

## **Growth Behavior and Impact of Input Used on Rice Production: A Case Study of Sirsa District**

**\* Seema Rani**

\* Research Scholar, JJTU Jhunjhunu (Raj.)

### **Abstract**

*Haryana is one of the main rice producing state of India. Although rice is cultivated in 20 districts of the state, its area and production is largely concentrated in the Karnal, Kaithal and Kurukshetra districts which is commonly known as “Rice bowl of the state”. Fatehabad, Ambala, Jind, Yamunanagar, Sirsa, Panipat and Sonapat districts are also giving their significant contribution in rice production of the state. Karnal district is largest rice producer in the state and Sirsa district is one the newly growing rice producer in the state. The present study is related with Sirsa district .It is observed that area under cultivation of paddy in district Sirsa is increasing over time. The study reflected that the farmers of Sirsa district are diverted towards rice farming from other crops. Area under rice, production of rice and productivity of rice in Sirsa is significantly increased. The uses of modern inputs are also increasing over time. Impacts of all inputs are significant in case of production. It is a challenge in the way of diversification and sustainability of agriculture because rice is more water consuming crop. More efforts should be done to attract the farmers towards less water consuming crops.*

### **Introduction:**

Agriculture is considered as the lifeline of Indian economy, mainly because of three reasons. Firstly, agriculture significantly contributes the country's national income though the share has been decreased from 55 per cent in early 1950s to about 13 per cent in 2012-13. Secondly, more than half of India's work force is working in this sector and finally agriculture plays a role to grow other sectors and overall economy. Besides, agriculture is a source of

employment, livelihood and food security for population in India as well as in world. Agriculture has specific importance for poor and vulnerable sections of the rural area.

Because of these reasons agriculture is at the pivot of socio economic development and progress of Indian economy. According to Malthus, population increases at geometric series and production of food grain increases at arithmetic series. Due to this behavior of population and food grain there is an acute shortage of food supply. In pre Green Revolution era India faced the acute shortage of food and depending on import to bridge the gap between demand and supply. Our Prime Minister Sh. LalBahadurShashtrirecognized this problem and gave slogan of “Jai Jawan, Jai Kisan”. Rice, Wheat, Bajara and Jawar are the main food grain crops in India. After the Green Revolution, Wheat and Rice production shows significant growth and India became food exporter from an importer. The jump in the rate of increase in productivity of these crops was so sudden and conspicuous that some economists named the new change as ‘Green Revolution’ (Soni, 2009). The main reason of increasing productivity was the use of modern inputs. India has made remarkable progress in agricultural mechanization technology. The agriculture productivity is directly related with the technology adoption (Misra and Puri, 2008).Rice is the main food grain of India. Haryana is one of the main rice producing state of India. Rice is the most important cereal food crop of India and is cultivated in 43.81 million hectares. It plays a major role in the national food grain production and is the main driver of food security in India. Haryana is mainly an agricultural economy with supremacy of wheat, rice, bajra, mustard, sugarcane and cotton. In the current years, commercial orientation of the state agriculture is more related with mustard, rice, fruits, vegetables etc. and the area under pluses has significantly declined. In1966-67, total area under rice crop was 192 thousand hectares with 223 thousand tonnes production, with the average productivity of 1,161 kg/ha in the state. In 2012-13, total area and production of rice has been increased upto1206.3 thousand hectares and 3941 thousand tonnes respectively with the average productivity of 3268 kg/ha in the state. Although rice is cultivated in 20 districts of the state, its area and production is largely concentrated in the Karnal, Kaithal and Kurukshetra districts which is commonly known as “Rice bowl of the state”. Fatehabad, Ambala, Jind, Yamunanagar, Sirsa, Panipat and Sonipat districts are also giving their significant contribution in rice production of the state. Karnal district is largest rice producer in the state and Sirsa district is one the newly growing rice producer in the state. The present study is related withSirsa districts of the state. In Sirsa about 80 per cents of the inhabitants are living in rural areas and Agriculture is their main occupation and two main cropping patterns in crop systems. Paddy, Cotton and Bajra crops are grown in Kharif whereas Wheat, Gram, Barley and Rape-mustard in Rabi season. Cotton and Rabi oilseeds are two main cash crops. Total

cultivable area of the District is 4.3 lakh hectares; net cultivated is 3.8 lakh hectares and total cropped area 6.03 lakh hectares.

