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RESEARCH PAPER

Acreage and Production Response of Groundnut Crop in Gujarat and Rajasthan States: A Supply Response Approach

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ABSTRACT

Background: Determination of growth rate, acreage response and production response of groundnut using price and non-price factors in Gujarat and Rajasthan state. **Methods:** Compound growth rate and Cuddy-Della index were used for the calculation of growth rate and instability index, respectively during the study period from 2002-03 to2018-19. To study the effect of price and non-price factors influencing on acreage and production of groundnut crop over time and space in both states were examined by using the Nerlovian lag adjustment method. **Results:** The study reveals that in Gujarat, the area under groundnut crop was decreasing at 1.79 per cent per annum with one per cent level of significance. The production and yield of groundnuts showed a high rate of instability with 42.02 per cent and 37.94 per cent, respectively. The factors namely, irrigated area and lag year groundnut production were found positive and statistically significant impact on the rise in groundnut area over the study period. This implied that higher irrigated area and lag year groundnut production leads to larger areas of the groundnut crop. However, the lag area of cotton (competitive crop) had a negative impact on the rise in groundnut area over the study period. The results of the production response function indicated that the regression coefficients of a irrigated area under groundnut crop and monsoon season rainfall has a statistically significant impact on the rise in groundnut production in Gujarat. The area under groundnut crop has been positively increasing at 7.52 per cent per annum and found statistically significant at a one per cent level in Rajasthan state. It was found that area (17.18 %), production (20.57%) and productivity (16.87%) registered medium instability. During the decision of area allocation for groundnut crop in Rajasthan state, the coefficient of area under *bajra* (competitive crop) was negative and significant magnitude was 0.69. It implied that an increase of one per cent in the area under *bajra* crop is expected to result in a decrease 0.69 per cent area for groundnut crop. Coefficient of irrigated area and monsoon season rainfall were positive and significant helps to increase groundnut production. Thus, results suggests that groundnut production is improved by agricultural improvements like building protective irrigation structures like farm ponds contribute to an improvement in groundnut area and production.

HIGHLIGHTS

- In Gujarat, groundnut area declined significantly, while production and yield showed high instability.
- Irrigation facilities and monsoon rainfall positively increased groundnut area and production in both Gujarat and Rajasthan.
- Competitive crops like cotton and *bajra* negatively affected the area under groundnut cultivation.

Keywords: Oilseed, Groundnut, Acreage response and Production response

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The agricultural sector holds significance in the Indian economy, particularly concerning poverty alleviation, income generation and employment. The sector's performance significantly influences people's livelihoods but is susceptible to various risks, primarily associated with climate, inputs, outputs and prices. The extent of risk is contingent on individual farmers' characteristics and the likelihood of specific events. Hence, the level of risk in any agricultural venture is influenced by farmers' decisions regarding acreage allocation and the overall growth performance of the farm economy (Jain *et al.* 2005). Oilseed crops are the second most significant determinant of agricultural economy, next solely to cereals within the broad area of field crops. India has the best condition for the cultivation of all nine oilseeds including seven edible oilseeds, namely, groundnut, rapeseed-mustard, sunflower, soybean, sesamum and safflower, castor and linseed as non-edible oilseeds (Thapa *et al.* 2019).

India's groundnut area and production were 1.69 million hectares and 9.95 million tonnes respectively, during 2019-20. Major groundnut producing states were Gujarat, Rajasthan, Tamil Nadu, Andhra Pradesh and Karnataka with 46.68 per cent, 16.27 per cent, 10.38 per cent, 8.53 per cent and 5.05 per cent share in production in India, respectively (Anonymous, 2021). India is one of the largest producers of oilseeds in the world (Anonymous, 2021), but it is unable to meet the domestic demands of vegetable oils. The domestic demand for vegetable oils and fats has also been rising rapidly at an increasing rate due to increase in per capita income and increase in standard of living (Reddy and Immanuelra, 2017). The growth in domestic production of edible oils has not been able to keep pace with the consumption growth and the gap between production and consumption is being met through imports (Jainuddin *et al.* 2019). The nation still imports more than half of its needs and given the country's rapidly growing population and rising per capita consumption, this percentage will undoubtedly rise in the days to come. This sector must receive rapid attention, failing which the reliance on imports would undoubtedly grow (Thapa *et al.* 2019).

