# CHAPTER – VII

# SUMMARY OF FINDINGS AND CONCLUSIONS

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India is a major oilseeds producing country in the world. The percentage share of India in the total area and production of oilseeds in the world is very considerable which accounts for 15.0 per cent and 7.0 per cent. The percentage share of it in the total area and production of the world is highest which constitutes 54.4 per cent and 56.5 per cent in castor; 48.0 per cent and 38.2 per cent in safflower; 29.0 per cent and 15.4 per cent in groundnut; 23.0 per cent and 14.5 per cent in rape and mustard; and 21.0 per cent and 16.8 per cent in the case of sesamum. Owing to an increase in per capita income, population and other factors, the per capita consumption of oilseeds in India increased to 9.5 kgs in 2000-01 from 3.2 kgs in 1955-56; consequently, more area has been brought under the cultivation of oilseeds. Hence, the percentage share of oilseeds cropped area to the total cropped area increased to 12.9 per cent in 2000-01 from 8.1 per cent in 1950-51. But the planners have failed to achieve the targets of increasing the production of oilseeds during the various plan periods except in First, Sixth and Eighth Five Year Plans. Factors such as rapid industrialization, increase in per capital income burgeoning population and stagnation in yield have contributed the gap between demand and supply. To meet the increasing requirements, the Government has increased the imports of oilseeds by 7.3 times (from US$ 1926 lakhs in 1990-91

to US$ 14,129 lakhs in 2000-01); whereas, the exports rose only by 1.9 times (from US$ 4697 lakhs in 1990-91 to US$ 8998 lakhs in 2000-01). Therefore, it is necessary to examine the oilseed economy of India in order to explore the possibilities of augmenting its production and productivity, so that the minimum requirements of the growing population of the country could be met. Therefore, in this study, an attempt has been made to analyse the growth and instability in production and productivity of oilseeds from 1950 to 2001. For an analysis of oilseeds, the entire study period was split into four sub-periods in order to evaluate the trend and the impact of new production and to assess the relative cheques in contribution of dependent factors to the output growth. The sub-periods formed are as follows :

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| Period-I | : | 1950-51 to 1964-65 | Pre-Green Revolution period |
| Period-II | : | 1965-66 to 1979-80 | Green Revolution period |
| Period-III | : | 1980-81 to 1999-2001 | Post-Green Revolution period |
| Period-IV | : | 1986-87 to 1999-2001 | Post Technology Mission on Oil Seeds (TMO) Period |
| Overall period: | | 1950-51 to 1999-2001 | Overall period |

The compound growth rates of area, production and yield of the oilseeds, during the overall period of study increased significantly at 1.7 per cent, 3.1 per cent and 1.4 per cent respectively. The correlation of co-efficient between the period and area, between period and production and between period and yield is 0.9 in all the cases and is significant both at 0.05 per cent and 0.01 per cent levels.

Most of the oilseeds recorded a significant increase in area, brought under the production of oilseeds, Soyabean oilseed recorded highest growth of 20.8 per cent, followed by sunflower (11.3 per cent), rape and mustard (2.2 per cent), castor (1.0 per cent), groundnut (0.8 per cent), safflower and niger (0.4 per cent). However, the growth rate has declined by -0.4 per cent and -1.5 per cent in the case of sesamum and linseed. The correlation of co-efficient between period and area is significant as it is 0.7 (groundnut and castor), 0.9 (rapeseed and mustard, sunflower and soyabean) both at 0.05 per cent and 0.01 per cent levels; whereas, it was negatively correlated in the case of sesamum (-0.5) and linseed (-0.6) and insignificant in the case of safflower (0.2) and niger (0.4).

The compound growth rate of production was high, again, in the production of soyabean which accounted for 22.7 per cent per annum followed by sunflower (10.7 per cent), castor (5.0 per cent), rape and mustard (4.3 per cent), safflower (3.8 per cent), niger (1.7 per cent), groundnut (1.5 per cent) and sesamum (0.8 per cent); whereas, it was negative in the case of linseed which accounted for -0.7 per cent. The correlation co-efficient between period and production was significant as it was 0.9 (in the case of rape and mustard, castor and soyabean), 0.8 (in the case of groundnut and sunflower), 0.7 (in the case of niger) and 0.6 (in the case of sesamum and safflower) both at 0.05 per cent and 0.01 per cent levels; whereas, it was negatively correlated in the case of linseed (-0.4).

