CHAPTER - I

INTRODUCTION
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Though oilseeds have been known for centuries, their importance as a major source of both fats and proteins has been realised only during 19th century especially after the end of the World War II. No other farm commodity can really meet simultaneously in so large a measure the energy and protein requirements of human body as oilseeds do. Since oilseeds supply the major energy protein needs of the livestock population as well, they are the primary source of even such valuable animal fats and proteins as milk, meat and eggs. Apart from their use in human foods and animal feeds, oilseeds also have a wide variety of industrial applications. The use of vegetable oils in soaps, paints and varnishes and even in lubricating oils has been known for quite sometime. In recent years oil seeds are finding their way in such diverse industrial uses as fatty acids, glycerin, tannin and even chemicals, to mention a few. The industrial uses of oilseeds are actually increasing with new technological break-throughs. As a result, the developed and developing economies like India are trying to increase the production and productivity of oilseeds.
1.1 REVIEW OF LITERATURE

A number of studies have been undertaken to examine the various issues relating to oil seeds production. A brief review of the relevant studies carried out by scholars is presented below:

1.1.1 International Studies

Girshick and Haavelmo\(^1\) have concluded in their statistical analysis of the demand for food that it is impossible to derive statistically the demand functions from the market data without specification of the supply functions involved. The simple reason for this is that the actually observed economic variables are determined jointly in the system but not individually.

Vandenbore\(^2\) developed a simultaneous equation model of the soyabean economy for the United States for the period 1948-1964. The study was mainly concerned with an analysis of the soyabean sector through an econometric study of prices, quantities demanded and exported. The estimates of the structural parameters of the model were obtained by the two stage least squares method. Supplies of meals and oil for all uses were assumed to be fixed at harvest time. Stock relationships for meal and oil were introduced to remove this assumption with respect to the availabilities for domestic consumption and exports. The estimated domestic demand for oil and meal was observed to be inelastic. The estimates of elasticities being -0.45 and -0.28

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respectively. However, the price elasticities of demand for meal were less reliable than those of demand for oil. The author concluded that annual increase of more than 30 billion bushels is necessary to cover the needs of the United States, Western Europe, Japan and Canada if prices are to remain relatively constant.

Shepard\(^3\) concluded that valid estimates of the elasticity of demand for agricultural products may be obtained by using least squares multiple regression analysis, for which price is the dependent variable while supply and some demand shifters are used as independent variables. The estimated demand function yielded income elasticity of demand of 1.4 for edible oils and 1.28 for edible oils and vanaspathi together. As expected, the demand for food oils was price inelastic, the price elasticity of demand was as low as -0.45 for edible oils and -0.44 for edible oils and vanaspathi together. The aggregate annual demand for edible oils for direct consumption is projected and it is expected to rise from two million tonnes in 1971-75 to a maximum of 2.75 million tonnes in 1980 and 3.33 million tonnes in 1985.

Johnson\(^4\) suggested that two year rotations including rapeseed, however, produced higher returns than two or three year rotations of cereal grains.


Abalu\textsuperscript{5} suggested that groundnut farmers are price responsive and that their responses were more a function of expected price than prevailing price in the previous buying season.

Al-Zand and Hassan\textsuperscript{6} have constructed a simultaneous equation model for estimating the demand for fats and oils in Canada based on time series data covering the period 1950-72. They have specified the nature of the demand for fats and oils, namely, margarine, lard, shortening and butter, and have estimated income elasticities of demand for individual fats and oils. The study has adopted the approach of expressing the per capita retail demand for four types of fats and oils as functions of their own price, the prices of other fats and oils, the per capita income of the consumer and a trend variable designed to capture effects of time related changes in tastes and preferences. Three alternative methods of estimation were used in the analysis. A first order auto regressive scheme was specified and estimates of the auto regressive coefficients were obtained by the Hildreth-Lu method. The original observations were transformed and then OLS, ZSUR and FIML were used to obtain estimates of demand parameters. The FIML parameters were found to be more efficient than the other two methods. Specifically, the range of prices elasticities of demand for fats and oils yielded under OLS and SZUR techniques remained almost unchanged. The price elasticity of demand ranged from -0.51 for lard to


-0.84 for butter. All income elasticities obtained were positive (except for lard) with value less than 1.0 which indicates that margarine, shortening and butter are considered normal goods in the consumption pattern of Canada. The study has indicated that price is the primary factor in the utilisation of and substitution between fats and oils. The effect of the prices of product and the price of its substitute measured in time of direct and cross price elasticities of demand, appeared highly significant in both magnitude and direction.