When farmers' land is suitable for the cultivation of different crops, and when they have the necessary inputs, farmers face decision-making problems regarding the allocation of land across various crops. The allocation decisions for the cultivation of various crops depend on relative prices and non-price factors such as yield, rainfall during the sowing season, proportion of irrigated area and risk factors: price and yield risk (Mohan *et al.* 2017; Devi and Jadav, 2019).

The earlier studies viewed the supply response in terms of the relationship between rates of growth in production and prices (Narain, 1960). Subsequently, Nerlove's reformation of Cagon's adaptive price expectation model has almost become a standard tool for the estimation of supply functions. This methodology has been extended even to estimating aggregate supply response with respect to terms of trade (Tyagi, 1987). Later, many studies used the Nerlovian framework to study the impact of prices on aggregate agriculture. Most of these studies concluded that the non-price factors are also more important in the acreage response decision of farmers.

Hence, based on above background, the present study was undertaken in Gujarat and Rajasthan states with the overall objective of assessing the growth rate of area, production and productivity of groundnut and farmer's decision-making factors viz., price and non-price factors in land allocation and production response in the state. The results of this study would help in suggesting suitable policy options and regional-level planning to increase oilseed productivity and bridge the demand-supply gap in the state as well as in the country.

MATERIALS AND METHODS

Sources of data

The study was based on secondary data from 2002-03 to 2018-19. The data on area, production and productivity were collected from the Directorate of Economics and Statistics, Directorate of Agriculture, Cooperation & Farmers Welfare, Government of India and Indiastat.com etc. Data regarding MSP was collected from the Commission for Agricultural Cost and Prices. Rainfall data was collected from the Indian Meteorological Department, Government of India.

Compound growth rate analysis

The growth rates can be specified as the percentage change of a particular variable within a given period. Compound annual growth rates (CAGR) of area, production and productivity of groundnut over the 17 year period were estimated using the following growth model,

$$Y = ab_t u_t \qquad ...(1)$$

Where,

Y = Area, production and productivity of groundnut consider in year t, a = Intercept, b = Regression coefficient, t = Time variable (years), u_t = Error term

The equation was estimated after transforming (1) as follow;

$$Log\ Y = log\ a + t\ log\ b + log\ u_t$$

Then, the per cent compound growth rate was calculated using the relationship

$$G = [(\text{antilog of } b) - 1] \times 100$$

Significance of growth rate was judged by conducting student's t- test at 5 per cent and 1 per cent level of significance.

Instability index

Instability index is a simple analytical technique to find out the fluctuation or instability in any time series data (Ramasamy *et al.* 2005; Gupta and Sharma, 2010). Coefficient of Variation (CV) is the simplest measure of instability, it does not completely explain the variability present in the time series data because of the existence of the trend component. In order to reduce this problem, formula suggested by Cuddy and Della (1978) was used. Rather of assessing variability over the mean of the data, this takes into account the time trend in the data and measures variability over the time trend.

$$C - D\ II(\%) = CV\sqrt{\left(1 - \bar{R}^2\right)}$$

Where, CV = co-efficient of variation and R^2 = co-efficient of determination from a time trend regression adjusted by the number of degrees of freedom. The significant CGRs were classified in two groups i.e. negative and positive CGR. The high growth and low instability are prerequisites for sustainable agricultural performance.

Nerlove' s supply response model

To analyze how groundnut crop acreage response and production response, we used the Nerlovian partial adjustment model, incorporating both price and non-price factors associated with the main crop and its competitive crop. The selection of competitive crop was based on statistical criteria, involving the calculation of correlation coefficients between crop areas.