**Objective of the study:**

1. To compare the growth behaviour of rice in term of area, production and yield in Sirsa district of Haryana.
2. To find and analysis the trend in input used in rice farming in Sirsa district of Haryana.
3. To find the impact of input used on rice production.

**Significance of the study:**

Various studies show growth behaviour and impact of input used on rice production.

**Prabhakaran and Harikumar (2006)** have pointed out remarkable decreasing trends in the area under cultivation of paddy in Kerla, because farmers don't find it profitable and remunerative. However, it is observed that area under cultivation of paddy in district Sirsa is increasing over time. Various studies have their own methodology and limitations. So my study explains the growth behaviour and impact of input used on rice production in Sirsadiistrict.

**Methodology:**

The present study is based on secondary data. The data regarding cultivated area, production, yield of rice and inputs (i.e. fertilizer, pesticides, number of tractors and number oftubewells) in Sirsadiistrict of Haryana are obtained from Statistical Abstract of Haryana for the selected period. In the present study, we have applied simple statistical and econometric techniques to find and compare the trend with respect to area, production and yield of rice in Sirsa district. The simple linear and multiple linear regression models have been used in the study. Ratio and per cent are also used in this study. These techniques are used due to simplicity and their ability to providing good results. Moreover, we have also determined a cause and effect relationship in the direction of study objectives.

**Growth behaviour of rice in Sirsa district of Haryana vis-à-vis area under cultivation, production and productivity:**

The trend is the long term pattern of a time series. It shows the long run tendency of time series. A trend can be positive or negative depending on whether the time series exhibits an increasing long term pattern or a decreasing long term pattern. Here we find exponential trend with respect to area, production and yield of rice in Sirsa district.

The table no.1 shows that area under rice farming was 39.8 thousand hectares in 2000-01 and 81.2thousand hectares in 2014-15. Area under rice farming has increased 104.02 per cent in Sirsa district from 2000-01 to 2014-2015. This type of trend shows that farmers of Sirsa district were diverted to rice farming from other crops specially cotton. Some abnormal fluctuations have been seen in the area under rice farming. Production of rice was 111 thousand tones in 2000-01and 291 thousand tones in 2014-15. Production of rice has been increased 162.16 per cent in Sirsa district from 2000-01 to 2014-2015.Some abnormal fluctuations have been seen in rice production in Sirsa district of Haryana.. Productivity of rice was 2777 Kilograms per hectare in 2000-01 and 3651 kilograms per hectare in 2014-15. Productivity of rice has been increased 31.47 per cent in Sirsa district from 2000-01 to 2014-2015. Fluctuations were observed in productivity of rice in Sirsa district.

**Table No.2**

**Model Summary and Parameter Estimates of Area, Production and productivity of rice in Sirsa**

Dependent Variable	Parameter Estimates				
	R Square	Sig	Constant	B	CAGR
Area	.923	.000	36.307	1.049	4.9
Production	.935	.000	113.951	1.060	6.0
Productivity	.288	.039	3127	1.011	1.1