Smith, in his study for Australia, observed that despite continued high prices for all oil seeds, Australian production in 1976-77 was the lowest. Since 1970 and that in 1976-77, it imported a considerable amount of oil seeds.

Food and Agricultural Organisation (FAO) has made world demand and supply projections of oil seeds, fats and oils for 1975-85 in two stages. In the first stage, production and demand were projected at constant prices which resulted in excess of world supply over demand and in the second stage, the responsiveness of supply and demand to the changes in international prices were taken into account to obtain the final adjusted projections of supply and demand that are in balance at the world level. The adjusted production of fats and oils rises from 47 million tonnes in 1972-74 to 67 million tonnes in 1985, which means a growth rate of 2.9 per cent a year. This was observed in the previous decade. Production in developing countries is expected to grow faster

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i.e., by 4.4 per cent against 2.7 per cent in the past decade. But in the
developed countries, it is expected to taper down from 3.1 per cent to 1.8 per
cent a year. Like production, the adjusted world demand for all fats and oils is
expected to rise from 47 million tonnes in 1972-74 to 67 million tonnes in 1985.
Demand in the developed countries is expected to grow at 4.9 per cent per
year, nearly three times that of developed countries. The study concluded that
average per capita intake in developing countries would increase by 30 per cent
over the projection period (that comes to about 6.4 kg), which would be ever
less than one-third of the developed countries.

Tuszynski\(^9\) found that Cameron and Ivory Coast of West Africa has the
best prospects to continue to be self-sufficient in oilseeds and to export them
and their products into the next decade. Nigeria will continue to be an exporter
of oilseeds, exporting only palm kernels.

Panayitou, G.S. study\(^10\) reveals that the majority of growers used
mechanical sowing and harvesting, and chemical weed control. The labour
requirements (500 h/ha) were covered by family labour (63 per cent) and hired
labour (37 per cent). The most labour-intensive operations were manual
weeding (accounting for 38 per cent of the total labour), harvesting and pod
cleaning (38 per cent) and irrigation (19 per cent). The average variable and
total costs per tonne of groundnut were £388 and £576, respectively, and

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were inversely related to yield/ha. Gross value per hectare averaged £ 1689 and ranged between £ 1128 and £ 2386 among the differed yield groups. Gross profit averaged £ 776 and ranged between £ 244 and £ 1453/ha. Net profit, which was negative in the lower yield group averaged £131/ha. The break even-point occurred at 2495 kg/ha, and nearly two thirds of the growers were operating above it. The lowest cost point (point of intersection of the average total and marginal cost curves) was achieved at the level of 4400 kg/ha but only 10 per cent to 15 per cent of the growers were operating at that level. The level of profit maximisation (point of intersection of marginal revenue and marginal cost curves) was 4760 kg/ha but none of the growers in the sample reached it. Productivity analysis based on the Cobb-Douglass production function indicated that the economic results could be improved if more capital could be substituted for labour (mainly chemical weedicides) and more land per farm could be brought under groundnut. A further expansion is possible owing to highly elastic demand.

Florkowski, W.J., Fletcher, S.M.'s study reveals the trends in the yields between 1973-87 in many groundnut producing countries. Large gains in yields were reported in Argentina, China, Nigeria and Korea Republic, losses in yields occurred in Gambia, Sudan, Senegal and Japan. Acreage of groundnut harvested increased in China and Nigeria but decreased in the major Latin American producing countries of Argentina and Brazil. Groundnut production