Model Specification and Estimation

Based upon the review of Nerlove (1958) and other studies that is; Sangwan (1985) evaluated the responsiveness of acreage for different crops with respect to their relative farm harvest prices, relative yield of individual crops, price risk, yield risk, irrigated area of the region, rainfall received during the critical period of crop and adjustment behaviour, Jain *et al.* (2005), lagged area, price, yield and rainfall of groundnut, Patil *et al.* (2012) , expected price, area lagged by one year, average annual rainfall and price risk, Karunakaran and Gangadharan (2014) area under the crop, lagged year area, price risk, yield risk, irrigated area and rainfall, Sandeep *et al.* (2016), One year lagged area, one year lagged farm harvest price, lagged yield, annual rainfall yield risk and price risk, Dupdal and Patil (2018), lagged acreage,lagged yield and lagged price, Katara and Khunt (2019), one and two year lagged area and farm harvest prices, sowing rainfall, one year lagged yield, current area of competing crop, gross income, gross income of competing crop, one year lagged price of competing crop, yield risk, and return risk and price risk.

In the present study Nerlovian model was used in both linear and log-linear forms. The best fits log linear form was selected on the basis of the coefficient of multiple determination (R^2). Care was taken for the presence of auto correlation and problem of multicollinearity in the time series data over the period of study of the variables by using the Durbin Watson 'd' statistic and correlation matrix between the independent variables.

Acreage response model

Gujarat

$$A_t = b_0 + b_1A_{t-1} + b_2Y_{t-1} + b_3Q_{t-1} + b_4\,IR_t + b_5SR_t + b_6MMSP_t + b_7\,YR_t + b_8\,Ac_{t-1} + U_t \qquad \ldots(2)$$

In the double log or log linear form, this module would be as following.

$$A_t = b_0 + b_1\log A_{t-1} + b_2\log Y_{t-1} + b_3\log Q_{t-1} + b_4\log IR_t + b_5\log SR_t + b_6\log MMSP_t + b_7\log YR_t + b_8\log Ac_{t-1} + U_t \qquad \ldots(3)$$

Rajasthan

$$A_t = b_0 + b_1A_{t-1} + b_2IR_t + b_3SR_t + b_4RF_t + b_5YR_t + b_6At_c + b_7PRC_t + b_8Yc_{t-1} + U_t \qquad \ldots(4)$$

In the double log or log linear form, this module would be as following.

$$A_t = b_0 + b_1\log A_{t-1} + b_2\log IR_t + b_3\log SR_t + b_4\log RF_t + b_5\log YR_t + b_6\log At_c + b_7\log PRC + b_8\log Yc_{t-1} + U_t \qquad \ldots(5)$$

Where, A_t = Area of *kharif* groundnut at time t (ha), A_{t-1} = Area of *kharif* groundnut lagged by one year (ha), Y_{t-1} = Yield of *kharif* groundnut lagged by one year (kg/ha) , Q_{t-1} = Production of *kharif* groundnut lagged by one year (tonnes), IR_t = Irrigated area under *kharif* groundnut at time t (ha), SR_t = Sowing month rainfall at time t (mm), $MMSP_t$ = Minimum support price of *kharif* groundnut at time t (₹/q), YR_t = Yield risk of *kharif* groundnut crop at time t (kg/ha), Ac_{t-1}= Area of competitive crop lagged by one year (ha) A_{t-1} = Area of *kharif* groundnut lagged by one year (ha), RF_t = Monsoon season rainfall at time t (mm), YR_t= Yield risk of *kharif* groundnut crop at time t (kg/ha), Ac_t = Area of competing crop at time t (ha), PRC_t = Price risk of competing crop at time t (₹/q), PR_t = Price risk of *kharif* groundnut crop at time t (₹/q)

Yc_{t-1} = Yield of the competing crop lagged by one year (kg/ha), U_t = Disturbance term

