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Editorial Note

In the last issue of South Asian Journal of Management Research, in the editorial note I mentioned about humor. Humor can increase the happiness and reduce the stress.

Stress is most vulnerable condition in the organization because experts as well as non-experts are handling the stress situation of the employees. Some scientists still argue that they know little about stress whereas many people claim that they know everything about stress. And the result is handling the stress improperly.

Job stress has several impacts on individual employee and organization. Most of the employees in modern organization experience stress. It can have a damaging effect on employee, especially managers. It can affect the effectiveness of the organization as well as employees. The problem of stress is very much relevant of change that is spreading across the globe in all the fields. The employees are unable to cope of with changes. Organizations are doing little to handle the change process. For any organizational process the change must be helping the employees in improving the ability of organization to cope up with the change in its environment.

Lazarus's view on stress is that an individual perception of the psychological situation is the critical factors for stress. It includes potential harms, threats, and challenges on one hand, and on another an individuals ability to cope with them. The ability or inability to cope with stress is the perceived ability of an individual. Coping strategy differs from individual to individual in a different manner.

Less research is available on coping strategies of stress. Readers can contribute research articles on coping strategies of stress.

Dr. Babu Thomas
Editor

Impact of Irrigation on Cotton Cultivation in Kurnool District (A.P)

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Abstract :

Cotton provides livelihood to more than 60 million people in India by way of support in agriculture, processing, and use of cotton in textiles. Cotton contributes 29.8% of the Indian agricultural gross domestic product, and nearly nine million hectares of land in India is used to produce 14.2 million bales of cotton lint.

Indian cotton production is third in the world in quantity, although the productivity is substantially low. The major reason for this low productivity is damage caused by insect pests—notably *Helicoverpa armigera*, commonly referred to as American Bollworm. Nearly Rs.12 billion worth of pesticides are used in India to control just the bollworm complex of cotton. Mahyco (Maharashtra Hybrid Seed Company), in collaboration with Monsanto, has introduced Bt cotton technology into India. Bt cotton carries the *Cry1Ac* gene derived from the common soil bacterium *Bacillus thuringiensis* var. *kurstaki*, which results in the expression of the *Cry1Ac* protein that confers resistance to the bollworm complex.

Along with HYV seeds and fertilizers, water forms another important input of the package of new agriculture technology. An important source of water is rainfall. But rainfall in this country is mostly confined to a few monsoon months in a year, and there are great variations in its incidence from year to year. Moreover, rainfall in large part of the country is low and uncertain in its distribution. Even where it is high, the available soil moisture in winter and summer months is not adequate to support multiple cropping. These vagaries of weather frequently give rise to drought and scarcity. Therefore, there is an increased need for providing assured supplies of water through irrigation system.

India is known for its diversity. Irrigation is no exception to this diversity. Major, medium and minor irrigation sources constitute the main sources in India. Canals originate from major and medium irrigation projects. Tanks and wells constitute the chief source of minor irrigation. They are indigenous and traditional in India. Construction of irrigation tanks call for collective action guided by local authority. Tank irrigation system is essentially community oriented. Well also have been an important source of irrigation in India. They have been supplementing inadequate supply flows. The performance of wells irrigation varies from region to region in India. It depends upon the availability of ground water. It also depends upon other climatic and soil conditions. At the beginning, human and animal power were used to lift water from wells. Modern power driven pump sets replaced man and animal power. The technological advancement has enormously increased the performance of wells irrigation in India.

Cotton (Gossypium arboreum) is the most important fibre crop in agriculture. Most of the cotton is rainfed and only a small portion is irrigated. Andhra Pradesh is one of the southern states of India, where more than 70 per cent of the agriculture area is depending on the rainfall. The average annual rainfall in the study area is about 650 mm and 80 per cent of it is received during monsoon (July to September months). Cotton is the major crop of the area and several number of cotton ginning/spinning are located in the area. Livelihood of several people is either directly or indirectly depending on these mills. The rain fall alone is not enough to meet entire water requirement of the cotton crop. So, farmers fulfill the deficit water requirement of the cotton by irrigation. But, since last 5-10 years, the seed production profession is picking up. Unlike other general crop production, the seed production needs the special attention with respect to the irrigation and use of other inputs. The farmers have now switched from local to the hybrid varieties in almost all crops. Further, high intensive cultivation demands judicious and efficient use of available ground water. Which are nearly impossible to achieve with conventional surface-irrigation methods. The drip is one of the irrigation systems, which permits the application of optimum, frequent irrigations with relatively higher applications and distribution efficiencies.

