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GROWTH, INSTABILITY AND SUPPLY RESPONSE OF GROUNDNUT CROP

(A Study in Rayalaseema Region of Andhra Pradesh)

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ABSTRACT

India is one of the largest producers of groundnut in the World. But they account for a small part of international trade because most of their production is consumed domestically as groundnut oil. Approximately 90 per cent of India's production is processed in to oil. Only a nominal amount of handpicked select-grade groundnut is exported. Groundnut for edible uses account for two-thirds of the total crop consumption. There were considerable fluctuations observed in the sector by the post studies. The growth of cropped area, production and yield of groundnut crop had not been steady. Andhra Pradesh also no exempted from this. An increased in cropped area may not raise the output of the crop. Hence, it is necessary to study 'growth and instability and supply response' of groundnut crop in Rayalaseema region of Andhra Pradesh state. To find out growth and instability simple linear regression model and co-efficient of variation used and tested by F-test statistics and to examine the supply responses of crop hectareage Nerlovian partial adjustment adaptive expectation model was used. It is able to raise the production through the raising of productivity to meet the demand for agriculture produce. It helps to take appropriate policy decisions on groundnut cropped area, production and yield. It also helps to raise the national income.

KEYWORDS: *Groundnut, Aspergilla, oil, shelled nuts, Peanut butter, soil fertilizer.*

INTRODUCTION

India is one of the largest producers of groundnut in the World. But they account for a small part of international trade because most of their production is consumed domestically as groundnut oil. Approximately 90 per cent of India's production is processed in to oil. Only a nominal amount of handpicked select-grade groundnut is exported. Groundnut for edible uses account for two-thirds of the total crop consumption. The principal uses are salted, shelled nuts, Peanut butter, Peanut brittle, candy bars and nuts that have been roasted in the shell salted groundnut is usually roasted in oil and packed in retail size, plastic bags or hermetically sealed cans. Dry roasted, salted groundnut is also marketed in significant quantities. Groundnut oil is often used in cooking, because it has a mild flavour and burns at a relatively high temperature. Under the name plump 'nut' two small bags per day are given by the World Health Organization as a surviving base to many children

Groundnuts are a rich source of protein and moron saturated fat. Recent research on groundnut in general has found antioxidants and other chemicals that may provide health benefits. Groundnut is a significant source of resveratrol a chemical studied for potential anti-aging effects. Because

groundnut is considered an incomplete protein containing relatively low amounts of the essential amino acids, Lysine, cosine and meth ionone, it is advised to be sure that a diet or meal with groundnut as a staple also include complementary food such as dairy or whole grain. Groundnut is also an unbalanced source of fat because they are devoid of required omega-3 fats. Some brands of groundnut butter are fortified with omega-3 in the form of flaxseed oil to balance the ratio of omega 3 to omega-6.

Groundnut may be spoiled with the meld Aspergilla's flavours, which produces a carcinogenic substance, called of afflation. While this substance quickly causes liver cancer in rats, humans are far more resistant. Lower quality specimens, particularly where meld is evident are more likely to be contaminated. To minimize this problem, make sure to obtain your groundnut from a reputable source and store the groundnut in a cool dry place such as the refrigerator or freezer.

Groundnut has a variety of industrial and uses. Paint, Varnish, lubricating oil, leather dressings, furniture Polish, insecticides and nitro-glycerine are mode from Groundnut oil. Soap is made from saponifined oil and many cosmetics contain groundnut oil and its derivatives. The protein portion of the oil is used in the manufacture of some textile fibres. Groundnut shells are put to use in the manufacture of plastic, wallboard, abrasives and fuel. They are also used to make in cellulose and mucilage. Groundnut plant tops are used to make hay. The protein cake residue from oil processing is used as an animal feed and as a soil fertilizer. It is estimated that half-a-billion people on Earth rely on the groundnut as their primary source of protein

Groundnut is the most important oilseed crop accounting for about 20 per cent of the cropped area in the state of Andhra Pradesh. The area, production and yield of groundnut crop during the year 2010-11 is 1758643 hectares, 986773 tonnes and 898 kgs / hectare respectively.

REPUTATION OF AGRICULTURE IN INDIAN ECONOMY

Agriculture farms are the back bone of the Indian economy and despite concerted industrialization in the recent past, agriculture countries to occupy a place of pride. Being the largest industry in the country, agriculture is the source of livelihood for over seventy percent of population in the country. The significance of agriculture in the national economy can be the best explained by considering the role of agriculture under different heads.