The compound growth rate of yield was high in castor which accounted for 4.0 per cent per annum, followed by safflower (3.4 per cent), rape and mustard (2.1 per cent), soyabean (1.6 per cent), niger (1.4 per cent), sesamum (1.3 per cent), linseed (0.8 per cent) and groundnut (0.8 per cent); whereas, it was negative in the case of sunflower which accounted for -0.6 per cent. The correlation co-efficient between period and yield was significant as it was 0.9 (in the case of castor and rape and mustard), 0.8 (in the case of sesamum, safflower and niger), 0.7 (in the case of groundnut and linseed) and 0.6 (in the case of soyabean) both at 0.05 per cent and 0.01 per cent levels; whereas, negatively correlated but insignificant in the case of sunflower which accounted for -0.3.

To determine the degree of variability over time in the area, production and productivity of nine oilseeds, the co-efficient of variation was calculated. The co-efficient of variation values indicate that the variation was low in yield which accounted for 24.45 and high in production which accounted for 51.05, followed by area which accounted for 26.11. Among the various oilseeds, the variation was low in yield in the case of rape and mustard, soyabean and linseed which accounted for 34.48, 23.08 and 18.82 and high in production in the case of groundnut, castor, rape and mustard, safflower, niger, soyabean and linseed which accounted for 27.09, 84.85, 68.65, 50.98, 24.44, 115.14 and 33.8. At the same time, in the case of groundnut, castor, sesamum, safflower and niger, the variation was low in the area which accounted for 14.21, 24.88, 11.38, 23.23 and 10.88. On the whole, the variation was low in yield but high in production.

area effect was the main factor in sesamum, safflower, niger, soyabean and linseed; whereas, it was due to yield in the case of groundnut, castor, rape and mustard seed and sunflower.

In producing oilseeds, the share of the State of Andhra Pradesh in India is considerably significant. The total area under the oilseeds, production in Andhra Pradesh increased to 2887 thousand hectares in 2000-01 from 1,602 thousand hectares in 1950-51 i.e., registering an increase by 1.8 times. During the period under study i.e., 1950-51 to 2000-01, the average percentage share of the area and production of oilseeds in Andhra Pradesh in the total area and production of oilseeds of India was 12.0 per cent and 13.8 per cent; whereas, it was 12.6 per cent and 15.6 per cent in the pre-green revolution period (period I); 11.5 per cent and 13.9 per cent in the green revolution period (period II); 11.8 per cent and 12.3 per cent in the post-green revolution period; and 12.0 per cent and 12.4 per cent in the post-TMO period (period IV). The inter-period analysis indicated that the average yield of oilseeds in the State of Andhra Pradesh increased to 320 kgs per hectare from 270 kgs per hectare for the entire study period (1950-51 to 2000-01) and during the post-TMO period, it was highest which accounted for 385 kgs per hectare. The average percentages share of oilseeds in the total cropped area increased to 15.0 per cent in the green revolution period, 20.8 per cent in the post-green revolution period, 22.5 per cent in TMO period from 13.5 per cent in the pre-green revolution period; whereas, it was 17.0 per cent for the entire study period. Even though, the compound growth rate of oilseeds area was negative in the pre-green revolution and green revolution periods (-0.8 per cent and

To find out the relative contribution of area, yield and their interaction to changes in the production of individual as well as total oilseeds, the decomposition had been applied. The decomposition results indicated that a significant increase in production of individual as well as total oilseeds was noted, which was mainly due to the expansion of area (45.2 per cent), followed by interaction (29.5 per cent) and yield effect (25.3 per cent) for the entire period. Among the various oilseeds, the area effect was the main factor in the case of groundnut (63.4 per cent), sunflower (120.5 per cent), soyabean (51.7 per cent) and linseed (125.6 per cent). The yield effect was the main cause in the case of castor (45.1 per cent), sesamum (202.8 per cent), safflower (113.2 per cent) and niger (185.1 per cent); whereas, the interaction effect was the main factor in rape and mustard seed (40.2 per cent). Inter-period analysis revealed that the area effect was the main factor. In the pre-green revolution period (period I) in the case of groundnut, rape and mustard seed and linseed; whereas, yield effect was the main factor in the case of castor and sesamum seeds. During green revolution period (period II), the area was the main factor in increasing production in the case of rape and mustard, niger, sunflower and soyabean; whereas, yield effect was the main factor in groundnut, castor, safflower and linseed. During the post-green revolution period (period II), except in the case of groundnut, sesamum and Rape and mustard, the area effect was the main factor influencing production; whereas, during Post-Technology Mission on Oilseeds period, the

-1.1 per cent), it increased tremendously during the post-green revolution period which accounted for 2.3 per cent and 0.7 per cent in Post-Technology Mission on Oilseeds (TMO) period; whereas, it was 1.5 per cent for the entire period under the study.

