CHAPTER V

Supply Response of Groundnut and Sugarcane Crops
5.1 INTRODUCTION:

To study the area response of two selected commercial crops groundnut and sugarcane in two periods Pre-green revolution and Post-green revolution, the log linear regression models were adopted. The study was carried out for three regions namely Rayalaseema, Coastal Andhra, Telengana separately and Andhra Pradesh state as a whole. In the present study, the dependent variable is the area under crop in current year (At), and the independent variables were lagged farm harvest price (Pt - 1), lagged yield (Yt - 1), the standard deviation of preceding three years yield (σPt), the standard deviation of preceding three years yield (σYt), current irrigated area (It), Rainfall in current year (Wt) and lagged year area (At-1). The data was fed to equation (4), i.e. area response functions and the results were shown in the table 5.1 for the both the periods. The estimated coefficients of the variables give different implications. The estimated regression values were analyzed accordingly.
Table 5.1
Estimated Area Response Functions of Groundnut and Sugarcane crops

<table>
<thead>
<tr>
<th>REGION/CROP</th>
<th>PERIOD</th>
<th>bo</th>
<th>Pt-1</th>
<th>Yt-1</th>
<th>c Pt</th>
<th>cYt</th>
<th>lt</th>
<th>wt</th>
<th>At-1</th>
<th>R²</th>
<th>R²*</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rayalaseema</td>
<td>Pre-green</td>
<td>28.7687*</td>
<td>(2.4552)</td>
<td>0.2207*</td>
<td>(0.0816)</td>
<td>0.1367</td>
<td>(0.1543)</td>
<td>0.0844*</td>
<td>(0.0180)</td>
<td>-0.2342*</td>
<td>(0.0451)</td>
<td>-0.0276</td>
</tr>
<tr>
<td>Groundnut</td>
<td>Post-green</td>
<td>2.6465</td>
<td>(2.1182)</td>
<td>0.1122</td>
<td>(0.077)</td>
<td>0.0362</td>
<td>(0.0395)</td>
<td>0.0030</td>
<td>(0.0191)</td>
<td>-0.0266</td>
<td>(0.0305)</td>
<td>0.0225*</td>
</tr>
<tr>
<td>Rayalaseema</td>
<td>Pre-green</td>
<td>-2.9327*</td>
<td>(2.3726)</td>
<td>-0.0046</td>
<td>(0.0529)</td>
<td>0.2870*</td>
<td>(0.1439)</td>
<td>0.0167</td>
<td>(0.0186)</td>
<td>0.0177</td>
<td>(0.0358)</td>
<td>0.9655*</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>Post-green</td>
<td>6.1724*</td>
<td>(2.4331)</td>
<td>-0.0573</td>
<td>(0.0923)</td>
<td>-0.1021</td>
<td>(0.1530)</td>
<td>0.0305</td>
<td>(0.0404)</td>
<td>-0.0262</td>
<td>(0.0551)</td>
<td>0.5130*</td>
</tr>
<tr>
<td>Coastal Andhra</td>
<td>Pre-green</td>
<td>-2.7675*</td>
<td>(5.5817)</td>
<td>0.1620</td>
<td>(0.1183)</td>
<td>0.6795</td>
<td>(0.3880)</td>
<td>0.0337</td>
<td>(0.0217)</td>
<td>0.0289*</td>
<td>(0.0119)</td>
<td>-0.0868*</td>
</tr>
<tr>
<td>Groundnut</td>
<td>Post-green</td>
<td>3.6889*</td>
<td>(1.1749)</td>
<td>-0.0618*</td>
<td>(0.0202)</td>
<td>-0.0243</td>
<td>(0.0483)</td>
<td>-0.0021</td>
<td>(0.0105)</td>
<td>0.0366</td>
<td>(0.0363)</td>
<td>0.3877*</td>
</tr>
<tr>
<td>Coastal Andhra</td>
<td>Pre-green</td>
<td>-1.5191*</td>
<td>(2.5372)</td>
<td>0.0444</td>
<td>(0.0321)</td>
<td>1.1857*</td>
<td>(0.2298)</td>
<td>0.0261*</td>
<td>(0.0122)</td>
<td>0.1919*</td>
<td>(0.0270)</td>
<td>0.1091*</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>Post-green</td>
<td>5.9346*</td>
<td>(2.6489)</td>
<td>-0.1616*</td>
<td>(0.0759)</td>
<td>-0.2090</td>
<td>(0.1752)</td>
<td>0.0091</td>
<td>(0.0236)</td>
<td>-0.0061</td>
<td>(0.0376)</td>
<td>0.7953*</td>
</tr>
</tbody>
</table>

Table Contd...
Table 5.1
Estimated Area Response Functions of Groundnut and Sugarcane crops