The share of agriculture in national income is often taken as an indicator of economic development. Normally, developed economics are less depends on agriculture when compared to under developed countries. But in India the share of agriculture has persistently declined on account of the development at the secondary and tertiary sector of the economy. In 1950-51 the share of agriculture in net domestic product was roughly fifty percent. It has declined steadily to 15.7 percent in 2010-11.

With rapid increase in population, the absolute number of people engaged in agriculture and allied activities has become exceedingly large. Development of the other sectors of the economy has not been sufficient to provide employment to the increase additions to working population who are, therefore, forced to fall back upon agriculture even if their marginal productivity on land is zero or nearly so. This gives rise to the familiar problem of under employment and disguised unemployment. According to Indian census, nearly 52.1 percent of India's working population is engaged in agriculture in 2010-11. In India, as in other developing countries agriculture plays an important role in industrial development. Agriculture provides raw material to the cotton textiles, Jute, Sugar and Vanaspati and plantation- all these depend on agriculture, which are of basic importance of the growth of national income. But then in recent years, the significance of agriculture to industries is going down as many new industries have been coming up which are not dependent on agriculture. Despite this, as agriculture develops in India and as the incomes occurring to the rural people increase the size at the market for industrial products in rural areas will also increase.

REVIEW OF LITERATURE

The study of K.R. Shanmugam reveals the farm-specific technical efficiency of raising major principal crops. He employs the stochastic frontier production function technique to measure the technical efficiency of rice, groundnut and cotton farm in Tamil Nadu. The technical efficiency or raising irrigated groundnut is relatively high in own land cultivation as compared with that of leased land cultivation. Farmers having a high promotion of family members with middle school education are more efficient in raising groundnut.

K. SubbaramaRaju and P.B.Parthasarthy study is related to supply response and influence of growth on supply response and adjustment mechanisms were assessed for major oilseed crops by regions in Andhra Pradesh. The adjustment mechanism indicates less number of years required to realize the price effect, when compared with the low growth districts in each region of Andhra Pradesh. The growth concept can be better utilized in the location-specific and crop specific research schemes and in the growth oriented development programmes.

Rahji and Adewunmi conducted a study on the market supply response and demand for local rice in Nigeria with implications for self-sufficiency policy. The main objective of the study was to apply a supply response model to rice production in Nigeria. This study examined the supply response and demand for local rice in Nigeria between 1960 and 2004. A system of equations using secondary data was estimated by OLS and 2 Stage Least Square techniques. The short run response elasticity is 0.077. The implied long run response elasticity is 1.578. The partial adjustment measure is 0.49 thereby indicating some difficulties in the supply response to changing economic conditions. The price elasticity of demand obtained is 0.841. The demand for local rice is thus price inelastic. Rice income inelasticity is 0.3378, that is, it is also inelastic. The ban on rice importation could be said to be a step in the right direction. This policy should be continued and policed. However, price, output and non-price incentives that can exert significant influence on rice supply response and demand are required if the self-sufficiency goal is to be achieved.

OBJECTIVES

The following are the core objectives of the present study,

1. to study the growth and instability in area, production and yield and
2. to examine the supply responses of selected groundnut crop in Coastal Andhra region, Andhra Pradesh.

METHODOLOGY

To fulfil the first objective of the study both the linear and log-linear models were estimated with the graphs were shown along with the original trend for groundnut crop. But analysis was carried out only for linear model.

The simple linear regression model was used. The model was

$$Y = a + bt$$

Here,

Y = area / production / yield

a, b are the constants to be determined

t = time point

The percentage of linear growth rate is calculated by the formula

$$L.G.R = \frac{\hat{b}}{\bar{Y}} * 100$$

$\hat{b}$ is tested by 't'-test statistic

$$t = \frac{\hat{\hat{b}}}{S.E\ (\hat{b})}$$

Where,

$$S.E(\hat{b}) = \sqrt{\frac{\varepsilon(Y - \bar{Y})^2}{N}}$$

To determine the instability in area, output and yield of the groundnut crop, the co-efficient of variation was calculated by the formula

$$C.V. = \frac{\sigma}{\bar{Y}} * 100$$

Where,

σ = standard deviation

$\bar{Y}$ = mean of area / production / yield

To fulfil the second objective, supply equations have been estimated with the help of Nerlovian partial adjustment, adaptive expectation model. The farmer decides the hectareage to be planted under different crop on the basis of expected future prices. The farmer adjusted the current planted area to the desired area in the current production year due to techno-economic and instructional constraints. Nerlove introduced the element of

dynamism by introducing the concept of distributed lags in the analysis of the hectareage of the agricultural commodities. He defined the long-run supply response function as follows:

$$A_t = C_0 + C_1 P_{t-1} + C_2 A_{t-1} + U_t \quad \ldots\ldots\ldots\ldots (1)$$