Successful cultivation of cotton requires a long frost-free period, plenty of sunshine, and a moderate rainfall, usually from 600 to 1200 mm (24 to 48 inches). Soil usually needs to be fairly heavy, although the level of nutrients does not need to be exceptional. In general, these conditions are met within the seasonally dry tropics and subtropics in the Northern and Southern hemispheres, but a large proportion of the cotton grown today is cultivated in areas with less rainfall that obtain the water from irrigation.

Cotton is one of the most important commercial crops in Kurnool district of Andhra Pradesh. Total area under cotton crop was 81,954 hectares in 1991-92 and it went upto to a maximum of 1, 53,708 hectares in 1998-99. But it has drastically fallen to 74,011 hectares in 2004-05.

Irrigated area under cotton crop was 10,468 hectares in 1991-92 and it went upto a maximum of 37,049 hectares in 1998-99.But it has fallen to 14,597 hectares in 2004-05.Production of cotton crop in1991-92 was 77,311 bales of 170 kgs. It reached to its maximum in the year 1995-96 to 2,17,374 bales. In 2004-05 it has come down to 1,99,830 bales.

In this district irrigation (both surface and ground water) plays a vital role in cultivation of cotton crop. More irrigated area has been brought under cotton cultivation. As farmers are moving towards Bt cotton, role of irrigation has become prominent. But statistics related to yield of cotton of this region indicate an insignificant increase.

In the present study efforts have been made to know the role of irrigation (both surface and ground water) on cotton cultivation in Kurnool district of Andhra Pradesh.

1. Literature Review

Number of studies has been carried out on the growth and instability and the relative impact of irrigation and rainfall on cotton output. Few of the recent studies are reviewed below.

Sing[1] and others investigated the relative economy and production of commercial crops like cotton, sugar cane and oil seeds in Haryana State. They estimated Cobb – Dougles production function. They observed that the inputs like fertilizers, irrigation and women labour explain 72 percent in cotton production. The inputs, irrigation and human labour show negative contribution to the production of cotton during the period 1973 – 75. The marginal value production of irrigation and human labour are found to be less than zero in case of cotton crop. It indicates that the production of cotton with respect to the inputs has the negative M.V.P. and is carried on in the third stage of production.

Subba Ramaraju, Veera Reddy and Damodar Reddy[2] studied the resource efficiency and returns to scale in Groundnut production in Mahaboobnagar district of Andhra Pradesh. The study indicates that the manures and irrigation formed the most influencing factors under irrigated conditions. The returns to scale under irrigated conditions were found to be significantly different from unity. The unirrigated farms experienced constant returns to scale and it is not significantly different

K.R. Shanmugam[3] studied farm specific technical efficiency of raising major commercial crops. He employed stochastic frontier production function technique to measure the technical efficiency of rice, groundnut and cotton in Tamilnadu. The technical efficiency of raising irrigated groundnut is relatively high in own land cultivation as compared with that in leased land cultivation. Farmers having a high promotion of family members with above middle school education are more efficient in raising groundnut.

U.M.Jha[4] in his book (1984) "Irrigation and agricultural development" emphasized importance of water as input in agriculture sector in India. Similarly, V.K.Sarma in his research study (1985) on "Water Resources Planning and Management" referred to a wide spectrum of water resource used for economic development of nation.

M. S. Shirahatti, C. J. Itnaland D. S. Mallikarjunappa Gouda[5] (2005) conducted a field experiment at Agricultural Research Station, Hanumanmatti for comparing the drip and furrow irrigation methods on the hybrid cotton yields in the red sandy loam soil of northern Karnataka. The results of the experiment indicated that by applying same quantity and 50 per cent of water as of surface irrigation (control), the yield was increased by 28 and 10 per cent respectively. When the water applied in the drip irrigation was 25 per cent of the control, the yield was reduced by just 2.5 per cent, but in this case highest water use efficiency was observed. The soil moisture distribution along the vertical direction increased and laterally it was decreased.

Pemsl, Waibel, and Orphal (2004) in their study found under non-irrigated conditions there would be no reason for farmers to adopt Bt cotton. Under irrigated conditions stochastic dominance shows, pesticide alone is the superior strategy. The regression analysis found pest pressure and cotton output price largely determine the yield.