To test the significance of the growth rates of area, production and yield, the seed-wise and period-wise compound growth rates, co-efficient of correlation and 't' values were calculated. The compound growth rate indicated that during the pre-green revolution period, the growth of area, production and yield was negative (-0.8 per cent, -1.9 per cent and -1.0 per cent). But later, during the green revolution period, the growth rate of yield was high (4.4 per cent); whereas, in post-green revolution period, the growth rate of area, production and yield was considerably significant (2.3 per cent, 4.3 per cent and 1.2 per cent); during Post-Technology Mission on Oilseeds period, the growth rate of production was high (2.4 per cent). But, on the whole, the compound growth rate of area, production and yield was significant (1.5 per cent, 2.3 per cent and 1.0 per cent). Hence, the co-efficient of correlation between time and area, production and yield was significant in period I (0.8, 0.8 and 0.7) both at 0.05 per cent and 0.01 per cent levels; whereas, it was significant in the case of yield in period II (0.8); in the case of area, production and yield in period III (0.8 each); and production and yield in TMO period (0.6 and 0.8). Among the oilseeds during the pre-green revolution and green revolution periods, the compound growth rates of area, production and yield were mostly low or negative in the case of all the oilseeds. But, during the post-green revolution

period it was significant in the case of groundnut (2.1 per cent, 3.9 per cent and 1.8 per cent), rape and mustard (8.8 per cent, 6.7 per cent and -1.8 per cent), niger (4.9 per cent, 7.6 per cent and 2.7 per cent) and sunflower (23.9 per cent, 26.1 per cent and 3.0 per cent). During Post-Technology Mission on Oilseeds (TMO) period, the compound growth rate was comparatively high in the case of niger (2.2 per cent, 4.1 per cent and 1.9 per cent) and sunflower (8.0 per cent, 12.6 per cent and 4.3 per cent); but, on the whole, the growth rate was considerable in the case of groundnut (2.0 per cent, 2.3 per cent and 0.4 per cent) and sunflower (29.5 per cent, 30.7 per cent and 2.1 per cent) for the entire period under the study. That is why the correlation co-efficient between the period and area, production and yield was negative and insignificant in the pre-green revolution period. During the green revolution period, yield (0.6) in safflower; production and yield (0.7 and 0.8) in niger; and area, production and yield (0.9, 0.8 and 0.7) in sunflower; and yield (0.8) in linseed. During the post-green revolution period, the co-efficient of correlation between the period and area, production and yield were 0.6, 0.8 and 0.7 in groundnut; production and yield were 0.6 and 0.8 in castor; production and yield were 0.6 and 0.5 in sesamum; production (0.6) in rape and mustard; area, production and yield were 0.9, 0.7 and 0.5 in niger; which were significant both at 0.05 per cent and 0.01 per cent levels. During Post-Technology Mission on Oilseeds (TMO) period the co-efficient of correlation between the period and production and yield were 0.5 and 0.7 in groundnut; yield was 0.6 in castor; production and yield were (0.6 and 0.5) in sesamum; area was 0.7 in niger; and

area, production and yield were 0.6, 0.7 and 0.7 in sunflower was significant both at 0.05 per cent and 0.01 per cent levels. On the whole, the co-efficient of correlation between the period and area and production was 0.9 and 0.8 in groundnut; yield was 0.7 in castor; yield was 0.8 in safflower and area, production and yield were 0.9, 0.8 and 0.7 in sunflower and was significant both at 0.05 per cent and 0.01 per cent levels.

To analyse the degree of variability over time in area, production and yield of all the oilseeds in the State of Andhra Pradesh, the co-efficient of variation was worked out. The values of co-efficient of variation indicates that during the pre-green revolution period, green revolution period and post-TMO periods, the variation in area was low (9.08, 13.11 and 10.45); whereas the variation in production was high in pre-green revolution, post-green revolution and post-TMO period (12.63, 27.34, 15.24); and variation in yield was high only in the green revolution period (22.37). On the whole, the variation was low in yield (20.22) and high in production (42.92) for the entire study period. Among the various oilseeds, the variation was found to be low in yield in the case of groundnut (14.66), sesamum (18.01), rape and mustard (41.36), sunflower (26.43) and linseed (25.22); whereas, it was high in production in the case of groundnut (42.39), castor (35.73), sesamum (26.17), safflower (47.81), niger (68.79) and sunflower (118.93) for the entire period under the study.