Production response model

Gujarat

$$Q_t = b_0 + b_1A_t + b_2IR_t + b_3SR_t + b_4RF_t + b_5YR_t + U_t \qquad \ldots(6)$$

In the double log or log linear form, this module would be as following;

$$Q_t = b_0 + b_1\log A_t + b_2\log IR_t + b_3\log SR_t + b_4\log RF_t + b_5\log YR_t + U_t \qquad \ldots(7)$$

Rajasthan

$$Q_t = b_0 + b_1Q_{t-1} + b_2IR_t + b_3RF_t + b_4QR_t + b_5YR_t + b_6At_C + U_t \qquad \ldots(8)$$

In the double log or log linear form, this module would be as following

$$Q_t = b_0 + b_1\log Q_{t-1} + b_2\log IR_t + b_3\log RF_t + b_4\log QR_t + b_5\log YR_t + b_6\log At_C + U_t \qquad \ldots(9)$$

Where,

Q_t =Production of *kharif* groundnut at time t (tonnes), A_t = Area under *kharif* groundnut crop at time t (ha), IR_t = Irrigated area under *kharif* groundnut at time t (ha), SR_t = Sowing month rainfall at time t (mm), RF_t = Monsoon season rainfall year at time t (mm), YR_t = Yield risk of *kharif* groundnut crop at time t (kg/ha), Q_{t-1} = Production of *kharif* groundnut at t–1 (tonnes)

Q_R = Production risk of *kharif* groundnut at time t (tonnes), Ac_t = Area under *kharif* competing crop at time t (ha), U_t = Disturbance term

Estimation of yield risk and production

Risk due to yield and production was calculated as standard deviation of the last three year's yield and production, respectively, of the crop.

Detection of autocorrelation

To determine whether auto correlation existed in the time series data collected throughout the study period, the Durbin Waston '*d*' statistic was computed. Durbin-Watson test for serial correlation is inappropriate for models including a lagged dependent variable as an explanatory variable; there is always likelihood of autocorrelation in autoregressive models than the *d*-statistic test would suggest. The combination of autocorrelation and lagged dependent variable results in biased parameter estimates because the error term is correlated with a regressor. For such models, called autoregressive models, Durbin has developed the so-called h statistic to test the first order autocorrelation which is defined as follows (Gujarati and Porter, 2009).

$$h = \rho \sqrt{n}/1 - n\ [\text{var}\ (\alpha)]$$

$$\rho = 1 - 1/2\ d$$

d = Durbin Watson value (DW)

$$var\ (\alpha) = (s.e)^2$$

$$pr\ (-1.96 \leq h \leq 1.96) = 1 - \alpha$$

Where n is total number of sample, $var\ (\alpha)$ is the variance of the coefficient of the lagged dependent variable, *s.e* is the standard error and ϱ estimate the first order autocorrelation. If the value of Durbin h statistic is in between -1.96 and 1.96 then there will be no autocorrelation.

Detection of multicollinearity

The zero order correlation matrixes were computed for testing the problem Multicollinearity of for time series data of the selected variables.

RESULTS AND DISCUSSION

Gujarat showed a negative growth rate in groundnut area at 1.79 per cent per annum with one per cent level of significance (Table 1). This implies that groundnut area were significantly decreasing over the years. The trend of area under groundnut crop in Gujarat state presented in Fig. 1. This study also supported by Kolar *et al.* (2020) who found that the area under the groundnut crop declined at 1.02 per cent per annum during their study period (1995-96 to 2017-18). Trends of production and productivity were presented in Figs. 2 and 3 respectively. Groundnut production and yield registered high rate of instability of 42.02 per cent and 37.94 per cent, respectively in Gujarat state. Adverse climatic conditions during the harvesting season contribute a major role in variation in yield and production. In terms of groundnut production in India, Rajasthan state has emerged as the second leading producer. Area and production of groundnuts in Rajasthan in 2018–19 were 673.37 thousand hectares and 1382.00 thousand tonnes, respectively (Fig. 1 and 2). This represented a worthy part of 14.23 per cent and 20.54 per cent of the total groundnut area and production in all of India. The area under the groundnut crop has been growing at a positive rate of 7.52 per cent per year, and it has been observed statistically one per cent level of significance (Table 1).