Where,

$$C_0 = a_0 B, \quad C_1 = a_1 B, \; C_2 = (1\text{-}B) U_t = B V_t$$

The equation (1) is helpful in the estimation of short-run and long-run price elasticity and they can be obtained by using the relations:-

$$SRE = C_1 \frac{\bar{P}_{t-1}}{\bar{A}_t} \quad \}\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

$$LRE = \frac{C_1}{1-C_2} \frac{\bar{P}_{t-1}}{\bar{A}_t}$$

Where,

$\bar{P}_{t-1}$ and $\bar{A}_t$ are the means (averages) of P_{t-1} and A_t respectively.

$$A_t^* = B\left[a_0 + a_1 P_{t-1} + a_2 Y_{t-1} + a_3 C V_P + a_4 C V_y + a_5 R_t + a_6 I_t + a_7 D + V_t\right] A_{t-1} (1\text{-}B) + Z_t$$

$$A_t^* = C_0 + C_1 P_{t-1} + C_2 Y_{t-1} + C_3 C V_p + C_4 C V_y + C_5 R_t + C_6 I_t + C_7 D + C_8 A_{t-1} + U_t \quad \ldots (3)$$

Where,

$$C_0 = a_0 B; \; C_1 = a_1 B; \; C_2 = a_2 B; C_3 = a_3 B; \; C_4 = a_4 B;$$
$$C_5 = a_5 B; \; C_6 = a_6 B; \; C_7 = a_7 B; \; C_8 = a_8 B; \; U_t = B V_t + Z_t$$

Variables are denoted as fallows –

A = actual area planted in 1,000 hectares under the crop.

t = 't^{th} production period.

P_{t-1} =farm harvest price of the crop (₹ / Quintal) lagged by one year.

Y_{t-1} = yield of the crop by one year (Kilograms /Hectares).

$C V_p$ = co-efficient of variations of the prices of the crop connected for the yearst-1, t-2, t-3 used as a measure of price risk.

$C V_y$ = co-efficient of variation of yields of the crop concerned for the years t-1, t-2, t-3 used as a measure of yield risk.

R_t = rainfall for the sowing season for the crop concerned in millimetres.

D = dummy variable to pick up the effect of the left out variables of new technology. Thus the dummy variable will specify the constant terms for the period of 1985-86 to 2010-11.

I_t = irrigated area under all crops in 1,000 hectares.

U_t = stochastic disturbance term.

C_1's = regression co-efficients.

Bothe the linear and log linear models for the equation (1) and (3) were fitted to the data and the results discussed to evolve a better model.

ANALYSIS

Growth and Instability in Groundnut

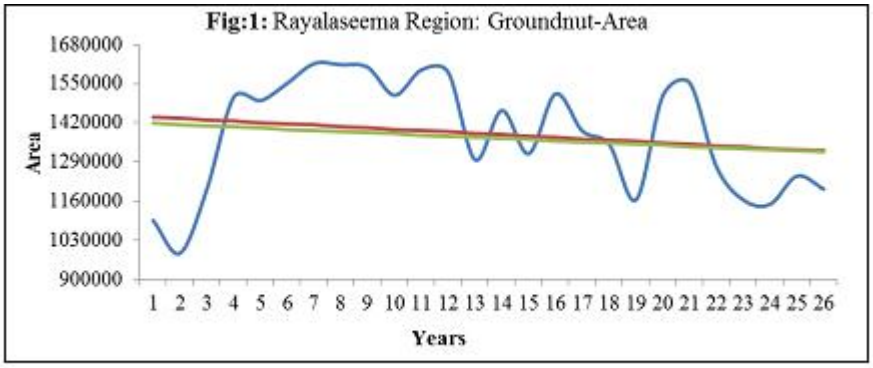
Trends, growth rates and instability were analysed with three views i.e., area, production and yield for selected groundnut crop with the help of the lineal equations, co-efficient of variation and also given graphical representation in Coastal Andhra region, Andhra Pradesh.