To find out the relative contribution of area, yield and their interaction to changes in the production of individual as well as total production supply of oilseeds, the decomposition has been applied. The decomposition results

indicate that, there had been a significant increase in the production of individual as well as total production of oilseeds which was mainly caused by the extension of area (42.05), followed by 'yield effect' (32.16) and 'interaction effect' (25.79) for the entire period. Among the various types of oilseeds the 'area effect' was the main factor in the case of groundnut (87.16), sesamum (97.13), rape and mustard (38.73), and linseed (106.22). The 'yield effect' was the main cause in the case of castor (66.67), safflower (348.12) and niger (89.51); whereas, the 'interaction effect' was the main cause in sunflower (49.87). The inter-period analysis reveals that in the pre-green revolution period, the 'yield effect' was the main factor in changing the production of groundnut, sesamum, safflower and linseed and 'area effect' is the main factor in castor, rape and mustard. During the green revolution period, the 'area effect' was the main cause in sesamum, sunflower and linseed; whereas, 'yield effect' was the main factor in groundnut, castor, rape and mustard, safflower and niger. During the post-green revolution period, the 'area effect' was the main factor in rape and mustard, niger, sunflower and linseed; whereas, yield was the main factor in groundnut, castor, sesamum and safflower. During the period of Post-Technology Mission on Oilseeds, the 'area effect' was the main factor in groundnut, sesamum, rape and mustard, safflower and linseed. And the 'yield effect' was the main factor in the case of castor and niger. On the whole, area is the main factor in groundnut, sesamum, rape and mustard and linseed; whereas, yield is the main factor in the case of castor, safflower and niger for the entire period.

Chittoor District, the area of the present study, is one of the backward districts in the drought-prone Rayalaseema region of the State of Andhra Pradesh. The District is one of the major oilseeds producing districts, especially groundnut in the State. Chittoor occupies a third place in producing groundnut in the State. During the study period, the total area under oilseeds and its production increased by 1.9 times each in the district; whereas, it increased by 1.8 times each in the State. The average percentage share of oilseeds area and production in Chittoor district in total oilseeds area and production in Andhra Pradesh was 7.5 per cent and 11.6 per cent in the pre-green revolution period (period I), 11.2 per cent and 20.6 per cent in the green revolution period; (period II) and 9.8 per cent and 14.4 per cent in the post-green revolution period (period III) and 9.2 per cent and 13.5 per cent in the post-technology mission oilseeds period (period IV); whereas, it was 9.5 per cent and 15.3 per cent for the entire study period. The average yield of the District increased by 477 kgs in the green revolution period (P-II) from 371 kgs in the pre-green revolution period (period I); but declined to 403 kgs in the post-green revolution period; (period III); and 426 kgs in post-TMO period (period IV); but, the average yield was 415 kgs for the entire period. The percentage share of the area under oilseeds in the total cropped area increased to 38.4 per cent in the green revolution period (period II); 50.6 per cent in the post-green revolution period (period III); and 52.9 per cent in the post-TMO period (period IV) from 23.9 per cent in the pre-green revolution period (period I); whereas, for the entire period it accounted for 39.1 per cent. The groundnut average share in the

total area under oilseeds and production accounted for 98.7 per cent and 99.8 per cent during the study period. The compound growth rates of area and production in the pre-green revolution period i.e., in period I, which accounted for 2.8 per cent and 2.1 per cent, area and production in the green revolution period i.e., in period II, which accounted for 3.4 per cent and 3.2 per cent; production and yield in the post-green revolution period i.e., in period III, which accounted for 2.3 per cent and 1.4 per cent; yield in post-TMO period i.e., period IV which accounted for 0.6 per cent; and area and production for the entire period, which accounted for 2.3 per cent and 2.7 per cent is found to be satisfactory. Hence, the co-efficient of correlation between the period and area was significant in the pre-green revolution (0.7), in the green revolution period (0.7) and for the entire period (0.9); whereas, it was significant between period and production in the pre-green revolution period (0.6), in the green revolution period (0.5) in the post-green revolution period (0.5) and for the entire period (0.8) both at 0.05 per cent and 0.01 per cent levels. In the case of period and yield, it was significant only in the post-TMO period (0.5) at both levels.

In order to examine the variation of area, production and yield of oilseeds in the district of Chittoor, the co-efficient of variation was applied. The co-efficient of variation indicates that the variation was low in yield which accounted for 14.64 and high in production which accounted for 42.74 during the study period for the entire district. The inter-period analysis indicates that during the pre-green revolution and green revolution periods, the variation was low in the case of yield (5.13 and 10.68) and high in production during the green

revolution period (25.2), the post-green revolution (25.65) and in post-TMO period (18.39); whereas, the variation in area was high in the pre-green revolution period (18.14). Among the various oilseeds also (except castor) the variation was low in yield in the case of groundnut (16.22); sesamum (27.24) and linseed (37.51); and high in production, which accounted for 42.88 in groundnut, 48.57 in sesamum and 58.1 in linseed during the study period.