Table 1: Compound growth rate and instability index of area, production and yield, of groundnut in Gujarat and Rajasthan states

States		Area	Production	Yield
Gujarat	Compound Growth rate (%)	-1.79*	1.98	3.85
	Instability Index (%)	9.54	42.02	37.94
Rajasthan	Compound Growth rate (%)	7.52*	10.95*	3.98
	Instability Index (%)	17.18	20.57	16.87

***Note:** *denotes significance at 1 per cent levels.*

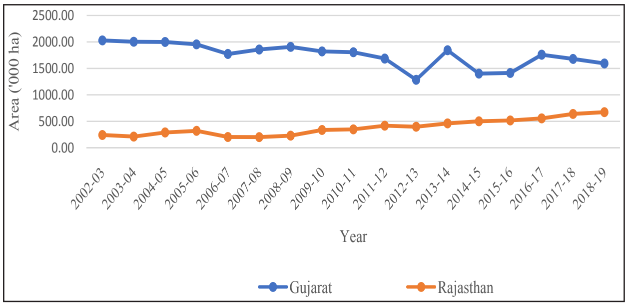

Fig. 1: Trends of groundnut area in Gujarat and Rajasthan states

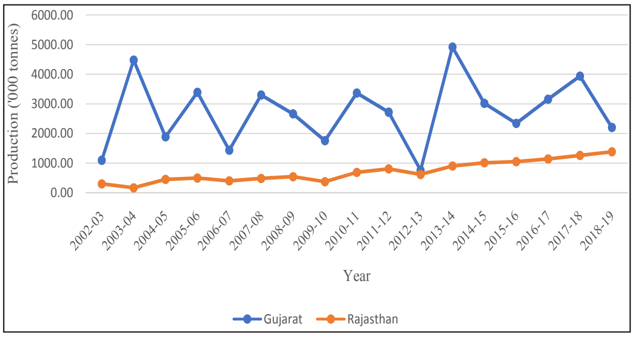

Fig. 2: Trends of groundnut production in Gujarat and Rajasthan states

The annual growth in groundnut production was 10.95 per cent level and also found statistically significant at a one per cent level. Similar results were noted by Kolar *et al.* (2020), who discovered that over their study period (1995–96 to 2017–18) in Rajasthan, the area and production under the groundnut crop grew by 4.13 percent and 4.35 percent, respectively. Suman *et al.* (2019), also found a positive growth rate in production (10.83 %) of groundnut during their study period 2005-14 in Rajasthan. Area (17.18%), production (20.57%), and productivity (16.87%) all showed moderate instability during the course of the research. Similar results were noted by Kolar *et al.* (2020), who discovered that Rajasthan has a medium rate of volatility in both area (18.42%) and production (25.73%).

Gujarat

Area response function:

The acreage response function was fitted to examine the impact of price and non-price factors on farmers' decisions on area allocation under groundnut in Gujarat state, and the results are discussed in this section (Table 2).

Table 2: Estimated coefficients of acreage response of groundnut in Gujarat state

Variables	**Coefficients**	**Standard Error**	**t-value**
Constant	4.629	0.967	4.784
Area under groundnut at *t*–1	-0.238	0.245	0.971
Yield of groundnut at *t*–1	0.009	0.037	0.253
Production of groundnut at *t*–1	0.085	0.048	1.749*
Irrigated area under groundnut	0.231	0.112	2.058*
Sowing month rainfall	0.004	0.023	0.173
MSP of groundnut	-0.177	0.148	1.196
Yield risk of groundnut	-0.044	0.087	0.505
Area under cotton at *t*–1	-0.251	0.150	1.673*
R^2	0.851		
Adjusted R^2	0.701		
D-W test	1.794		