<table>
<thead>
<tr>
<th>REGION/CROP</th>
<th>PERIOD</th>
<th>Bo</th>
<th>P1-1</th>
<th>Y1-1</th>
<th>P2t</th>
<th>Y2t</th>
<th>I1</th>
<th>w1</th>
<th>A1t</th>
<th>R²</th>
<th>R²</th>
<th>F</th>
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<tbody>
<tr>
<td>Telangana</td>
<td>Pre-green</td>
<td>7.9218</td>
<td>-0.1637</td>
<td>0.0867</td>
<td>-0.0013</td>
<td>0.0582</td>
<td>0.5034</td>
<td>-0.2810</td>
<td>0.1009</td>
<td>0.9594</td>
<td>0.8645</td>
<td>10.1161*</td>
</tr>
<tr>
<td>Groundnut</td>
<td></td>
<td>(8.9481)</td>
<td>(0.6048)</td>
<td>(0.2621)</td>
<td>(0.2148)</td>
<td>(0.1984)</td>
<td>(0.3081)</td>
<td>(0.6444)</td>
<td>(0.6842)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-green</td>
<td>13.8583</td>
<td>-0.2866</td>
<td>-0.0553</td>
<td>0.2288</td>
<td>-0.2175</td>
<td>0.9987*</td>
<td>-1.9199*</td>
<td>0.1918</td>
<td>0.5468</td>
<td>0.0072</td>
<td>1.0301</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(9.5889)</td>
<td>(0.5788)</td>
<td>(0.4084)</td>
<td>(0.3653)</td>
<td>(0.2695)</td>
<td>(0.7989)</td>
<td>(0.9148)</td>
<td>(0.1992)</td>
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<tr>
<td>Telangana</td>
<td>Pre-green</td>
<td>13.6776*</td>
<td>0.0065</td>
<td>-0.1689</td>
<td>-0.0023</td>
<td>0.0766</td>
<td>0.3689*</td>
<td>-0.8065*</td>
<td>-0.0683</td>
<td>0.9141</td>
<td>0.7137</td>
<td>4.5603</td>
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<tr>
<td>Sugarcane</td>
<td></td>
<td>(4.4629)</td>
<td>(0.0329)</td>
<td>(0.1321)</td>
<td>(0.0214)</td>
<td>(0.0719)</td>
<td>(0.1309)</td>
<td>(0.3669)</td>
<td>(0.2374)</td>
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<tr>
<td>Post-green</td>
<td>-1.2762</td>
<td>0.0401</td>
<td>0.4380*</td>
<td>0.0788</td>
<td>0.0755</td>
<td>0.0171</td>
<td>0.2612</td>
<td>0.4821*</td>
<td>0.4711</td>
<td>0.3029</td>
<td>2.7998*</td>
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<td></td>
<td>(3.0113)</td>
<td>(0.0892)</td>
<td>(0.1644)</td>
<td>(0.0725)</td>
<td>(0.0758)</td>
<td>(0.0602)</td>
<td>(0.2331)</td>
<td>(0.1767)</td>
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</tr>
<tr>
<td>Andhra Pradesh</td>
<td>Pre-green</td>
<td>21.3576</td>
<td>0.4719*</td>
<td>-0.0108</td>
<td>0.1029</td>
<td>-0.1301</td>
<td>-0.0805</td>
<td>-0.1791</td>
<td>-0.5018</td>
<td>0.9528</td>
<td>0.8428</td>
<td>8.6600</td>
</tr>
<tr>
<td>Groundnut</td>
<td></td>
<td>(13.3468)</td>
<td>(0.2314)</td>
<td>(0.3271)</td>
<td>(0.0638)</td>
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<td>(0.1697)</td>
<td>(0.4286)</td>
<td>(0.8092)</td>
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<tr>
<td>Post-green</td>
<td>2.9459*</td>
<td>0.0241</td>
<td>-0.0211</td>
<td>-0.0172</td>
<td>-0.0480*</td>
<td>0.2130*</td>
<td>0.0737</td>
<td>0.5919*</td>
<td>0.9376</td>
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<td>(1.6148)</td>
<td>(0.0469)</td>
<td>(0.0397)</td>
<td>(0.0257)</td>
<td>(0.0555)</td>
<td>(0.0858)</td>
<td>(0.1134)</td>
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<tr>
<td>Andhra Pradesh</td>
<td>Pre-green</td>
<td>-6.6009</td>
<td>0.1353</td>
<td>1.4678</td>
<td>0.0519</td>
<td>0.2069</td>
<td>0.4806</td>
<td>-0.6866</td>
<td>0.8931</td>
<td>0.6435</td>
<td>3.5788</td>
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<tr>
<td>Sugarcane</td>
<td></td>
<td>(13.4719)</td>
<td>(0.2685)</td>
<td>(1.1791)</td>
<td>(0.0953)</td>
<td>(0.1622)</td>
<td>(0.2901)</td>
<td>(0.5172)</td>
<td>(0.2807)</td>
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</tr>
<tr>
<td>Post-green</td>
<td>-0.3776</td>
<td>-0.0528</td>
<td>0.3124</td>
<td>0.0293</td>
<td>0.0325</td>
<td>0.3459</td>
<td>-0.0492</td>
<td>0.4803*</td>
<td>0.6561</td>
<td>0.5467</td>
<td>5.9957*</td>
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<td></td>
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<td>(0.0900)</td>
<td>(0.1962)</td>
<td>(0.0349)</td>
<td>(0.0399)</td>
<td>(0.2159)</td>
<td>(0.1651)</td>
<td>(0.2230)</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Note: * Significant at five Per cent Probability level.
Figures in Parentheses are Standard errors of the estimates.
5.2 RAYALASEEMA REGION:

GROUNDNUT:

From the above table 5.1, the value of multiple correlation coefficient \( (R^2) \) is 0.9869. It is observed that the combined effect of all independent variables on dependent variable, area under the groundnut in Pre-green revolution period is observed to be 99 per cent i.e. all independent variables collectively shows nearly 99 percent of variation in groundnut area during the Pre-green revolution period in Rayalaseema region. From F-test statistic, this collective effect \( (R^2) \) of independent variables is found to be significant. The coefficients of lagged price \( (Pt - 1) \) and standard deviation of price \( (\sigma Pt) \) shows positive and significant effect. It indicates that the groundnut area is price responsive. It means there exists positive and significant relationships between area and price of groundnut crop in Rayalaseema region. It indicates as the price of Groundnut increases the area under groundnut may be raised by its growers, i.e. the area under groundnut is price responsive. The coefficients of \( \sigma Yt \) and \( At-1 \) are negative and significant. It indicates that these two variables shows a negative effect on groundnut area. The negative and significant effect indicates insufficiency in the use of these variables. The negative and significant values of \( \sigma Yt \) indicates as the risk in yield increase the area under groundnut may decrease. There is some scope to raise the area under groundnut by reducing the risk in yield. Similarly, the lagged year area was more, automatically the current years’ area was decrease significantly. The coefficients of lagged yield was positive and insignificant, where as the
coefficients of irrigated area (It) and Rainfall (Wt) were negative signs, which establish a negative relationship with the groundnut area but they were insignificant. The constant or intercept term is positive and significant. The value of adjusted multiple correlation ($R^2$) is 0.9563.

During the Post-green revolution period, it is observed that all most all selected endogenous (Independent) variables are shown positive relation with the exogenous (dependent) variable area under the groundnut crop. The coefficients of Irrigated area (It) and rainfall (Wt) variables shows positive and significant effect on area under groundnut crop in Rayalaseema region. It indicates that the groundnut area is responded by irrigation and rainfall. The coefficient of lagged area (At\(-1\)) is also positive and significant. It expresses that groundnut crop area is responded the independent variable lagged area. The variables, lagged price of the crop (Pt \(-1\)), lagged yield (Yt \(-1\)), price risk ($\sigma$Pt) are also shown positive effect on area (At), under groundnut during post-green revolution period. The coefficients of the variable yield risk ($\sigma$Yt) is negative and insignificant. It means there is inverse relationship between ($\sigma$Yt) and groundnut area (At) in Rayalaseema region, i.e. as the risk in groundnut yield increases the area will be decreased. The value of constant term (2.65) is positive but not significant. It is inferred that the groundnut growers were positively responded by price, but not significant. They were also significantly responded by irrigated area and rainfall significantly. The combined effect ($R^2$) of all independent variables on the dependent variable is 95 per cent. This collective effect on groundnut area is significant at five per
cent probability level. From F-test statistic, this collective effect of independent variables is found to be significant. It is noticed that 95 per cent variation was observed by all endogenous variables on exogenous variable, area under groundnut. The value of adjusted multiple correlation ($R^2$) is 0.9307.

Comparing the estimates in both the periods, it is observed a significant price effect on groundnut area was observed during pre-green revolution period but it is observed only positive during Post-green revolution period. The groundnut prices are encouraging it’s grower to allocate more area under the groundnut crop in Pre-green revolution period, but the groundnut prices are attractive but not significantly encouraging it’s growers in Post-green revolution period. During Post-green revolution period the irrigation and rainfall variables are encouraging the groundnut growers to allocate more area to groundnut where as these variables shows negative effect in Pre-green revolution period, but this negative effect is insignificant. The coefficients of lagged area are significant in both the periods but its effect is in opposite directions. Finally, it may be concluded that price is a responsive factor, during Pre-green revolution period and sources of water is a responsible factor during the Post-green revolution period in allocating the area to groundnut crop to its growers.

**SUGARCANE:**

From the estimated regression coefficients for the sugarcane crop, during the Pre-green revolution period, it is observed that majority of selected
independent variables were established a positive relationship with the
dependent variable sugarcane area, except lagged price and lagged area in
Rayalaseema region. The coefficients of Irrigated area \( (I_t) \) and lagged yield
were positive and significant at five percent probability level. It indicates that
the sugarcane area was positively and significantly affected by irrigated area
and lagged yield of sugarcane crop. Hence, it may infer that the sugarcane area
was responded by mainly irrigated area and lagged yield of the crop. An
increase in irrigated area will increase the total cane area. Similarly, for every
one unit increase in lagged yield 0.29 units of cane area was increased. The
coefficients of two risk variables standard deviation of Preceding three year's
prices \( (\sigma_{Pt}) \), and standard deviation of preceding three year's yield \( (\sigma_{Yt}) \), and
the coefficients of Rainfall \( (W_t) \) were also positive and insignificant. It
means, if all these variables were increased the area under sugarcane crop was
also increased. This increase is not significant. The coefficients of lagged price
\( (Pt - 1) \) and lagged area \( (At - 1) \) were negative and insignificant. It reveals
that there is a inverse relationship between lagged price and lagged area with
sugarcane Area \( (At) \) individually in Rayalaseema region. For every one unit
increase in these two variables will decrease the cane area. Hence, cane area
was not price responsive during the period. The value of constant term is
\(-2.93\), it is negative and significant. The combined effect of all independent
variables is 99 per cent. It is observed by the value of multiple correlation
coefficients \( (R^2) \). Almost 99.5 per cent of variation in cane area was noticed by
these independent variables. This collective effect of independent variables on
sugarcane area is significant at five per cent probability level. From F-test statistic, this variation was significant at five per cent probability level. The value of adjusted multiple correlation ($R^2$) is 0.9824.