The changes in the production of oilseeds in the district is in general, noted, owing to the area, yield and interaction effects. Among the three factors, the 'area effect' was the main factor (60.94) in bringing the changes in the production, followed by yield and interaction effects (20.16 and 18.90) during the study period i.e., 1950-51 to 2000-01. Among the oilseeds also, except castor, the area effect was the major causal factor in bringing about the changes in production which accounted for 64.14 in groundnut; 145.43 per cent in sesamum and 82.71 per cent in the case of linseed. The inter-period analysis indicates that during the pre-green revolution period and green revolution periods, the area was the main factor (124.68 per cent and 67.77 per cent); whereas, during the post-green revolution and post-TMO periods, yield was the main factor (112.39 per cent and 283.19 per cent). Among the oilseeds also, the extension of area was the main factor in the pre-green revolution and the green revolution periods which accounted for 163.57 per cent and 66.86 in groundnut; 83.24 per cent and 100.52 per cent in castor; 63.39 per cent and 89.25 per cent in sesamum; and 190.11 per cent and 114.86 per cent in linseed. During the post-green revolution period yield was the main factor in the

case of groundnut (110.07 per cent); whereas, it was due mainly to area effect in the case of castor (46.0 per cent), sesamum (181.6 per cent) and linseed (51.23 per cent). But, during the post-TMO period, yield was the main factor in the case of groundnut 616.31 per cent, 66.56 per cent in castor, 265.67 per cent in sesamum; whereas, it was due to 'area effect' in linseed (115.50).

**Hence, the null hypothesis that "there is no instability in production and stagnation in productivity of oilseeds in the District" stands rejected.**

Although the area has been increased for groundnut, the corresponding production is not being increased as the productivity of it per hectare is low and stagnant owing to institutional, climatical, technological and other general causal factor. The impact of time-lags on production is one of the most important causes for low level or stagnation in yield of groundnut. Among various stages of production, 83.3 per cent and 75.0 per cent of the sample farmers in Thamballapalle Mandal and Kurabalakota Mandals faced the problem of time-lags during the stage of pod development; whereas 48.2 per cent and 45.0 per cent of the sample farmers faced the problem of time-lags during the sowing stage in Peddamandyam and Molakalacheruvu Mandals respectively. On the whole, the percentage share of the sample farmers who faced the problem of time-lags during the various stages of production was highest in the stage of pod development which accounted for 58.2 per cent; whereas, it was 24.0 per cent in the stage of sowing, 7.8 per cent in irrigation stage, 7.0 per cent in peak flowering and peg formation stage and

3.0 per cent in harvesting stage. Among the various size groups of the sample farmers, the percentage of excess days spent was high which accounted for 5.5 per cent in the category of small farmers in Thamballapalle Mandal, 7.6 per cent in the category of large farmers in Peddamandyam Mandal, 9.5 per cent in large size farmer's group in Molakalacheruvu Mandal, and 7.5 per cent in small farmer's group in Kurabalakota Mandal; whereas, the yield loss is high which accounted for 43.5 per cent in medium size farmer's group in Thamballapalle Mandal, 63.5 per cent in the category of small farmers in Peddamandyam Mandal, 61.1 per cent in the semi-medium size farmer's group in Molakalacheruvu Mandal, and 39.4 per cent in large size farmer's group in Kurabalakota Mandal. On the whole, the excess days spent was high which accounted for 9.4 per cent in the category of medium size farmers; whereas, the percentage yield loss was high in the semi-medium size group which accounted for 46.6 per cent in the entire study area. The difference in excess number of days spent and the loss in yield among the sample farmers was highly significant as the calculated 't' value for excess days spent and the loss in yield accounted for 67.72 and 7.15 for Thamballapalle; 60.93 and 5.72 for Peddamandyam; 77.61 and 6.87 for Molakalacheruvu; 90.86 and 13.01 for Kurabalakota Mandals and 113.33 and 13.01 for the entire study area, which are greater than the tabular 't' value both at 0.05 per cent which accounted for 2.58 per cent and at 0.01 per cent at 1.96 levels. At the same time, the analysis of variance indicates that the excess number of days spent by the sample farmers and the subsequent loss in yield to them was significant among the size groups as the calculated 'F' value which accounted for 5.761049 for excess

number of days spent and 1,044.745 for the loss in yield were highly greater than the tabular 'F' value both at 0.05 per cent which accounted for 2.37 and 0.01 per cent at 3.32 levels. At the same time, it was significant both at 0.05 per cent and 0.01 per cent levels among the sample mandals only in respect of excess number of days spent as the calculated 'F' value accounted for 90.59701; whereas, it was not significant in the case of yield loss among the sample mandals as the calculated 'F' value which accounted for 0.054746 is lesser than the tabular 'F' value both at 0.05 per cent (2.60) and 0.01 per cent (3.78) levels.