Note: ** denotes significance at 10 per cent level.*

The regression coefficient of these explanatory variables is presented in Table 2. It shows that the irrigated area was found a positively influential factor in the farmer's decision regarding area allocation to groundnut and was found significant at a ten per cent level of significance in Gujarat state. The estimated coefficient of the irrigated area was 0.23, suggesting that an increase of one per cent in the irrigated area is expected to result in 0.23 per cent expansion in acreage under groundnut crop. Nowadays, erratic rainfall is becoming a problem for the farming community. In general, crop require water in growing activities, however, if meeting the requirement in their critical stages fails, it directly affects their area and production also. This suggests that if irrigation facilities improve, farmers will increase their cropping areas for a crop. Nadaf *et al.* (2021) found a positive and significant response of irrigated area to area allocation for groundnut crop in their study.

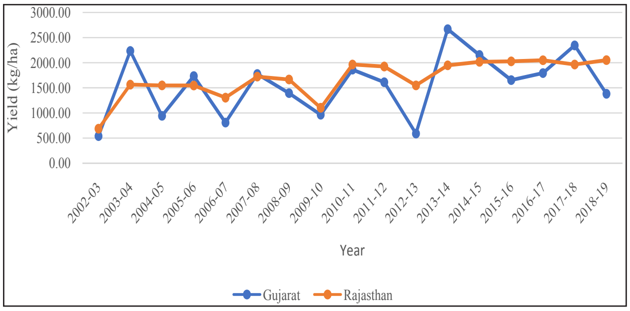

Fig. 3: Trends of groundnut yield in Gujarat and Rajasthan states

The coefficient of a lag area of the competitive crop (cotton) was negative and significant at ten per cent level of significance, which implies that the lag area of cotton had shown a negative impact on the area of groundnut in the study period. The results are supported by Devi *et al.* (2018) who found the lag area under competitive crop had exerted a negative influenced on area under the main crop. One of the reasons behind the because of farmers follow the same cropping pattern and do not want to change it. So, farmers grow cotton in every season rather than cultivating a groundnut crop.

Coefficient of lag groundnut production was found to have a positively significant impact on acreage allocation decisions in groundnut crop. The estimated coefficient of lag groundnut production was 0.08. It shows that an increase of one per cent in lag groundnut production will lead to a 0.08 per cent expansion in groundnut acreage. It implied that lag groundnut production was an influencing variable in the area allocation of the crop. The lag yield of groundnut has positive but non significant effects on acreage allocation under groundnut crop. Whereas, the MSP of groundnut has not shown any significant influence on acreage allocation decisions. Probably this might be due to the unawareness of MSP declaration among the farmers and also farmers receive better market prices than MSP. The rest of the variables namely, MSP of crop, yield risk variables and sowing month rainfall did not found a significant impact on the decision in acreage allocation. It indicates acreage allocation decisions by the groundnut growers are not influenced by these factors.

Production response function

The results of the production function for groundnut are presented in Table 3.

Table 3: Estimated coefficients of production response of groundnut in Gujarat state

Variables	Coefficients	Standard Error	t-value
(Constant)	-5.914	4.334	1.365
Area under groundnut crop	1.148	1.114	1.031
Irrigated area under groundnut crop	0.713	0.385	1.851*
Sowing month rainfall	-0.053	0.135	0.388
Monsoon season rainfall	0.996	0.544	1.830*
Yield risk of groundnut crop	0.387	0.385	1.006
R^2	0.454		
Adjusted R^2	0.205		
D-W test	2.207		