1. Area

The calculated linear regression equation for groundnut area in Rayalaseema is

Y= 1444093 - 4526.757*t	L.G.R = -0.3273 %	C.V = 13.36 %

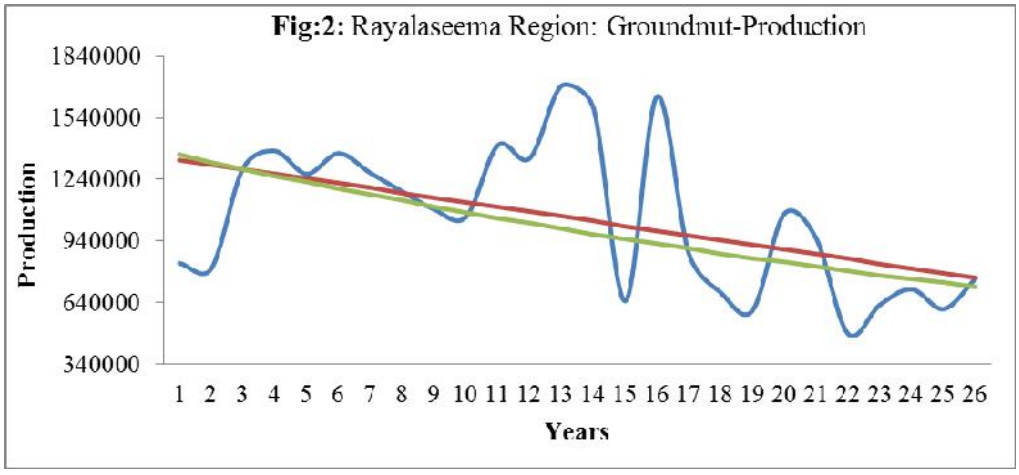
The linear growth rate is -0.3273per cent. It shows that there is a negative growth in groundnut area. The average annual decrease in area of groundnut in Rayalaseema region is 0.3 per cent. The estimated value of 'b' is 4526.757. It reveals that there is a decreasing trend in groundnut area in the region. This value reveals that an average, 4526.7 hectors of area is decreasing and this decrease is significant. The value of the intercept i.e., 'a' is 1444093. The coefficient of variation is 13.36 per cent and reveals that 13 per cent of variation is in area of groundnut during the study period.



2. Production

The computed equation for the production of groundnut crop is

Y=1359807.76 - 23011.2*t	L.G.R = -2.1933%	C.V = 35.12 %

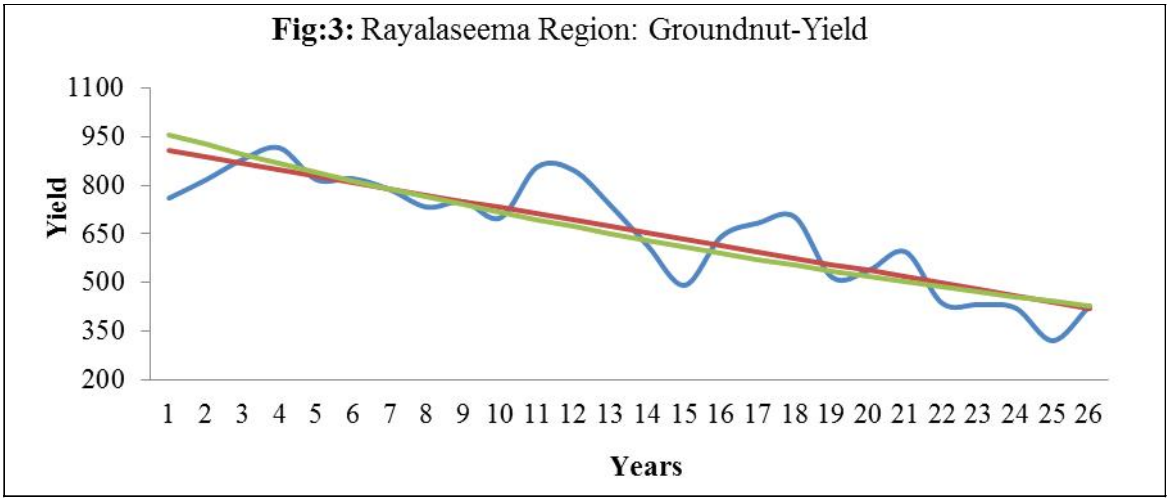


From the above estimated equation, the value of 'b' is negative and significant at 5 per cent of probability level. It reveals that the rate of change in the equation. It means every year, on average, 23011.2 tons of groundnut production is decreasing. It is a significant increase tested by t-test statistic. The estimated linear growth rate of production of groundnut crop is -2.1933 per cent. The value of constant/intercept term is 1359807.76. The coefficient of variation is 35.12 per cent.