**Hence, the null hypothesis that "the impact of time-lags on production of groundnut is insignificant", stands rejected.**

Costs or returns and/or both play a crucial role in determining the efficiency of a farm. The total costs have been classified into two costs viz., fixed and variable / operational cost. In the total production costs, within the size groups in the sample mandal of Thamballapalle the percentage share of fixed and variable / operational cost accounted for 92.6 per cent and 7.4 per cent in the marginal, 93.9 per cent and 6.1 per cent in the small, 94.4 per cent and 5.6 per cent in the semi-medium, 95.0 per cent and 5.0 per cent in the medium, 95.1 per cent and 4.9 per cent in the large size farmer's categories; whereas, it was 94.4 per cent and 5.6 per cent for the entire mandal. In Peddamandyam mandal, the percentage share of fixed and variable cost accounted for 93.2 per cent and 6.8 per cent in the marginal, 94.2 per cent and 5.8 per cent in the small, 95.1 per cent and 4.9 per cent in the semi-medium, 95.3 per cent and

4.7 per cent in the medium, and 94.4 per cent and 4.6 per cent in the large size farmer's groups; whereas, it was 94.9 per cent and 5.1 per cent for the entire mandal. In Molakalacheruvu mandal, the percentage share of fixed and variable / operational cost accounted for 92.9 per cent and 7.1 per cent in the marginal, 94.6 per cent and 5.4 per cent in the small, 94.4 per cent and 4.6 per cent in the semi-medium, 95.8 per cent and 4.2 per cent in the medium and 95.9 per cent and 4.1 per cent in the large size farmer's groups; whereas, it was 95.3 per cent and 4.7 per cent for the entire mandal. In Kurabalakota mandal, the percentage share of fixed and variable / operational cost accounted for 92.9 per cent and 7.1 per cent in marginal, 94.4 per cent and 5.6 per cent in small, 94.8 per cent and 5.2 per cent in semi-medium, 95.3 per cent and 4.7 per cent in medium and 95.4 per cent and 4.6 per cent in the large farmer's groups; whereas, it was 94.9 per cent and 5.1 per cent for all categories of sample farmers. For the entire study area, the percentages share of fixed and variable / operational cost accounted for 92.9 per cent and 7.1 per cent in the marginal, 94.3 per cent and 5.7 per cent in small, 95.0 per cent and 5.0 per cent in the semi-medium, 95.4 per cent and 4.6 per cent in the medium, and 95.5 per cent and 4.5 per cent in the large size farmer's categories; whereas, it accounted for 94.9 per cent and 5.1 per cent for the entire study area.

The average acreage response in terms of yield in Thamballapalle mandal accounted for 11.9 quintals in the marginal, 45.0 quintals in the small, 90.1 quintals in the semi-medium, 212.4 quintals in the medium and 393.0 quintals in the large size farmers categories; whereas, it was 55.4 quintals for the entire mandal. In Peddamandyam mandal, the acreage

response i.e., yield was 10.2 quintals in the marginal, 28.1 quintals in the small, 94.7 quintals in the semi-medium, 216.2 quintals in the medium and 416.0 in the large size farmer's categories; whereas, it was 51.0 quintals. In Molakalacheruvu mandal the acreage response in terms of yield accounted for 12.5 quintals in the marginal, 47.4 quintals in the small, 92.5 quintals in the semi-medium, 227.4 quintals in the medium and 379.3 quintals in the large size farmer's categories; whereas, it was 60.2 quintals for the entire mandal. In Kurabalakota Mandal, the acreage response in terms of yield accounted for 12.0 quintals in the marginal, 45.8 quintals in the small, 93.7 quintals in the semi-medium, 233.3 quintals in the medium and 428.4 quintals in the large size farmer's categories; whereas, it accounted for 63.4 quintals for the entire mandal. For the entire study area, the acreage response in terms of yield accounted for 11.8 quintals in the marginal, 41.8 quintals in the small, 92.4 quintals in the semi-medium, 222.9 quintals in the medium, and 404.2 quintals in the large size farmer's categories; whereas, it accounted for 57.6 quintals for the entire study area.

The profitability ratio (income / cost of production) in Thamballapalle mandal was high in the large size farmer's category which accounted for 2.0; whereas, it was 1.9 each in Peddamandyam, Molakalacheruvu and Kurabalakota mandals and for the entire study area. On the other hand, it was low which accounted for 1.2 in the category of marginal size farmers in all the sample mandals. Among the sample mandals, the profitability ratio was found to be high in Kurabalakota Mandal which accounted for 1.7 and it was 1.6 in the case of other sample mandals; whereas, it was 1.9 for the entire study area.