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Florkowski, W.J., Fletcher, S.M., "An Economic Profile of the World Peanut Sector", Research Bulletin, 383 Agricultural Experiment Stations, College of Agriculture, The University of Georgia, Georgia, Jan., 1989, pp. 18 (En. 5, Ref. 10, Lab. 2, Fig. OQEH).
was determined by a combination of yields and acreages. Major factors that influenced yield and acreage included the application of new technology and changes in policy. Weather also often influenced production of groundnut between 1973-87. China and Argentina are likely to remain major U.S. competitors in the world market for groundnut. Although, China and Argentina represent different economic systems, their main reason for exporting large quantities of the groundnut is the need to generate foreign exchange. In the long-run, Chinese groundnut exports may decrease if the domestic population growth or relative prices of other commodities increases. On the other hand, if the Chinese Government continues to exercise tight control over the economy exports of groundnut may be maintained. Argentina, however, has vast acreage available for cultivation, little population pressure, and a large foreign debt. Small domestic groundnut consumption also indicates that Argentina is likely to depend heavily on export markets for disposition of groundnut. Canada, Japan and Western Europe remain the largest buyers of U.S. groundnut. Potential markets to which the USA has not exported in the past include Indonesia and USSR. The potentially sizeable market of Eastern Europe could be developed in the future if the economic situation of those countries improves. U.S. groundnut/peanut exports suffered in 1976 and 1981, but reasons for the smaller volume exported were different. In 1976, under the Government price support programme, the floor price for groundnut was probably too high to attract foreign buyers who could find lower prices elsewhere. The introduction of the two tier price system in 1977 corrected the problem, making the price of groundnut more responsive to world supply and demand.
Dubman, R., Miller, B.R.'s\textsuperscript{12} study finds that the input supply risk is two sided for a large groundnut sheller. Projects diminish when farm production is too low or too high relative to contracts with farmers and buyers of shelled groundnut. The potential for project depends significantly on forward – contract positions taken prior to groundnut harvest with both farmers and buyers.

1.1.2 National Studies

National Council of Applied Economic Research (NCAER)\textsuperscript{13} has attempted long-term projections of demand for and supply of selected agricultural commodities based on time series data as well as cross section data on consumer expenditures collected by National Sample Survey. Specifically, the objectives of the study were to make an estimate of aggregate domestic supply of important agricultural commodities including oilseeds, cotton and pulses etc., for the period 1961 to 1976. The projections of demand in this study were based on the co-efficients of income elasticities, the likely changes in per capita income and expected increase in the population over the projected period. The changes in relative prices was well as changes in price elasticities were not considered while arriving at the projected demand. The study concluded that demand for oilseeds appeared to be more than doubled during the projected period, increasing from 6 million tonnes 1960-61 to 13 million tonnes in 1975-76.


\textsuperscript{13} NCAER, "Long Term Projections of Demand for and Supply of Selected Agricultural Commodities, 1960-61 to 1975-76, National Council of Applied Economic Research, New Delhi, 1962, pp. 120-130.
The supply projections presented in this study were obtained primarily on the basis of projected yield rates and acreages of different crops. The acreage under each crop was projected and then multiplied by corresponding yield per acre in order to arrive at the estimated production of that crop over the projected period. The gross area sown under different crops over the projected period was estimated on the assumption that the cropping pattern in the base period (1955-56) would change only to the extent that additional area could be made available for farming by way of land reclamation and multiple cropping. The additional acreage under any particular crop was assumed to be directly proportional to (a) its corresponding monetary returns per acre valued at 1955-56 farm harvest prices and (b) the relative gap between the base period supply and projected demand for the crop. It was assumed that yield rates were influenced by land, labour, capital and entrepreneurship. Thus, the domestic supply relations was explained by land, labour (number of man-days), capital (irrigation, fertilizers, improved seeds) and entrepreneurship. The production of oilseeds was expected to have more than doubled from 5.6 million tonnes in 1995-56 to 10 millions in 1970-71 and thereafter to 14 million tonnes in 1975-76. Thus, the study optimistically concluded about self-sufficiency in the case of oilseeds.

NCAER\(^{14}\) has also initiated a study on the export prospects for vegetable oils and oilseeds as these items form an important part of India's export and are significant in India's agriculture. Though the world conditions generally suggest

good scope to expand exports, the actual performance will depend mainly on domestic factors especially on exportable surplus. The study has revealed that if the present trend in productivity and utilization of cotton seed, rice bran and minor oils continued by 1970-71, supplies could be insufficient even for domestic demand by $1.2 \pm 0.6$ million tonnes, ignoring the rise in demand due to better distribution of income.

Kamala Devi, P. and Rajagopalan, P., survey has drawn following conclusions: (i) Increase or decrease of acreage under groundnut crop in North Arcot is universally associated with the acreage under its competing crops viz., ragi, varagu, samai and pulses. An increase in the area under these crops would mean a decline in the area under groundnut. (ii) In increase in the relative price influences the acreage under groundnut in the following year. The ratio of groundnut price to ragi price is found to have an influence on the acreage under groundnut in the following year. (iii) The influence of relative prices on productivity is not at all significant. A rise in prices does not cause an increase in productivity. It is only a change of inputs from one crop to other that takes place as the prices increase and not the yield per acre.