Form the above table 5.1, during the Post-green revolution period, the value of multiple correlation coefficients ($R^2$) is 0.7224. The collective effect of all independent variables on dependent variable area under sugarcane is observed to be 72 per cent. It indicates that there is 72 per cent variation by these variables in Sugarcane area in Rayalaseema during the Post-Green revolution period. From F-test statistic, this collective effect is found to be significant. Regarding the endogenous variables considered in the model, it was observed that the three variables, namely Price risk, Irrigated area and lagged area were found to be positive, but only the irrigated variable shows significant effect on cane area. The remaining variable shows insignificant negative effect on cane area. The coefficient of Irrigated area shows positive and significant effect on area of sugarcane in Rayalaseema region. It indicated that the sugarcane area is responded by irrigated area significantly. The coefficients of standard deviation of preceding three year's price ($\sigma P_t$) and lagged area of sugarcane crop ($A_t - 1$) were shows a positive effect, but not significant. It reveals that the current year area was depending on lagged area and also as the risk in price increasing the area may be increased only three per cent. The coefficients of lagged price ($P_{t-1}$), lagged yield ($Y_{t-1}$), standard deviation of preceding three year's yield ($\sigma Y_t$) and Rainfall ($W_t$) were shows a negative and insignificant effect on dependent variable sugarcane area ($A_t$).
means there is inverse relationship between area under sugarcane and lagged price, lagged yield, yield risk, and Rainfall individually. It is noticed that the cane area was not responded by lagged price, it is only irrigation responsive. The value of constant term is 6.17 it is positive and significant. But intercept term shows significant and positive effect on sugarcane area. It means the effect of other independent variables which are not taking in the model, is significant in Rayalaseema region during Post-green revolution period. It reveals that there is a technological effect on cane area in Rayalaseema region in Post-green revolution period. The value of adjusted multiple correlation \( (R^2) \) is 0.6341.

Comparing the estimates during Pre and Post-green revolution periods, it is observed that the coefficients of Irrigated area \( (I_t) \) is positive and significant in both periods. The effect of lagged yield \( (Y_{t-1}) \) on sugarcane area was observed positive and negative during Pre and post-green revolution periods, respectively. It may be concluded that sugarcane area is responded by yield risk in pre green revolution but it is not so in Post-green revolution. The price effect on sugarcane area was negative and insignificant in both the periods. This means the cane prices were not encouraging it’s growers. Rainfall shows positive and negative effects on cane area in two periods respectively. It may be inferred that the rainfall is favorable to cane growers to raising its area during Pre-green revolution period but not so in the later period. Finally, it may be concluded that Irrigated area \( (I_t) \) variable is only responsible factor, in both periods, in allocating the more area to sugarcane crop in
Rayalaseema region. From the intercept values, the other variables were more responsible than the original variables in enhancing the cane area during the Post-green revolution period.

5.3 COASTAL ANDHRA REGION:

GROUNDNUT:

The table 5.1 reveals that the collective effect of all independent variables on groundnut area during the Pre-green revolution period is observed to be 99 per cent, i.e. more than 99 per cent of variation was observed by all endogenous variable on groundnut area. It is evident by the value of $R^2$ (0.9936). From F-test, it is found to be significant. All most all selected independent variables except irrigated area established, individually, positive relationship with area under the groundnut crop in Coastal Andhra region of Andhra Pradesh. The coefficients of Irrigated area (-0.0868) shows negative and significance effect on groundnut area in the region during Pre-green revolution period. It means the insufficient irrigated area was allocated to the groundnut crop. It is possible to raise the groundnut area by providing sufficient irrigated water. The coefficients of standard deviation of proceeding three year’s of yield and rainfall were shown positive and significant effect on groundnut area in Coastal Andhra region. The groundnut area may be increased by raising these two variables. The coefficient of lagged area is also a positive and significant. For every one unit increase in these variables will raise the total groundnut area by 0.03, 0.12 and 0.79 unit respectively. Also this increase is significant. The coefficients of lagged price ($P_t - 1$), lagged
yield \( (Y_t - 1) \) and standard deviation preceding three year's prices \( \sigma P_t \) are shown positive and insignificant effect on groundnut area in coastal Andhra region. The value of intercept term is \(-2.77\). The value of adjusted multiple correlation \( R^2 \) is 0.9307.