To test the significant difference between operational cost and returns the data were put to 't' test. The calculated 't' value indicates that the difference was significant in all the sample mandals which accounted for 2.75 in Thamballapalle; 2.23 in Peddamandyam; 2.62 in Molakalacheruvu and 2.42 in Kurabalakota mandals; whereas, it was 5.03 for the entire study area and significant both at 5.0 per cent and 1.0 per cent levels. Correspondingly, to test the variation of the profits among the size groups and within the sample mandals, the data were put to 'F' test. The analysis of variance indicates that the variation within the size groups was significant as the calculated 'F' value which accounted for 1163.375 was significant both at 5.0 per cent and 1.0 per cent levels; whereas, it was not significant among the sample mandals as the calculated 'F' value accounted for 1.048128.

**Hence, the null hypothesis that, "there is no significant variation in acreage response and profitability of groundnut" stands rejected.**

The present study leads to the following major findings :

(i) Total oilseed crops recorded growth in area, production and yield in the country during the study period, except in the case of sesamum and linseed.

(ii) In Chittoor District under study, there was a significant increase in the total area and production of oilseeds.

(iii) Among the different varieties of oilseeds, most of the total area was allotted for raising the crop of groundnut.

(iv) There was mixed trend in the growth of area, production and productivity of groundnut during the green revolution and post-green revolution periods.

(v) The variability was found to be more in production and low in yield.

(vi) The changes in the production of groundnut were mainly due to extension of 'area', followed by 'yield' and 'interaction' effects. On the whole, there had been instability in production and stagnation in yield.

The major factors accounting for instability in production and stagnation in productivity in the sample mandals are due mainly to technological factors such as poor follow-up of agronomic practices, non-application of improved technology and failure to undertake timely plant protection measures, especially in the face of time-lags caused during the different stages of production process.

2. Secondly, the impact of time-lags on production is the most important causal factor for the low level or stagnation in yield of groundnut. It was found that, majority of the sample farmers faced the problem of time-lags by way of loss in yield, to a greater extent, in all the sample mandals. But the yield loss was high in the semi-medium farmer's group, followed by, small, marginal, medium and large size farmer's group. Hence, the impact of time-lags on production is markedly significant in the study area.

3. Thirdly, the amount of cost incurred on a farm plays a crucial role in determining income generation and consequent profits. The sample marginal farmers are getting lower levels of returns (income) due to lower level of fixed cost mainly area which results lower level of variable

cost / operational cost which, in turn, caused lower level of production, income and profits. On the other hand, the sample large farmers were found to get higher levels of income due to higher levels of land holding and variable cost / operational costs. Evidently, there seems to be a positive relation between the size and returns of the farms.

In the light of the empirical study, we put forth the following suggestions to enable the policy makers and programme implementers in deriving a suitable, location-specific strategy to augment production and productivity of groundnut – an important variety of oilseed raised in the study area (i.e., Chittoor District) in particular and the drought-prone region in general. It is hoped that the suggestions made here, if implemented, by the Governmental departments and extension agencies, in letter and spirit, will ensure an increasing trend in production and productivity of groundnut by reducing the adverse impact of time-lags on production, minimizing costs of production and maximizing returns.

(i) An adequate and assured supply of water assumes greater importance in the strategy. The area under irrigation will have to be increased by constructing many more minor and major irrigation projects, ensuring adequate maintenance of canals, promoting efficient water management and developing a national water grid system so that water from the surplus areas may be diverted to water deficit areas. As the groundnut crop is unduly dependent on erratic and uncertain rainfall and the crop is affected during the peg formation and pod development stages, especially in un-irrigated areas, the Government has to take the initiative

and ensure the supply of irrigation water to the farmer by building up check dams, percolation tanks, common water tanks by sinking borewells besides conducting soil surveys on the availability of water so that the farmers can increase production and productivity of groundnut.

(ii) There is an urgent need for evolving improved high yielding variety seeds which can be grown in rain-fed areas. This requires intense and extensive research in dry farming techniques. The supply of improved seeds of the right type by the Governmental agencies has to be stepped upto ensure its un-interrupted supply to all sections of the farm population. For this purpose, mere granting of subsidy is not enough. An efficient distribution system is the need of the hour.

(iii) Improved variety of seeds which can yield higher output per hectare require use of heavy doses of fertilizers. The soil in India has been found to be deficient in many micro nutrients. This must be removed at once. Thus, serious efforts must be made to increase availability and consumption of fertilizers to raise productivity.