3. Yield

The estimated equation for groundnut yield in Rayalaseema regions

The estimated linear growth rate is -2.9313 per cent. It shows that the average annual decrease in the yield of groundnut in Rayalaseema region is nearly 3 per cent. The estimated value of b' is -19.442. It is negative and insignificant significant at 5 per cent probability level. It reveals that there is decreasing trend in groundnut yield in the region. It discloses that on average, 19.44 kilograms of yield is decreasing every year during the study period. The coefficient of variation is 26.32 per cent. The value of the intercept term is 925.741.



Supply Responses

Equation -1:-

In the present study, the dependent variable was the area under groundnut crop in current year (A_t), and the independent variables are lagged farm harvest price (P_{t-1}) and lagged year area (A_{t-1}). The results are drawn to study the combined and individual effect of both lagged price (P_{t-1}) and lagged area (A_{t-1}) on current year cropping area of groundnut. The data was fed to equation -1 which is supply response function and the results were shown in the following manner.

In the given below table-1the multiple correlation coefficient is 0.4593. It shows that the combined effect of lagged price (P_{t-1}) and lagged area (A_{t-1}) on current year cropped area of groundnut (A_t) is approximately 46 per cent during the study period and tested by F-test statistic and found as significant at 5 per cent probability level. Nearly 46 per cent of variation in total groundnut cropped area was noticed by those two independent variables in the region. It is observed that as increased in lagged price (P_{t-1}) and lagged area (A_{t-1}) simultaneously, the current year cropping area of groundnut (A_t) raised by its grower's about 46 per cent. The value of adjusted multiple correlation coefficient ($\bar{R}^2$) is 0.4123. The value of coefficient of constant term i.e., b_o is 5.1252.

The coefficient of lagged price (P_{t-1}) was -0.0296. It reveals that the effect of the lagged price (previous year price) on current year cropping area of groundnut (A_t)is negative. This negative figure shows that there was adverse effect of price on cropped groundnut in Rayalaseema region. But this negative effect was insignificant. The coefficient of lagged area (A_{t-1}) is 0.6523. The efficient of logged area is two and significant 5 per cent probability level. For every one unit in area in (At-1) variables will in increase the event year – area by 0.6523 units. This increase is a significant increase. It indicates that its effect on current year cropped area of groundnut is 65 per cent during the study period. It is tested as significant at 95 per cent of confidence. Hence, current year cropping area of groundnut was only supply (area) responsive. Hence, in Rayalaseema region groundnut cropped areas is not price response but responded by lagged year's area.

Table: 1 Estimated supply response function of Groundnut for Equation-1	
Coefficients	**Estimated Values**
b_o	5.1252 (2.0402)
P_{t-1}	-0.0296 (0.0506)
A_{t-1}	0.6523* (0.1486)
R^2	0.4593
$\bar{R}^2$	0.4123
F	9.7698*
Note: Figures in parentheses are standard errors of the estimates. * Significant at five per cent probability level.	

Equation – 3:-

To study the combined effect of all independent variables namely, lagged price (P_{t-1}), lagged yield (Y_{t-1}), the coefficient of variation of preceding three years price (CV_p), the coefficient of variation of preceding three years yield (CV_Y), current year rainfall (R_t) current irrigated area (I_t), dummy variable (D) (the effect of the left out variables like new technology, HYV, use of fertilisers and chemicals etc.,)and lagged area (A_{t-1}) on dependent variable (current cropping area of groundnut (A_t)) it is adopted the equation-6, shown in methodology. The findings of all variables are given in table-2.

Table:2 Estimated supply response function of Groundnut for Equation-3	
Coefficients	**Estimated Values**
b_o	4.1584 (2.1144)
P_{t-1}	0.1609* (0.1269)
Y_{t-1}	0.0736 (0.1456)
CV_p	0.0344 (0.0294)
CV_y	-0.0391 (0.0351)
R_t	-0.0214 (0.1076)
I_t	0.3903* (0.1263)
D	0.0082 (0.0210)
A_{t-1}	0.2814* (0.2104)
R^2	0.6908
$\bar{R}^2$	0.5453
F	14.7480*
Note: Figures in parentheses are standard errors of the estimates. * Significant at five per cent probability level.	