Note: ** denotes significance at 10 per cent level.*

The regression coefficient of the irrigated area of groundnut and monsoon season rainfall were found 0.71 and 0.99, respectively at a ten per cent level of significance. Here, the regression coefficient of monsoon season exerted more influence as compared to irrigated areas because it helped increase production. These two factors were found most affecting in increasing the production of groundnut crops as water is the most important requirement for any crop. The influence of rainfall on variation in groundnut production was positive and substantial, indicating that favorable moisture conditions had an impact on production allocation. Every one percent increase in the irrigated area under groundnut crop will lead to an increase in groundnut production by 0.71 per cent. These results are also supported by Byligoudra (2019) and Mulla, (2019). The estimated coefficient of monsoon season rainfall was 0.99, which suggested that an increase of one per cent in monsoon season rainfall is expected to lead 0.99 per cent of expansion in groundnut production. The rest of the variables like area under groundnut crop, yield risk of groundnut and sowing month rainfall did not significantly affect groundnut production. Here, the value of R2 was low, implying that there might be other independent variables, which are not mentioned in the model also affecting groundnut production.

Rajasthan

Area response function:

The coefficients of the estimated model for groundnut crop along with the related statistics are presented in Table 4.

Table 4: Estimated coefficients of acreage response of groundnut in Rajasthan state

Variables	Coefficients	Standard Error	t-value
Constant	3.352	1.694	1.979
Area under groundnut at time t-1	-0.524	0.301	1.743
Irrigated area under groundnut	1.013	0.226	4.486***
Sowing month rainfall	0.048	0.051	0.938
Monsoon season rainfall	0.335	0.248	1.351
Yield risk of groundnut	-0.011	0.028	0.384
Area of *bajra*	-0.690	0.320	2.160*
Price risk of *bajra*	0.058	0.052	1.124
Yield of *bajra* at *t*–1	-0.173	0.139	1.244
R^2	0.952		
Adjusted R^2	0.904		
D-W test	2.074		

Note: *** and *** denotes significance at 5 per cent and 1 per cent levels, respectively.*

The coefficient of the irrigated area under the groundnut crop was discovered at the one percent significance level, indicating that, while holding other factors constant, every percent change in an irrigated area is expected to increase the area of the groundnut crop by 1.01 percent. This is one of the reasons behind the increase in area for the groundnut crop, if controlled amounts of water are provided through irrigation to land in order to aid in the production of crops and to help plants flourish. Nadaf *et al.* (2021) also found a positive and significant response of irrigated area to area allocation for groundnut crop. The coefficient of the area under *bajra* (competitive crop) was negative and significant. Its magnitude is 0.69 per cent, suggesting that an increase of 1 percent in the area under *bajra* is expected to result in a decrease 0.69 per cent area for groundnut crop. The results are supported by Devi *et al.* (2018) who found the area under a competitive crop had exerted a negative influenced on area under main crop. One possible explanation for this could be that farmers switched from growing groundnuts to *bajra*. The rest of the variables namely, the lag area under groundnut crop, monsoon season rainfall, sowing month rainfall, yield risk of groundnut crop, price risk of *bajra* crop and lag yield of *bajra* crop had no significant influence on farmer's decision on land allocation under groundnut crop.

Production response function

The results obtained from the production response function for groundnut in Rajasthan state are presented in Table 5.

Table 5: Estimated coefficients of production response of groundnut in Rajasthan state

Variables	Coefficients	Standard Error	t-value
(Constant)	2.085	1.443	1.444
Production of groundnut *t*-1	-0.444	0.170	2.614**
Irrigated area under groundnut crop	1.504	0.189	7.959***
Monsoon season rainfall	0.809	0.319	2.538**
Production risk of groundnut	0.059	0.119	0.497
Yield risk of groundnut	-0.634	0.735	0.863
Area under *bajra* crop	-0.554	0.280	1.979*
R^2	0.956		
Adjusted R Square	0.930		
D-W test	2.114		

Note: **, ** and ***denotes significance at 10 per cent, 5 per cent and 1 per cent levels, respectively.*

The coefficient of the irrigated area was found positive and significant at one per cent level on groundnut production. It implied that It indicated that for every one per cent increase in area under irrigated conditions or increase in water availability is likely to increase 1.50 per cent in production. The monsoon season rainfall coefficient was shown significantly positive at the five per cent level. A one percent increase in rainfall results 0.80 percent rise in production.