(iv) Though the land reforms have been introduced in India since the attainment of independence, yet, the progress made is quite un-satisfactory. What is needed is strong political will to implement the land reforms in letter and spirit.

(v) Deforestation and over-grazing are a root-cause of soil erosion. Afforestration, through peoples' participation and based on the Joint Forest Management (JFM) strategy, should be promoted not only to arrest soil erosion but to ensure environmentally sustainable agricultural development. Through JFM, farmers may be induce to raise plants which not only hedge their main crops as a safeguard but provide fodder to their cattle.

(vi) Introduction of machinery in agricultural operations helps increase agricultural productivity many folds. But since India is a land of small and marginal holdings with ever increasing pressure of exploding population on land, the use of machinery will have to be selective, especially during peg formation and pod development stage when the farmer has to apply pesticides by using sprayers and other implements. Hence, the Government has to take steps to open mechanical shops within the reach of the farmers.

(vii) In order to motivate the farmers to help raise production and productivity of groundnut crop, he must be provided with incentives such as enhanced procurement price, subsidiary inputs, free training programmes, timely demonstration extension service (programmes such as 'Lab to Land', 'Training and Visit' (T & V)) which play a very vital role in increasing the farm productivity. Further, in order to educate the farmers in efficient farm management, the extension agents have to demonstrate an ideal cropping pattern so that farmer can learn and adopt new technology of cultivation which helps augment production and productivity. Not that the Government is unaware of these incentives or does that, not provide these, but that machinery which is responsible for implementation and extension has never so far geared itself up to the task. An efficient machinery for effective implementation is an essential pre-requisite for raising farm productivity.

(viii) After the introduction of high-yielding drought resistant seeds, plant protection measures must be implement for boosting farm production. According to the present estimate, the loss in yield due to time-lags i.e., failure of the farmers to protect their produce during various stages of production is high. Majority of Indian farmers, being illiterate, are unaware of the timely application of insecticides, weedicides and

pesticides. It is, therefore, necessary that the Government, through its extension staff, and mass media, carryout the distribution of insecticides and pesticides at subsidised rates and educate the farmers in the use of them at proper time.

(ix) Management has become an important input in an economic enterprise. With the change in technology farm management has come to assume an important place in agricultural activities. Traditional farm practices are giving way to new scientifically managed operations. From the stage of sowing to the stage of harvesting, each step has to be initiated in a planned and calculated manner in order to reap richer harvest. One hasty and unplanned operation may cause enormous damage to the crops. Therefore, farmers have to be given adequate training in efficient farm management techniques through mass media such as radio, T.V., newspapers, etc.

(x) An efficient system of agriculture requires a number of non-agricultural services or non-farm services like credit, marketing, ware-housing, transportation facilities, etc. In the absence of adequate institutional credit support, it will not be possible for him to use the improved varieties of seeds, fertilizers, pesticides, insecticides and other improved agricultural inputs. The rural market needs the structure so as to ensure timely supply of inputs. An efficient extension service is greatly needed in this direction. The small and marginal farmers have to be made aware of these facilities and induced to secure the services from the Government agencies as and when required.

(xi) The Government has to introduce 'mobile marketing system', i.e., during the peak selling season, the respective marketing yard has to arrange the transportation to collect all the produce from the village by giving

notification so that the marginal and small farmers will get benefits as they are selling their produce to local middleman or to commission agents at an un-remunerative price and getting low incomes.

(xii) Agricultural research is primarily impossible for bringing about green revolution in different parts of the world. Nobel economist Prof. Schultz attached prime importance to farm research in the transformation of traditional agriculture. Hence, efforts should be made to transfer new farm technology from lab to land.

(xiii) As the produce of oilseeds is market-sensitive, the support price needs to be continued and strengthened. Provision of good market facilities, modernization of extraction facilities for better oil recovery and strengthening of processing facilities for value addition are critical in achieving the sustained growth in the oilseed sector. There is an urgent need for future trading in oilseed for stabilizing the prices in the long-run.

Further, concerted efforts should be made, by all the agricultural developmental authorities in the district, for the development of irrigation so as to increase the production and productivity of groundnut.

Thus, the time-lags, acreage response and profitability of groundnut in the Chittoor district have brought certain lapses / deficiencies to light which are a part of the Governmental strategy. It is hoped that the afore-mentioned strategy, if implemented earnestly and effectively by the Governmental agencies, in tandem with the non-governmental organisations, wherever necessary, will help minimise the time-lags, augment production and productivity, boost profits of farmers and help accelerate the pace of agricultural and rural development of Chittoor District in particular and the drought-prone regions in general.