2. Methodology

Commercial crops grown under rain fed conditions are high risk corps. The farmers are naturally reluctant to increase their investment in such crops. Andhra Pradesh is an important producer of commercial crops like Groundnut, Cotton, Tobacco, Chillies, Sugarcane and Onions. The demand of commercial crops is increasing day by day. Cotton is a commercial crop and its prices are high. The price from season to season depends on its overall production in the country. To meet increasing demand of Cotton, it is necessary to know the future estimates of cotton production. To study the impact of irrigation on Cotton crop in Kurnool District simple regression modol was used. The objectives of the present study are

- To find out trends as well as growth rate and instability in production of Cotton crop in irrigated area in Kurnool District.
- To study the impact of rainfall and irrigation on cotton cultivation in Kurnool district

1. To analyze the cotton cultivation in Andhra Pradesh and in Kurnool district, it is proposed to estimate the growth and instability in area, production and yield of cotton. There are two types of growth rates viz., linear and compound growth rates. In present study both linear and compound growth rates of cotton were estimated to determine the LGR, the linear function of the form

$$Y = A + Bt \text{------} (1)$$

$$LGR = \frac{\hat{B}}{\bar{Y}} \times 100 \text{------} (2)$$

To determine the CGR, the exponential function of form is

$$Y = A.B^t \text{------} (3)$$

Where, Y= area/production/yield

t= time

A, B are the constants to be determined

The % of CGR is CGR = (B -1) ×100------(4)

The coefficient of time $\hat{B}$ was tested by t-test statistic

$$t = \frac{\hat{B}}{SE of\ \hat{B}}$$

$$\text{where S.E of B} = \sqrt{\frac{\sum (Y - \hat{Y})^2}{N}}$$

The instability measured by coefficient of variation (C.V.)

$$C.V. = \frac{\sigma}{\bar{Y}} \times 100 \text{------} (5)$$

2. Cotton cultivation in Kurnool district depends on two sources of water viz. rainfall and irrigation. To determine the impact of each source on cotton cultivation a multiple regression analysis was carried out. Since the data related to irrigated area under different sources in Kurnool district is not sufficiently available, the study considered the total irrigated area under cotton crop (surface water, ground water and other sources) as a single independent variable. The rainfall is another independent variable included in the model. Therefore the proposed multiple regression equation in the study is given as

$$Y_t = a_0 + a_1X_1 + a_2X_2 \text{------} (6)$$

Where, Y_t = Total cotton area/production/yield

X_1= Rainfall (in m.m)

X_2= Irrigated area under cotton crop

The effect of X_1 and X_2 variables on Y was tested by t - Test statistic independently.

The collective effective of independent variables on dependent variable is called Multiple correlation coefficient. It is denoted by R^2.

$$R^2 = 1 - (? e_i^2 / ? y_i^2) \text{ ------------------- } (7)$$

To test the significance of the combined effect of all independent variables on dependent variable, F-test statistic was adopted.

$$F = \frac{R^2/(K-1)}{(1-R^2)(N-K)} \text{ --------------------- } (8)$$

Where N = Number of Observations
K = Number of Variables

3. Data

The data related to the present study is obtained from secondary sources. The relevant data was collected from various issues of "Seasons and Crop Report of A.P." and "Statistical Abstract of Andhra Pradesh" issued by the Director of Bureau of Economics and Statistics, Andhra Pradesh and the "Chief Planning Officer, Kurnool". The data relating to area under cotton, rainfall, cotton yield and production obtained from the secondary sources is used to estimate the model.

4. Limitations of the study

The study is confined to Kurnool district only. The study covers the cultivation of cotton crop only. The study of cultivation of crop is limited to growth & instability and impact of irrigation on cotton cultivation. The period of study is 1985-86 to 2004-05.

5. Compound Growth Rates in Cotton Irrigated Area

5.1 Area

The estimated exponential form of irrigated area of cotton in Kurnool district is as given below

$$Y = (0.0413)\,(1.7706)^t$$
$$(0.1914)$$
$$CGR = 77.0607 \quad C.V = 58.3952$$

From the above mentioned equation the value of b, i.e. the coefficient of t is 1.7706. It expresses the average annual increase over the previous year in irrigated area under cotton crop. The compound growth rate of irrigated area is 77.0607. It reveals that the average annual growth in cotton crop area over the previous year is 77.0607. The value of intercept term is 0.0413. The annual growth in irrigated area under crop is not significant. It is inferred that the growth in irrigated area of cotton crop is Kurnool district is positive because natural conditions for cotton crop is favourable than other irrigated crops. So the farmers prefer cultivating cotton instead of other crops. It is proved by 't' – test statistic.