During the Post-green revolution period, it is observed that the coefficients of Irrigated area \( (I_t) \) and lagged area \( (A_{t-1}) \) were positive and significant. It means irrigated area and lagged area were the factors to raise the groundnut area significantly in Coastal Andhra region. A unit increase in these two variables will raise the groundnut area by 0.39 and 0.53 units respectively. The coefficient of Rainfall and lagged price variables shown a negative and significant effect on groundnut area. Since their coefficients were negative and insignificant \((-0.247 \text{ and } -0.062\)). This means the climatic conditions i.e. Rainfall and the lagged price are not favorable to groundnut crop during Post-green revolution period in coastal Andhra region. The lagged prices and rainfall variables were not attracting the groundnut growers to allocate more area under the crop. It reveals that the price stability and timely rainfall may raise the groundnut area. The coefficients of standard deviation of lagged yield \( (Y_t - 1) \) and standard deviation of preceding three year's prices were \((-0.024 \text{ and } -0.0021\)) negative and insignificant. It means the groundnut area is negatively responded by these two variables. The coefficient of yield risk is positive i.e. 0.0366. The constant term is 3.69, it is positive and significant. This means other factors, which are not taken in our present model are also influencing groundnut area in Coastal Andhra region. The value of
multiple correlation coefficients is 0.9129. The combined effect of all independent variables is observed to be over 91 per cent. This collective effect of independent variables on groundnut area is significant at five per cent probability level. The value of adjusted multiple correlation ($R^2$) is 0.8852.

Comparing the estimates in both the periods, it is observed that the Irrigated area shows significant effect in both periods, but it is negative in Pre-green revolution period and positive in Post-green revolution period. It reveals the insufficient irrigation during Pre-green revolution period to groundnut crop. The coefficient of Rainfall also significant in both periods, but it is negative in Post-green revolution period. During the Post-green revolution period insufficient rainfall or odd time rains leads to decrease the groundnut area. This means, Irrigated area and Rainfall variables were encouraging the groundnut growers during Post and pre-green revolution periods respectively. The coefficient of lagged area shows positive and significant effect on groundnut area during pre and Post-green revolution periods. This means lagged area variable is encouraging groundnut grower’s in both the periods. Standard deviation of proceeding three years yield ($\sigma Yt$) i.e. yield risk is positive in both periods. So, yield risk and groundnut area are positive related. The price effect is negative and significant on groundnut area in Post-green revolution period. The price response is absent or not encouraging the growers. The independent variables other than the considered variables were also influencing significantly and positive during Post-green revolution period, but not in pre-green revolution period in coastal Andhra region. Finally it may be
concluded that, Price, lagged area, Rainfall, Irrigated area, yield risk the responsive factors in both the periods in allocating the area to groundnut crop.

SUGARCANE:

During Pre-green revolution period, from the table 5.1, it is noticed that the coefficients of all independent variables, except the variable, lagged area, were positive in Coastal Andhra region. The coefficients of lagged yield price risk, yield risk and Irrigated area of the sugarcane crop were positive and significant. An increase in one unit in each of these four variables will increase 1.19, 0.03, 0.19 and 0.11 units of cane area respectively. This increase is a significant increase. It means, the increase in area of sugarcane is significantly influenced by these four independent variables. The coefficients of lagged price and Rainfall were also influencing the sugarcane area positively, but not significantly. Only four per cent and three per cent increase in cane area was recorded by these two variables. The coefficient of lagged area is negative and insignificant. A negative relationship was established between $A_t$ and $A_{t-1}$. The value of constant term is $-1.52$. The independent variables, which were considered in the study, were much influencing the sugarcane area during the Pre-green revolution period in Coastal Andhra region. It is noticed by the value of $R^2$. The combined effect of all independent variables is more than 99 per cent. More than 99 per cent of variation was recorded by the selected variables on cane area. This collective effect of independent variables on sugarcane area is significant at five per cent probability level. It is proved from F-test statistic. The value of adjusted multiple correlation ($R^2$) is 0.9794.
During the Post-green revolution period, the value of $R^2$ is 0.8227. The collective effect of all independent variables on, dependent variable, area under sugarcane is observed 82 per cent, i.e. over 82 per cent of variation in cane area was recorded by these endogenous variables. From F-value this variation in cane area was found to be significant. The value of adjusted multiple correlation ($\tilde{R}^2$) is 0.7663. The coefficient of only one variable i.e. irrigated area is positive and significant. An increase in one unit of irrigated area will raise the area under sugarcane area by 0.8 units therefore cane area was responded by irrigated area only. The coefficient of price risk is positive but not significant. The price risk also affecting the cane area positively but it is insignificant. The coefficient of the variable lagged price ($P_t - 1$) shows negative significant effect of lagged price is negative and significant. Hence, lagged price is negatively related to sugarcane area. This negative and significant coefficient reveals that sugarcane growers are not influenced by the lagged price of sugarcane in raising the area of sugarcane in the region. By increasing the price of cane, it is possible to motivate the growers to allocate more area. The coefficient of standard deviation of preceding three year’s price shows positive but insignificant. The effect of price risk on cane area was negligible. The coefficients of standard deviation of preceding three year’s yield ($\sigma Y_t$), Rainfall ($W_t$), lagged area ($A_{t-1}$) and lagged yield are negative and insignificant. It means, the above four independent variables are influencing negatively on sugarcane area. The value of constant or intercept
term is 5.94. It is significant and positive. This means some other variables are also influencing the area of sugarcane crop in coastal Andhra region.

Comparing the estimates of both the periods, only one variable i.e. Irrigated area (It) is the dominating variable in determining the area under sugarcane in two periods. It may be inferred that the sugarcane area is highly responded by this major fact on irrigation. It is observed that the variables, price risk, yield risk and lagged yield are also influencing sugarcane area during Pre-green revolution period, but it is not observed during Post-green revolution period. The sugarcane prices are encouraging its growers to allocate more area to the sugarcane crop in Pre-green revolution period. During the post-green revolution period, there is enough scope to raise the cane area by offering encouraging prices to its growers in Coastal Andhra region. The constant term is positive and significant in Post-green revolution period which means some other factors are also influencing sugarcane area positively. But it is not so during Pre-green revolution period. The independent variables yt-1, σPt, σYt and It were more encouraging factors to sugarcane growers to enhance in Pre-green revolution period, but only Irrigated area is influencing the sugarcane growers in area allocation during Post-green revolution period in Coastal Andhra region.