The aggregate effect of all independent variables on dependent variable is measured by the value of (R^2) the multiple correlation co-efficient (R^2) is 0.6908. It shows that the collective effect of all independent variables namely, lagged price (P_{t-1}), lagged yield (Y_{t-1}), the coefficient of variation of preceding three years price (CV_p), the coefficient of variation of preceding three years yield (CV_Y), currentyear rainfall (R_t) current irrigated area (I_t), dummy variable (D)and lagged area (A_{t-1}) on current year cropping area of groundnut is 69 per cent and tested by F-test statistic as significant (14.7480) at 5 per cent level of probability in the study period (1986-87 to 2010-11) in Rayalaseema region. Therefore it is observed that 69 per cent of variation in groundnut area by these selected independent variable. The value of adjusted multiple correlation coefficient ($\bar{R}^2$) is 0.5453. The coefficient of b_o (constant) is 4.1584.

FINDINGS AND SUGGESTIONS

The linear growth rate is estimated and found as positive trend -0.3273, -2.1933 and -2.9313_percent regarding to *area*, *production* and *yield* of groundnut crop in Coastal Andhra region in the study period. But towards area this positive growth rate is insignificant by t-test statistic at 5 percent probability level.

The coefficient of variation is 13.36, 35.12 and 26.32 per cent of instability was observed in the view of *area*, *production* and *yield* of groundnut crop during the study period respectively.

The combined effect of both independent variables on dependent variable is calculated by the multiple regressions coefficient (R^2) and is similar in all regions including state as a whole. It is tested by F-test statistic as significant at 95 per cent of confidence.

There is no scope to improve the cropping are (A_t) by increasing the above said variables in Rayalaseema region. Contradictorily, the coefficient of lagged yield (Y_{t-1}; 0.0736) and the coefficient of irrigated area (I_t: 0.3903*) are showing its positive and significant effect on current year cropped area (A_t) except the coefficient of lagged yield. It indicates as the irrigated area of groundnut increases the area under the groundnut crop raised 98 per cent by its growers i.e. the area under groundnut is perfectly irrigated area responsive in Rayalaseema region and this growth is significant at 5 per cent probability levels. The value of coefficient of b_o (constant) is 4.1584.

Suggestions to Improve Cropping Area, Production and Productivity of Groundnut

Major constraints to groundnut production that India faces are land, water, labour and other inputs such as fertilizers, pesticides and insecticides, and even high quality germ plasma, without affecting the already degraded and stressed agricultural environment. The problems of flash floods, water logging/submergence due to poor drainage are very common in South India. Due to the non-availability of seeds farmers are using continuous of traditional varieties, lack of awareness of farmers about high yielding varieties is the major constraint low soil fertility, due to soil erosion resulting in loss of plant nutrients and moisture. Low and imbalanced use of fertilizers, low use efficiency of applied fertilizers particularly in the North-Eastern and Eastern States.

1. It is possible that most of the fluctuations are due do to price and payment polices. This is an area that needs to be investigated.
2. Need of stabilizing policies towards a*rea* and p*roduction* of groundnut crop, in Rayalaseem region.
3. To improve location specific technology through research, development and extension efforts and also ensured input supply mechanism.
4. There is more scope to raise the area under these commercial crops by enhancing or offering the more prices and providing better irrigation and marketing facilities to its producers.
5. To get best results in production and productivity by enhancing the consumption of bio-fertilizers.
6. The introduction of new seed-irrigation-fertilizer technology supported by remunerative pricing policy encouraged the farmers to put more and more area under this crop.
7. Adequate number of improved/high yielding varieties may be evolved for rain fed eco-system, which constitutes nearly 60% of the cultivated rice area.
8. Rice area in Eastern region is 59% of total area but productivity is very poor. Hence, suitable technology and varieties may be developed for this state so that productivity could be increased.
9. More number of cold tolerant high yielding varieties is required to be developed and popularized for different altitudes of hill regions.
10. Leguminous crops may be included in the cropping system in order to improve the soil fertility.
11. Saline, alkaline and acidic soils may be reclaimed by application of soil ameliorants.
12. To encourage the Integrated Pest Management approach for effective control of pests and diseases by emphasizing the need based application of pesticides.
13. Another green revolution should be needed towards accelerate production and yield of food crops in the state.
14. Abolish role of mediators at the time of selling crops by farmers.
15. Provide interest-free loans to farmers at cropping time sufficiently.
16. Provide guaranteed crop-insurance for all type of crops overall the state.

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