

The significance difference between the Co-efficiencies of the two periods may be attributed has the change in production process after green revolution. To study the change in production due to the change in period, the following equation was fitted.

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

The above exponential function is given below after taking logarithms.

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

Where 'D' is the dummy variable, which takes values 'o' and '1' respectively representing the two periods. The dummy variable 'D' takes 'o' during the period 'I' and '1' during the period I. Here 'o' is meant for the effect of no new technology, while '1' is meant for the effect of new technology.

The t-test was performed for testing the estimated co-efficient in each equation.

$$t = \frac{\hat{B}}{SEofB}$$

(SE = Standard Error)

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

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

To test the significance of the combined effect of all explanatory variables on explained variable, F-test statistic has been adopted.

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

Where N=No. of observations

K= No. of variables

DATA:

The data relating to area, production and yield under major oilseed crops. Sesamum in the state was obtained from the various issues of Seasons and Crop Reports of Andhra Pradesh, Statistical Abstract of Andhra Pradesh, Hand Book of Statistics, issued by the Director Bureau of Economics and Statistics, Hyderabad. The present study was carried out for the three period's i.e.

(1) Pre-green revolution and green revolution period=1965-1985
(2) Post-green revolution and post TMO (Technology Mission on Oilseeds) period= 1985-2005
(3) Over all period = 1965-2005

Sesamum – Andhra Pradesh

Parameter	Estimation	SE	t	R^2	F
no=20					
α	9.6753	1.1218		0.6438	15.3630*
β	0.1676	0.0915	1.8317**		
λ	-0.0393	0.0076	5.1420*		
no=20					
α	8.0309	4.9617		0.0551	0.4960
β	0.1781	0.4079	0.4367		
λ	0.0145	0.0149	0.9765		
no=40					
α	8.7556	1.6974		0.0968	1.9816
β	0.1473	0.1398	1.0538		
λ	-0.0071	0.0045	1.5844		

To study the technology effect on Sesamum equation (3) was developed and it was calculated. The calculated coefficients of the variables area and time in Andhra Pradesh were given in table the related statistics are also given in table.

Analytical Results for Sesamum in Andhra Pradesh

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

From the above table,it is observed that the value of the coefficient of area is (0.1676) positive. It establishes a positive relationship with the sesamum production during pre-green revolution and green revolution period. i.e., as everyone hectare increase in sesamum area will increase the sesamum production by 0.17 tonnes. From t-test statistic, it is noticed that the increase in sesamum production by the area, is a significant increase. The Coefficient of time is (-0.0393) negative. It reveals that, every year the sesamum production may be decreased by 4.0 percent. This decrease is significant. The collective effect of independent variables, sesamum are and time period are shown by the value of R^2. The estimated value of R^2 is 0.6438. It reveals, 64 percent of variation in sesamum production was

observed. This effect is a significant effect, which is proved by F-test statistic. The constant intercept term is 9.6753. Here, the green revolution's effect on production through area and time may be observed.

During the period II, the estimated coefficient (β) of sesamum area is (0.1781). It is observed that a positive relation was established between sesamum area and production. For every one hectare increase in Sesamum area will increase the 0.18 tonnes of sesamum production. But, this increase is not a significant increase. The estimated value of λ is (0.0145) positive. Every year, the sesamum production is increased by 1.5 percent. This increase is not a significant increase. The coefficient of intercept term is 8.0309, and it is positive. From the value of R^2, the combined effect of explanatory variables on explained variable, sesamum production is 0.0551. Only 5 percent variation in sesamum production was observed by these two variables area and time factors. The value of F-test statistic, expresses that the collective effect is not a significant effect TMO's are not influencing the sesamum production in Andhra Pradesh.

During the period III, the coefficient of area under sesamum crop, i.e., 'β' value is (0.1473) positive. It reveals that there is a positive relationship between area and production of sesamum in Andhra Pradesh. As everyone-hectare of area increased, it increases the sesamum production by 0.15 tonnes. This is not a significant increase. The estimated value of time (λ) is (-0.0071) negative. Every year the sesamum production is decreased by 0.7 percent. This decrease is not significant decrease. It may be happened due to lack of technological achievements. The table 6.4 noticed that, the value of multiple correlation coefficient is 0.0968. The collective effect of all independent variables on dependent variable, production of sesamum crop, during the period III for entire Andhra Pradesh State is about 9.7 percent. Only 9.7 percent of variation in sesamum production was observed by these two independent variables in the entire state. From F-test statistic, it is noticed that this combined effect is not significant on sesamum production. The intercept term is (8.7556) positive.

Comparing the estimates, it is noticed that the coefficients of area under the crop (β) is positive and significant only in pre-green revolution and green revolution period. Remaining two periods, it is positive, but not significant. The co-efficient of time variable is (λ) is showing negative and significant in period I, positive and insignificant in period II and negative and insignificant in period III. Here, TMO operations effect on sesamum production is not adverse. Finally, it is interred that the technology effect on sesamum production in Andhra Pradesh State is absent.

Dummy variables are commonly used in econometric research for Qualitative factors such as profession, religion, Sex, region, literacy and for such other attributes. The presence of such variables cannot be measured, but can only be noted whether the given characteristic is present or not. So, dummy variables are particularly useful when dealing with Qualitative data. Dummy variables can be used in regression model may contain explanatory variable is used for measuring the shift of a function and for measuring the change in parameters. Here, the data of two periods, i.e., Pre – green revolution – green revolution period and Post – green revolution and TMO period was considered. To determine the net effect of technology on Sesamum production function. The dummy variable takes 'zero' during the period 'One' and 'one' during the period two. Here, zero is meant for the effect of no new technology, while 'One' is meant for the effect of new technology. If the coefficient of dummy variable

'δ' is positive and significant, reveals that, there exists a positive and significant influence of technology on Sesamum production while, it the 'δ' value is negative and significant the impact of new technology was not observed on the crop output. Here, the technology is main factor in raising the crop output i.e., it is a dominant factor in enhancing the crop production.

The Estimated Coefficients Of Sesamum

	no=40					
Andhra Pradesh	α	8.9849	1.7471		0.1072	1.4405
	β	0.1314	0.1430	0.9191		
	λ	-0.0123	0.0092	1.3382		
	δ	0.1373	0.2118	0.6484		

* : Significant at 5% Probability level

** : Significant at 10% Probability level.

In the case of sesamum, the coefficient of area, the value of 'β' is (0.1314) positive. There exists a positive relationship between sesamum area and its production. For every one-hectare increase in sesamum area, 0.1314 tonnes of production will raise. This increase is an insignificant increase, which is observed by t-test statistic. The coefficient of time (λ) is (-0.0123) negative i.e., every year, the sesamum production may be decreased by 0.0123 tonnes. But this decrease is not significant decrease. The intercept term is (8.9849) positive. The combined effect of all exogenous variables on endogenous variable was 0.1072, since the value of R^2 is 0.1072. It shows that 10.72 percent of variation was observed by the independent variables. This collective effect is not significant which is observed by F-test statistic. The value of 'δ' is 0.1373. It is positive, but not significant. It means the new agricultural technology influence the sesamum production is very less but this influence is not significant. Finally, it may be concluded that, sesamum production was not influenced by the three independent variables i.e., land, time and technology.

Observing the table, the aggregate effect of independent variables on Sesamum production is not significant. The two factors, area and technology were also insignificantly influence the Sesamum output in Andhra Pradesh state as a whole.

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