5.4 TELANGANA REGION:

GROUNDNUT:

During the Pre-green revolution period, from the table 5.1 it is observed that the regression values of the variables Yt – 1, σYt, It and At–1 were
positive and the remaining variables $Pt - 1$, $\sigma Pt$ and $Wt$ were negative. All these selected variables are not shown any significant effect on groundnut area in Telangana region of Andhra Pradesh. The coefficients of lagged area ($At-1$), lagged yield ($Yt - 1$) and yield risk ($\sigma Yt$) were positive and insignificant. Hence, these variables established a positive and insignificant relationship with groundnut area during the Pre-green revolution period in Telangana region of Andhra Pradesh. The coefficients of lagged price ($Pt - 1$), standard deviation of preceding three year's prices ($\sigma Pt$), and Rainfall ($Wt$) were established a negative insignificant relationship with the groundnut area. It means one unit increase in these variables will decrease the groundnut area by 0.16, 0.001, 0.28 units respectively. The constant term is 7.92, it is positive but not significant. The value of $R^2$ is 0.9594. The combined effect of all independent variables is 96 per cent. The collective effect of these independent variables on groundnut area is significant at five per cent probability level. Almost 96 per cent of variation in groundnut area was noticed by all selected variables. The value of adjusted multiple correlation ($\bar{R}^2$) is 0.8645.

From the table 5.1, it is noticed that the collective effect of all endogenous variables on exogenous variable, area under groundnut, is observed to be 55 per cent during the Post-green revolution period, it was revealed by value of $R^2$. From F-test statistic, this combined effect of independent variables is found to be insignificant. The value of adjusted multiple correlation ($\bar{R}^2$) is 0.0072. The constant term is 13.86, it is also positive but not significant. In the present study, it is found that only one
independent variable, Rainfall (\( W_t \)) shows a negative and significant effect on groundnut area in Telangana region. An increase in one unit of rainfall will decrease the groundnut area by 1.92 units. This negative and significant value of \( W_t \) expressed that the improper rainfall leads to significant decrease in groundnut area in the region. Therefore the timely rainfall will lead to increase in groundnut area. The coefficient of the variables Price risk (\( \sigma P_t \)), Irrigated area (\( I_t \)) and lagged area (\( A_{t-1} \)) were positive. These variables will shows a positive relation with area under groundnut, and this relation is not a significant relationship. The coefficient of lagged price (\( P_{t-1} \)), lagged yield (\( Y_{t-1} \)), yield risk (\( \sigma Y_t \)) were negative and insignificant. Every increase in each of these variables, there is a decreasing trend may take place in groundnut area from this analysis, it is observed that the growers of groundnut were not influenced by these variables. These variables are failed to encourage the growers in allocating the area to this crop in this Telangana region.

Comparing the estimated regression coefficients during the Pre and Post-green revolution periods, it is observed that all most all endogenous variables were not shows any significant effect on groundnut area in this region. It is clearly known that the selected variables are not much influencing on groundnut area. It also clear that insufficient rain fall or untimely rainfall shows a negative impact on area during the Post-green revolution period. Finally, it may be noticed that the groundnut growers were not favour to the crop. In Post-green revolution, all independent variables were expressed an insignificant effect on groundnut area in this region. The variables lagged area
(At-1), Irrigated area (It) were shown some positive effect during the two periods on its growers in allocating the area. The constant terms are also shows their positive effect to groundnut area, i.e. some other variables which are not taken in our study, are influencing to increase the area under groundnut

**SUGARCANE:**

From the table 5.1, it is observed that the value of multiple correlation coefficients (R²) is 0.9141, i.e. the collective effect of all endogenous variables on exogenous variable, area under Sugarcane crop during Pre-green revolution period is more than 91 per cent. This combined effect of all independent variables on sugarcane area is significant at five per cent probability level. It is proved from F-test statistic. The value of adjusted multiple correlation (R²) is 0.7037. The constant term is 13.68, it is positive and significant. This means some other variables, which are not taken in our study, were also influencing, collectively, sugarcane area in the region. The coefficient of independent variable Irrigated area (It) is positive and significant. There is a positive and significant relation between Irrigated area and area under cane. It for every one hectare increase in It, 0.3989 units of total cane area may be increased. This means irrigation is a major influencing factor in allocating the area to sugarcane crop in Telangana region. The coefficient of Rainfall (Wt) is also significant, but it is negative. The variable, rainfall shows a negative impact on cane area allocation. Every unit increase in rainfall will decrease the cane area by 0.81 units. The timely rainfall may influence the cane growers to allocate more area to sugarcane in Telangana region during Pre-Green
revolution period.. The variable yield risk ($\sigma Y_t$) shows positive and insignificant effect on sugarcane area. As an increase in yield risk will increase the cane area. The coefficient of lagged price ($P_t - 1$) is also positive, but not significant. This means price effect is also influencing factor to cultivate more area of sugarcane. Since the price coefficient is a negligible value (0.0065), it is noticed that there is no price effect on cane area. The coefficients of the variables standard deviation of preceding three year’s prices ($\sigma pt$), lagged yield ($Y_t - 1$), lagged area ($A_t - 1$) were negative and insignificant. Therefore, these above variables, shows a negative effect on sugarcane area in Telangana region. It is noticed that the price effect on cane area allocation is totally absent, but irrigation shows some significant effect.