5.2 Production

The estimated exponential form of the cotton production in Kurnool district is

$$Y = 0.1071\,(2.2713)^t$$
$$(1.0737)$$
$$CGR = 127.1330 \quad C.V = 64.5880$$

From the above estimated equation the value of b is 2.2713. It expresses the average annual increase in cotton production. The compound growth rate of cotton production is 127.1330. It reveals that the average annual growth rate in cotton production over the previous year is 127.1330. The value of intercept term is 0.1071. The annual growth in cotton production under irrigated area is positive and not significant. It is proved by 't' –test statistic. The instability in Cotton production is 64.50 percent.

5.3 Yield

The estimated exponential form of the cotton yield in Kurnool district is

$$Y = 0.1360\,(1.7085)^t$$
$$(0.1795)$$
$$CGR = 70.8529 \quad C.V = 16.8424$$

From the equation the value of b i.e. coefficient of t is 1.7085. It expresses that the average annual increase in cotton yield. The compound growth rate of cotton yield is 70.8529. It reveals the average annual growth rate in cotton yield over the previous year is 70.8529. The value of intercept terms is 0.1360. The annual growth in cotton yield is insignificant. It is noticed that the cotton yield in Kurnool district is significant and also better than the other crops. It is proved by 't' – test statistic.

To study the impact of irrigation on cotton cultivation in Kurnool district, the multiple regression model of the form (given in the methodology) cotton area/production/yield as the dependent variables and independent variables are rainfall and total irrigated area under cotton crop. Both the linear and log linear models were estimated by adopting OLS method and the parameters are given in equation form. Initially the study considered that the total area under the cotton crop is influenced by the rainfall and irrigated area, i.e. the impact of two independent variables on the dependent variable, cotton area was estimated.

5.4 Area-Impact of Irrigation

The estimated linear regression model is

$$Y_t = 80.1299 + 55.6117^* X_1 + 2.89404^* X_2$$
$$(5.7862) \quad (8.0115)$$
$$R^2 = 0.9829^* \qquad F = 487.4461$$

* Significant at 5% probability level

Figures in the parenthesis are 't' values.

It is observed that the coefficients of rainfall and irrigated area are positive (55.6117 and 2.894). A positive relationship was established by these two independent variables each with the total cotton area in the district. To test the significant effect of these variables, t-test statistic was calculated. From the t-test statistic, it is proved that the effect of each of these two independent variables on cotton area is a significant effect. For every one unit of X_1 variable will increase a total cotton area by 55.61 hectares. This increase in total cotton area is significant. Similarly, it is observed that effect of irrigated area on total area is also positive and significant. Hence, a positive and significant effect was established between irrigated area and total area. For every one hectare increase in irrigated area will increase the total area by 2.89 hectares. The aggregate effect of these two independent variables rainfall and irrigated area is expressed by the value of R^2. The estimated multiple correlation coefficient (R^2) is 0.9829. More than 98% of variation in total cotton area was shown by these two variables collectively. This combined effect of independent variables (98.29% of variation) was tested for its significance, from F-test statistic. This aggregate effect is a significant effect.

The estimated log-linear model with the above variables is

$$Y_t = 5.025 + 0.1593 X_1 + 0.5484^* X_2$$
$$(0.8959) \quad (8.4329)$$
$$R^2 = 0.8501^* \quad F = 48.2046$$

In the fitted equation, the coefficient of irrigated area is positive and significant. It reveals that there exists a positive and significant relation between irrigated area and total cropped area. An increase in irrigated area will reflect a significant increase in total cotton area. But, the rainfall will establish a positive relationship with total area.

It is also observed that the aggregate effect of the two variables on cotton area is significant, proved by F-test statistic. Observing the two estimated equations, the irrigated area shows a positive and significant effect whereas the rainfall shows only positive effect, and is significant in linear model alone.

It is found that total cotton area may be increased significantly by raising the irrigated area in Kurnool district. The variation in the total cotton area is significant by the two selected variables. From the above discussion it is advised to raise the cotton area by raising the irrigated area. The irrigated area may be increased through increasing the ground water and surface water flows and other irrigation channels. The ground water level may be raised by the construction of check dams and deepening of tanks.