Table no. 2 indicate that there was increasing trend in area under rice production in Sirsa district of Haryana and 4.9 per cent annual compound growth rate was seen in area under rice

production from 2000-01 to 2014-15. Trend in area under rice production in Sirsa district is significant and the value of  $R^2$  is very high having value 0.923. Which shows that only 92.3 per cent variation in dependant variable is explained by independent variable. 4.9 per cent ACGR in area under rice production because already small share of cultivated land was under rice farming in this district and farmer were shifted to rice farming from cotton farming. According to **Nelson** capital formation is inversely related to the portion of area already under cultivation. The same trends have been seen in area under rice production in Sirsa district. There was increasing trend in production of rice in Sirsa district of Haryana and 6.0 per cent annual compound growth rate was seen in production of rice from 2000-01 to 2014-15. Trend in production of rice in Sirsa district is significant and the value of  $R^2$  is very high having value 0.935. Which shows that only 93.5 per cent variation in dependent variable is explained by independent variable. There was increasing trend in rice productivity in Sirsa district of Haryana, however only 1.1 per cent annual compound growth rate was seen in rice productivity from 2000-01 to 2014-15. Trend in rice productivity in Sirsa district is significant and however the value of  $R^2$  is very low having value 0.288, which shows that only 28.8 per cent variation in dependent variable is explained by independent variable. We must worry about this type of trend in productivity of rice because rice plays an important role in food security. There is need of another green revaluation in India.

#### **Compound Growth and Trend in Input Used in Sirsa:**

Modern input plays an important role in agricultural development. After Green Revolution use of modern input significantly increased, however farmers are using these inputs without soil testing and proper knowledge. Data regarding four main modern input fertilizer, pesticide, no. of tractors and tubewells are shown in table no3. The table no.3 shows that use of fertilizer was 93897 tonnes in 2000-01 and 149235 tonnes in 2014-15, use of pesticide was 599.4 tonnes in 2000-01 and 361 tonnes in 2014-15, the numbers of tractors were 20354 in 2000-01 and 25410 in 2014-15 and numbers of tubewells were 34678 in 2000-01 and 65012 in 2014-15.

#### **Table No.4**

##### **Model Summary and Parameter Estimates of Fertilizer, Pesticide, Tractors and Taubewells in Sirsa**

Dependent Variable	Parameter Estimates				
	R Square	sig	Constant	B	CAGR
Fertilizer	.898	.000	87020	1.042	4.2
Pesticide	.674	.000	839.293	.941	-5.9
Tractors	.193	.102	21710	1.013	1.3
Tubewells	.975	.000	33390	1.047	4.7

Table no. 4 indicates that there was increasing trend in use of total fertilizer in Sirsa district of Haryana. ACGR of total fertilizer use was 4.2 per cent from 2000-01 to 2014-15. Trend in use of total fertilizer in Sirsa district is significant and the value of  $R^2$  is 0.898, which shows that only 89.8 per cent variation in dependent variable is explained by independent variable. There was decreasing trend in use of pesticide in Sirsa district of Haryana. ACGR of total pesticide use was -5.9 per cent from 2000-01 to 2014-15. Trend in use of pesticide in Sirsa district is significantly decreases and the value of  $R^2$  is 0.674, which shows that only 67.4 per cent variation in dependent variable is explained by independent variable. There was increasing trend in number of tractors in Sirsa district of Haryana. ACGR of tractors were 1.3 per cent from 2000-01 to 2014-15. Trend in use of tractors in Sirsa district is significant and the value of  $R^2$  is 0.193, which shows that only 19.3 per cent variation in dependent variable is explained by independent variable. There was increasing trend in number of tubewells in Sirsa district of Haryana. ACGR of tubewells was 4.7 per cent from 2000-01 to 2014-15. Trend in number of tubewells in Sirsa district is significant and the value of  $R^2$  is 0.975, which shows that only 97.5 per cent variation in dependent variable is explained by independent variable.

**Impact of Inputs on Production and Productivity of Rice in Sirsa:**

The estimates of the production function for rice is presented in Table 1 and 3. In this study, we consider only four input fertilizer, pesticide, tractors and tubewells. But there is a problem of multicollinearity between fertilizer and tubewells. So we drop the variable tubewells and estimated coefficient of tractors, fertilizer and pesticide has been worked out to examine the impact of inputs on production and productivity of rice.