During Post-green revolution period in Telangana region, the coefficient of lagged yield ($Y_t - 1$) and lagged area ($A_t - 1$) are positive and significant at five per cent probability level. This means previous year’s yield and area were the influencing factors to raise the area of sugarcane in Telangana region. A unit increase in these two variables will raise the cane area by 0.44 and 0.48 units respectively. The remaining all variables which are included in the model, established a positive relationship with the dependent variable sugarcane area ($A_t$). Since the coefficients of all these variables are positive and insignificant. According to t-test, the coefficients of lagged price ($P_t - 1$), standard deviation of preceding three year’s prices ($\sigma Pt$), yield ($\sigma Y_t$); Irrigated area ($I_t$) and Rainfall ($W_t$) are all expressed an insignificant effect on sugarcane area in Telangana region. The constant term is -1.28. It is observed
that the collective effect of all endogenous variables on exogenous variable, sugarcane area, during Post-green revolution period is 47 per cent. It is revealed by the value of multiple correlation coefficients. From F-test statistic, this collective effect is found to be significant. The value of adjusted multiple correlation ($R^2$) is 0.3029.

By comparing the estimates of Pre-green revolution period with Post-green revolution period in Telangana region, it is observed that the effect of lagged yield (Yt - 1) and lagged area (At-1) during the Post-green revolution period, was observed, but during Pre-green revolution period, lagged yield and lagged area (At-1) shows negative and insignificant effect on sugarcane area. The variable Irrigated area is possessing positive and significant relation with sugarcane area in Pre-green revolution period, but it is only positive in Post-green revolution period. It reveals that the cane growers were responded by irrigated area during Pre-green revolution period. The Rainfall (Wt) variable's is influence is in opposite directions on sugarcane area in both periods. Finally, it may be concluded that the effects of lagged price and price risk is totally absent. Hence, it may infer that this commercial crop sugarcane area is not price responsive but irrigation responsive.

5.5 ANDHRA PRADESH:

GROUNDNUT:

The area response functions for the two commercial crops groundnut and sugarcane were analyzed for the three regions of Andhra Pradesh namely Rayalaseema, Coastal Andhra and Telangana separately. The same analysis
may be carried out for entire Andhra Pradesh state for the two crops. The estimated regression coefficients were shown in the table 5.1.

The table 5.1 reveals that the multiple correlation coefficients ($R^2$) is 0.9528 during the Pre-green revolution period in Andhra Pradesh. It means the collective effect of all independent variables on dependent variable, area under groundnut crop was 95 per cent. This combined effect of these endogenous variables on groundnut area is not significant at five per cent probability level. It was tested by F-test statistic. The value of adjusted multiple correlation coefficient ($\bar{R}^2$) is 0.8428. The constant term is 21.36, it is also positive but not significant. Majority of selected endogenous variables are showing negative effect on groundnut area in Andhra Pradesh state as a whole. Among the Pre-green revolution period estimates, only one independent variable, i.e. lagged price ($P_t - 1$) is possessing positive and significant sign. It expresses that lagged price having a significant effect on groundnut area in Andhra Pradesh. As the change takes place in lagged price, a significant increase may be recorded in groundnut area. An increase in one unit in lagged price, 0.47 units of groundnut area may be increased. Similarly, price risk variable ($\sigma P_t$) showing some positive effect on area of groundnut. Hence, groundnut area in Andhra Pradesh, during Pre-green revolution period, is a price responsive. The coefficients of lagged yield ($Y_t - 1$), standard deviation of preceding three year's yield ($\sigma Y_t$), Irrigated area, Rainfall and lagged area were negative and insignificant. An increase in these variables will decrease the groundnut area in the state of Andhra Pradesh. But this decrease is not significant. Hence, it
may inferred that groundnut area is not responded by irrigation facilities or previous years yield etc. Finally, it may be concluded that the area under the groundnut is price responsive only. Therefore, price is the only factor which influencing the growers to allocate more area to this groundnut crop during the Pre-green revolution period.

During the Post-green revolution period, it is noticed that the variable irrigated area \( (It) \) showing a positive and significant effect on groundnut area. The coefficient of irrigated area is 0.213. This means irrigation facilities are more favorable to groundnut growers to raise the area of the crop in the state. The coefficients of lagged area \( (At-1) \) is also positive and significant. The lagged area is also leads to raise area the under groundnut in Andhra Pradesh. Therefore cropped area is responded by irrigated area mainly. The coefficients of standard deviation of preceding three year's yield \( (\sigma Yt) \) is negative and significant, i.e. as the risk in yield increases the area will decrease. There is some scope to raise the cropped area by decreasing the yield risk. The coefficients \( Yt-1 \) and \( \sigma Pt \), were negative and insignificant at five per cent probability level. The coefficients of lagged price \( (Pt - 1) \) and Rainfall \( (Wt) \) were positive and insignificant. One unit increase in each of these two variables will increase the area under groundnut by 0.02 and 0.07 units respectively. Lagged yield \( (Yt - 1) \), standard deviation of preceding three year's prices \( (\sigma Pt) \) coefficient were negative and insignificant. There exists a negative relationship between groundnut area and \( Yt - 1, \sigma Pt \) respectively. This means that these two factors are negatively influencing the area of
groundnut in the state. The constant term is 2.95, it is positive and significant. The value of $R^2$ is 0.9376. The combined effect of all independent variables on the dependent variable is 94 percent. Nearly 94 percent of variation in groundnut area was observed in Andhra Pradesh. This combined effect of endogenous variables on exogenous variable, groundnut area, is significant at five per cent probability level. The value of adjusted multiple correlation coefficient is 0.9177.