The coefficient of area under *bajra* crop had negatively influenced production because of cultivable area of *bajra* crop increased which might affect groundnut area and ultimately production. It indicated that for every one per cent increase in area under *bajra* crop likely to decrease (0.55) per cent in production. Here, also coefficient of lag production (-0.444) was also found negatively significant at five per cent. Growing the same crop year after year depleted the soil by lowering the availability of certain nutrients. The soil becomes depleted of these nutrients and monocultures may lead to soil exhaustion. So, lag groundnut production affected negatively groundnut production. Here, production risk was found positive on groundnut production implying that farmers were willing to bear risk.

Overall, the comparative analysis indicates that while irrigation availability and competitive crop are the major determinants of groundnut acreage in both states. These findings imply that state-specific policies focusing on irrigation development and efficient crop planning can play an important role in enhancing groundnut cultivation. Irrigation and monsoon rainfall are the key determinants of groundnut production in both Gujarat and Rajasthan. However, groundnut production in Rajasthan is more responsive to irrigation, whereas Gujarat is relatively more influenced by favourable monsoon rainfall. The greater responsiveness of groundnut production to irrigation in Rajasthan may be attributed to the state's arid to semi-arid agro-climatic conditions, where rainfall is low, highly variable, and unevenly distributed. Under such conditions, irrigation serves as a reliable source of water, mitigating moisture stress during critical crop growth stages and significantly enhancing production. In contrast, Gujarat receives relatively higher and better-distributed monsoon rainfall, reducing the crop's dependence on irrigation alone. For Rajasthan, priority should be given to strengthening irrigation infrastructure, expanding micro-irrigation systems, and promoting efficient water management to ensure sustainable growth in groundnut production.

CONCLUSION

It was concluded based on the findings of the study that the growth rate of area under groundnut crop was found negative (-1.74%) with a one per cent level of significance. High rate of instability were observed in production (42.02%) and yield (37.94%) in Gujarat state. This may be due to adverse climatic conditions during the harvesting season contribute a major role in variation in the production and yield of groundnut. On assessing acreage, the coefficients of the irrigated area were found positively significant influence as per logic and expected signs. The coefficient of a lag area of competing crop (cotton) was negative and significant at ten per cent level of significance, indicating that the lag area of cotton had a negative impact on the rise in groundnut area over the study period. MSP of groundnut has not shown any significant influence on acreage allocation decisions. Probably this might be due to the unawareness of MSP declaration among the farmers and also farmers receive better market prices as than MSP. The regression coefficient of the irrigated area of groundnut and monsoon season rainfall had significant impact on increased groundnut production. Area, production and productivity were increasing over the year in Rajasthan state. Irrigated area of groundnut crop in Rajasthan state exerts positively on farmers' groundnut crop area allocation decisions than *bajra* area (competitive crop). The coefficients of groundnut production response during the study period in Rajasthan showed that the irrigated area under the groundnut crop had a positive and substantial impact on the groundnut production. It is concluded that the Nerlovian acerage response function is very well explained by the various contributing factors and supply response is according to price and non price factors. The country currently imports more than half of its internal needs, which is expected to increase due to population growth and rising per capita consumption. Immediate action is crucial in this area to avoid increased reliance on imports. To achieve self-sufficiency, oilseed growers require support through research and development, long-term planning, government policies, and remunerative pricing. Agricultural inputs, such as creating protective irrigation structures like farm ponds, yield-boosting technology like HYV in sufficient quantities at a reasonable price through cooperatives or groundnut producer organizations, helps to increase area and production of groundnut farmer and if indirectly helps raise the standards of living of groundnut farmers. Since groundnut production in Rajasthan is highly dependent on irrigation due to its arid and semi-arid climate, low and erratic rainfall, and high evapotranspiration, priority should be given to strengthening irrigation infrastructure and promoting efficient irrigation systems to ensure sustainable increases in groundnut productivity. All of these actions contribute to the growth and development of the oilseed sector in the state.

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