5.5 Production- Impact of Irrigation

The impact of rainfall and irrigated area on cotton production in the district was estimated by multiple regression equation. The estimated equation along with 't' values and multiple correlation coefficient (R^2) is given by the fowling equation.

$$Y_t = 10704.1875 + 37.3272 X_1 + 4.2420^* X_2$$
$$(0.6893) \quad (4.5298)$$
$$R^2 = 0.6466^* \qquad F = 15.5547$$

* Significant at 5% probability level.

Figures in the parenthesis are't' values.

In the above estimated equation, the coefficient of rainfall (X_1) is positive and it is 37.3272. A positive relationship between rainfall and cotton production was observed.

From t-test statistic, it is noticed that the effect of rainfall on production is not significant. For every one unit increase in rainfall, 37.33 units of cotton production is increased. But this increase in cotton production is not significant increase. The estimated regression coefficient of irrigated area on cotton production is positive and it is 4.242. From t-test statistic it is proved that the irrigated areas effect is significant on cotton production. For every one hectare increase in irrigated cotton area will increase the cotton production by 4.24 bales. This increase in cotton production is a significant increase. Therefore, the impact of the two selected variables on cotton output is positive, but the effect of only irrigated area is a significant one. The aggregate effect of two selected independent variables on cotton output is represented by multiple correlation coefficients (R^2). The estimated value of R^2 is 0.6460. Therefore, the variation in cotton production by these two variables is 64.6%. The aggregate effect of the independent variables on production is significant at 5% probability level is given by F-test statistic.

The estimated log linear production function is

$$Y_t = 3.936 + 0.0878\,X_1 + 0.7268^*\,X_2$$
$$(0.2626) \qquad (5.9441)$$
$$R^2 = 0.7265^* \qquad F = 22.5843$$

Observing the estimated log linear model, both the independent variables establish a positive relationship with cotton production in the district. The effect of irrigated area on cotton production is significant. About 72.65% of variation in cotton output was recorded by these selected variables. The variation in production is observed to be significant.

From the above analysis, it is observed that cotton production is significantly influenced by the irrigated area. Therefore, to raise the cotton production more area may be brought under irrigation. It is suggested that to extend the irrigation facilities through construction of irrigation projects and stop wastage of rain water, develop proper channel system and proper harvesting of rainfall to raise the cotton production in the district.

5.6 Yield- Impact of Irrigation

The estimated linear regression model is

$$Y_t = 177.339 - 0.0123\,X_1 + 0.002\,X_2$$
$$(0.1551) \qquad (1.4664)$$
$$R^2 = 0.1299 \qquad F = 1.2692$$

It is observed that the coefficient of rainfall is negative (-0.0123). A negative relationship between yield and rainfall indicates that, a rise in rainfall in mm has actually led to decline in yield . But this decline is very negligible and it is not significant as shown by 't' statistic. For every unit increase in rainfall there is a decline of cotton yield by 0.0123 units. The estimated regression coefficient of irrigated area on cotton yield is positive and it is 0.002. From 't' statistic it is proved that the irrigated area's effect is not significant on cotton yield. For every one unit increase in irrigated area, cotton yield is increased by a meager amount of 0.002 units. This is not a significant increase. The aggregate effect of two selected independent variables on cotton yield is represented by multiple correlation coefficient (R^2). The estimated value of R^2 is 0.1299. This indicates that the variation in cotton yield due to these two variables is just 12.99 percent. This combined effect of independent variables on cotton yield is not significant at 5 percent probability level as shown by F – Test statistic.

The estimated log linear production function is

$$Y_t = 3.992 - 0.061\,X_1 + 0.1764\,X_2$$
$$(0.2366) \qquad (1.8821)$$
$$R^2 = 0.1886 \qquad F = 1.9754$$

Observing the above estimated log linear model, rainfall established a negative relationship with cotton yield. The coefficient of rainfall on cotton yield is -0.061. This indicates that a unit increase in rainfall will decline the yield by 0.061 units. But this decline is not a significant decline as shown by 't' statistic. There is a positive relationship between irrigated area and cotton yield (0.1764). For every unit increase in cotton irrigated area, cotton yield increases by 0.1764 units. But this increase in cotton yield due to increase in irrigated area is not a significant increase proved by t – Test statistic. The