Comparing the estimates of the variables in both the periods, it is noticed that the lagged price effect is observed in Pre-green revolution period, but it was not so in Post-green revolution period. It means prices are encouraging groundnut growers in Pre-green revolution period, but not in Post-green revolution period in Andhra Pradesh state. Hence, it may be concluded that the groundnut area is price responsive during Pre-green revolution period.

The two coefficients of irrigated area ($I_t$) and lagged area ($A_{t-1}$) expressed a positive and significant effect on groundnut area during Post-green revolution period but not so in Pre-green revolution period. It indicates that groundnut is responded by irrigated area also. During Post-green revolution period, combined effects of all variables are significant but not so in Pre-green revolution period in Andhra Pradesh. Hence, it may be inferred that the groundnut area is responded by the variable $I_t$ and $A_{t-1}$.

**SUGARCANE:**

During the Pre-green revolution period, from the table 5.1, it is noticed that all endogenous variables expressed an insignificant effect on exogenous
variable sugarcane area in the state. Except the rainfall variable (Wt), remaining all variables established a positive relationship with cane area in Andhra Pradesh. The coefficients of lagged price (Pt - 1) shows their positive effect on dependent variable sugarcane area (At), but it is not significant. The coefficient of lagged yield (Yt - 1), standard deviation of preceding three year's price (σ Pt), risk in yield (σYt), Irrigated area (It) and lagged area (At-1) are all showing their positive insignificant effect on exogenous variable sugarcane area (At) in Andhra Pradesh state as a whole. Every one unit increase in each of the above variables will raise the cane area by 0.14, 1.47, 0.05, 0.21, 0.48 and 0.19 units respectively. The coefficient of Rainfall variable (-0.6866) is negative but insignificant. It means a negative relationship was established between Wt and At. An increase in one unit of rainfall will decrease the cane area by 0.69 units but this decrease is not significant. The climatic conditions are not favourable to cane growers in area allocation during Pre-green revolution period in Andhra Pradesh state. The value of constant term is –6.60. It is negative and insignificant. The value of multiple correlation coefficient (R²) is 0.8931. It reveals that the combined effect of all independent variables is 89 per cent. This collective effect of independent variables on sugarcane area is insignificant at five per cent probability level. It is proved by F-test statistic. The value of adjusted multiple correlation (R²) is 0.6435.

During the Post-green revolution period, the multiple correlation value is 0.6561. From this value, it is observed that the aggregate effect of all
independent variables on dependent variable, area under sugarcane, is 66 per cent. From F-test statistic it is found to be significant. The value of adjusted multiple correlation ( $\bar{R}^2$ ) is 0.5467. There is only one independent variable, i.e. lagged area (0.4803) is positive and significant. A positive and significant relationship expressed by this variable with cane area during the Post-green revolution period in Andhra Pradesh state. The coefficients of lagged yield ($Yt - 1$), price risk ($\sigma Pt$), yield risk ($\sigma Yt$), Irrigated area (It) are positive but insignificant. One unit increase in these four variables will increase the cane area by 0.31, 0.03, 0.03 and 0.35 units respectively. It means, these endogenous factors influencing positively on sugarcane area in the state. The coefficients of lagged price and Rainsfall were negative and insignificant. The effect of these exogenous variables on sugarcane area in Andhra Pradesh state is negative. The negative relation reveals that every one unit increase in these two variables will decrease the cane area by 0.05 and 0.05 units respectively. Sugarcane crop area allocation was not responded by price and irrigated area. No selected variable established a significant relationship with cane area. The constant term is negative and insignificant.

Comparing the estimated regression coefficients in both periods, it is noticed that the lagged Area's effect on cane area was observed in Post-green revolution period, but it was not so observed in Pre-green revolution period. It indicates that last year area under sugarcane crop influencing the cane growers during Post-green revolution period to raise the cane area but not so in Pre-green revolution period in Andhra Pradesh state. During the both periods
the estimated values of the variables, lagged yield \((Y_t - 1)\), price risk \((\sigma P_t)\), yield risk \((\sigma Y_t)\) and Irrigated area \((I_t)\) were expressed a positive and insignificant relation with sugarcane area in the state. It indicates that these factors are encouraging sugarcane growers in area allocation. The price effect is positive in Pre-green revolution period but it is negative in Post-green revolution period. It is noticed that the commercial crop sugarcane is not price responsive. Finally it is concluded that the variable rainfall \((W_t)\) is expressing a negative and insignificant effect on sugarcane area in both the periods.