**Table: 5**

**The impact of Inputs on Production and Productivity of Rice in Sirsa (2000-01 to 2014-15)**

Inputs	Production		Productivity	
	Value of Regression Coefficient	't' Value	Value of Regression Coefficient	't' Value
Fertilisers	.992*	7.476	.389	1.021
Pesticides	.336**	2.558	.555	1.466
Tractors	.314**	2.916	.578**	2.297
$R^2 = 0.902$		$R^2 = 0.453$		

Note: Dependent variable: Rice Production and Productivity

\*and \*\* Statistically Significant at one and five per cent level of significance respectively

The impact of inputs on production and productivity of Rice in Sirsa is presented in Table 5. Table 5 shows that the regression coefficients of all the inputs have shown positive value in the case of production. The  $R^2$  value is 0.902, which shows that 90.2 per cent variation in the dependent variable has occurred due to all the independent variables. The regression coefficients of fertilizer, pesticide and tractors are 0.992, 0.336 and 0.314 respectively. Impacts of all inputs are significant in case of production. In the case of productivity, the regression coefficients of fertilizer, pesticide and tractors have a positive impact as the values observed 0.389, 0.555 and .578 respectively. The regression coefficient of only tractors is significant at five per cent level of significance. Use of tractors has a higher positive impact on productivity.

**Suggestions:**

On the basis of results and findings of the study, the following suggestions are recommended:

1. New inputs i.e. fertilizer, pesticide, tractors and tubewells should be used by the farmers with proper knowledge, at the right time, right place and in right quantity.
2. The fertilizers should be used regularly as per recommendation of soil test results.
3. More focus should be on increase on productivity since area is limited.

4. Government should make efforts to employ one more Green revolution.
5. The reason for such a strong concern seems to be the increasing public awareness about the ill-effects of new inputs.
6. More emphasis on diversification of agriculture.
7. In view of water scarcity farmers should be diverted to other crops.

### **Conclusions:**

The study reflected that the farmers of Sirsa district are diverted towards rice farming from other crops. Area under rice, production of rice and productivity of rice in Sirsa is significantly increased. The uses of modern inputs are also increasing over time. Impacts of all inputs are significant in case of production. It is a challenge in the way of diversification and sustainability of agriculture because rice is more water consuming crop. More efforts should be done to attract the farmers towards less water consuming crops.

### **References**

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## **Annexure-I**

**Table No.1: Area, Production and Productivity (yield) of Rice in District Sirsa (2000-01 to 2014-15)**

Year	A (1000 Hec.)	P (1000 Tonnes)	Y (Kg per hec.)
2000-01	39.8	111	2777
2001-02	37.2	118	3201
2002-03	45.2	145	3214
2003-04	47.7	156	3242
2004-05	45.7	157	3411
2005-06	46.0	166	3616
2006-07	46.5	179	3799
2007-08	48.2	189	3928
2008-09	57.5	196	3437

2009-10	61.4	204	3344
2010-11	61.4	195	3190
2011-12	63.1	203	3220
2012-13	65.2	230	3534
2013-14	68.6	271	3921
2014-15	81.2	291	3651

Source: Statistical Abstract of Haryana

## **Annexure-II**

**Table No.3**

**Consumption of Fertilizer, Pesticide, no. of Tractors And Tubewells in District Sirsa**

Year	Fertilizer (in tonnes)	Pesticide (in tonnes)	No of Tractors	No of Tubewells
2000-01	93897	599.40	20354	34678
2001-02	96357	599.10	21514	36532
2002-03	97041	740.00	21248	37745
2003-04	97164	732..00	22014	40303
2004-05	107094	730.00	22798	41374

2005-06	106957	728.00	23472	41637
2006-07	105482	725.00	24139	46136
2007-08	121742	690.00	32022	50223
2008-09	130957	380.00	32022	52745
2009-10	138014	420.00	23110	56651
2010-11	142597	360.00	23396	56229
2011-12	165584	355.00	23482	57171
2012-13	143187	355.00	24109	58209
2013-14	147500	360	24600	62110
2014-15	149235	361	25410	65012

Source: Statistical Abstract of Haryana