Observing the above estimated log linear model, rainfall established a negative relationship with cotton yield. The coefficient of rainfall on cotton yield is -0.061. This indicates that a unit increase in rainfall will decline the yield by 0.061 units. But this decline is not a significant decline as shown by 't' statistic. There is a positive relationship between irrigated area and cotton yield (0.1764). For every unit increase in cotton irrigated area, cotton yield increases by 0.1764 units. But this increase in cotton yield due to increase in irrigated area is not a significant increase proved by t – Test statistic. The combined effect of irrigated area and rainfall on cotton yield represented by R^2 is 0.1886. This shows that only 18 percent of variation is found in the cotton yield due to variation in the two selected independent variables.

From the above analysis it is observed that cotton yield is not significantly influenced by the rainfall and irrigated area in Kurnool district.

The estimated regression coefficients of the equation are given in the table 1. The equation was fitted for cotton area, production and yield in Kurnool District. Both linear and log linear models are estimated.

Table 1 : Estimated Regression Coefficients - Irrigation

Dependent Variable	Model	Intercept	X_1 Rainfall	X_2 Irrigated Area	R^2	F
Area	Linear	80.1299	55.6117*	2.89404*	0.9829*	487.4461
	LogLinear	5.025	0.1513	0.5484*	0.8501*	48.2046
Production	Linear	10704.1875	37.3272	4.2420*	0.6466*	15.5547
	LogLinear	3.9360	0.0878	0.7268*	0.7265*	22.5843
Yield	Linear	177.339	0.0123	0.0020	0.1299	1.2692
	LogLinear	3.992	0.0610	0.1764	0.1886	1.9755

*** Significant at 5% probability level.**

From the above table it is observed that the area under the cotton crop was significantly influenced by both the selected variables – rainfall and irrigated area in case of linear model. The two explanatory variables explained 98.3 percent of variation in cotton area. This is a significant variation. With respect to log linear model, these two variables show 85 percent variation. The cotton area was significantly influenced by irrigated area only. Therefore, it can be concluded that cotton is an irrigated crop in Kurnool District.

The cotton production was positively influenced by the two variables – rainfall and irrigated area. Cotton production was significantly influenced by irrigated area. The cotton production variation was significantly influenced by these two variables (64.66% and 72.65%) in both the models. Therefore, it is inferred that the cotton production was mainly dependent on irrigated area.

A negligible positive effect was recorded by the two selected variables on cotton yield. The value of intercept term is considerably high, reveals that the cotton yield was influenced by other variables which are not included in the model. These two selected variables recorded only 13 percent and 18.86 percent yield variation in both linear and log linear models. Finally, it is inferred that the cotton crop was mainly irrigated crop. The cotton yield can be increased by focusing on other factors which include HYV seeds, new agricultural technology, fertilizers and pesticides and plant protection methods.

6. Conclusion

The effect of rainfall and irrigated area on cotton area, production and yield was estimated by the multiple regression model. Both the linear and log-linear models were fitted using OLS method. From the estimated regression equations, the rainfall and irrigated area's effect on total cotton area is positive and significant. About 98 percent of variation in total cotton area was observed by these two variables. This aggregate effect is observed to be a significant. It is noticed that the total cotton area may be increased significantly by raising the irrigated cotton area. The irrigated cotton area may be increased through the increase in ground water and surface water flows. Proper harvesting of rainfall can improve the ground water.

The established relationship between cotton production and the two independent variables, namely rainfall and irrigated area reveals that the irrigated area's effect on cotton production is positive and significant. The effect of rainfall on production is positive but not significant. It is also noticed that the aggregate effect of these two variables is significant as given by the R^2 value and F-test statistic. It is therefore concluded that the irrigated area significantly influenced the cotton production. So to raise the cotton production more area should be brought under irrigation. The increase in irrigated area is possible, by taking appropriate measures like construction of check dams, irrigation projects, proper canal systems restricting the wastage of rain water, deepening of tanks, and construction of new tanks.

The net effect of irrigated area on cotton yield is positive but not significant. An insignificant negative effect of rainfall on cotton yield was observed. The aggregate effect of these two variables is also insignificant. From the above it is noticed that the cotton yield was not influenced by the two water sources. But it could be influenced by new technology. As indicated by the high value of intercept term. Therefore other factors like HYV seeds, fertilizers and pesticides, farm mechanization, plant protection methods may increase the cotton yield.

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