Sharma has formulated a simultaneous equation model containing eleven relations for Indian vegetable oil economy on the basis of time series data covering the period 1947-64. Three relations were constructed for each component of demand of groundnut oil, namely, demand for direct liquid

consumption, demand for vanaspathi and export demand. The demand for groundnut oil for food was hypothesized as negatively related to the prices of peanut oil and positively related to the price of mustard oil, sesame oil price and disposable income. The demand for peanut oil in vanaspathi production was postulated to be inversely related to the prices of peanut oil and positively related to the prices of competing oils like sesame and cotton seed oils and to the price of vanaspathi. The export demand function of peanut oil was hypothesized as negatively related to Indian peanut oil price and positively related to oil prices in foreign countries. In the supply relationship, the quantity of peanut oil was postulated as a function of the prices of joint products — oil and oil meal and the level of technology characterised by the industry. Similar equations were described for sesame, mustard and cotton seed oils. The relations were estimated by OLS, ZSLS, unrestricted least squares reduced form and ZSLS reduced form methods in log linear forms. The price elasticity of demand for peanut, sesame and mustard oil was -0.45, -0.53 and -0.39 respectively and income elasticity was 1.42, -0.03 and 1.40 respectively. The results of supply analysis revealed that mustard oil had the highest price elasticity of supply (0.65), followed by peanut oil (0.60), cotton seed oil (0.39) and sesame oil (0.18). The results of demand and supply analysis indicated that both demand and supply were price inelastic. Liquid consumption of vegetable oils was more responsive to changes in income than to changes in prices. On the basis of these results, it was concluded that in times of short supply of oils, the sufferer will be the low income house-holder.
Mahender Reddy, J. survey\textsuperscript{17} concluded that the co-efficients of relating price and yield are statistically significant. Farmers in the area under study are responsive to relative price changes and relative changes in yield. He also found that the Nerlovian co-efficient of adjustment to be one which would mean that farmers are very rapidly adjusting to the changing circumstances. The negative co-efficient of trend shows that there is downward shift in the allocation of land for the cultivation of groundnut because of the fact that relative cost of production has risen.

Alagh, Subramanian and Desai\textsuperscript{18} have made use of price, cost and productivity data at the regional level to estimate econometric price formation systems for the edible oil and vanaspati industries of the Indian economy and traced the impact of fluctuations in the agricultural sector on prices in these industries. The study made use of the data collected from Annual Survey of Industries for the period 1960-64. The study has concluded that unless the implementation of price control at the retail level is strict, the consumers are liable to be confronted by a situation of grave shortage.

Varadarajan, S. and Subramanian, R.\textsuperscript{19}, however, noticed that (i) the time was the major factor deciding acreage under groundnut in Madurai District,


(ii) price changes are not significantly influencing production decision of farmers in the study district, (iii) that the farmers in underdeveloped countries are not responsive to price change is proved to be true.

Hanumanth Rao, C.H.\textsuperscript{20} observed that the relative importance of \textit{rabi} cultivation in Indian agriculture has been rising in the recent period, due to increase in cropping intensity made possible by increased availability of irrigation, and by use of short duration, high yielding varieties which enable farmers to grow even three crops in a year on the same land. Groundnut has also shared this increase in \textit{rabi} cultivation.

FAO\textsuperscript{21} reported that production of the major oil seeds in India fluctuated widely from year to year mainly due to the vagaries of the weather since about 95 per cent of the total oilseeds are grown under the rain-fall condition.

The study made by P.S. George, Uma K. Srivatsava and B.M. Desai\textsuperscript{22} concluded that: (i) groundnut production between 1980 and 1985 will increase in four states, namely, Tamilnadu, Punjab, Rajasthan and Uttar Pradesh; (ii) in the remaining states, it will decline; (iii) the projections indicate that the Fifth plan target of groundnut production will not be achieved in Andhra Pradesh, Gujarat, Maharashtra and Kamataka States, and (iv) in these states, the targeted production of groundnut would be approximately achieved even if the low weighted yield projection are realized.

Narain Row, J.S.\textsuperscript{23} study observed that, (i) surprisingly, the impact of both rainfall and irrigation is negative, though small, (ii) variations in yield also come out with a small negative impact, (iii) the influence of price even in the short-run emerge out to be positively large, (iv) on the whole, it appears that farmers in the country are not only price-conscious but also are increasingly become so. This calls the fixation of remunerative prices for groundnut as they are not attractive at present.

George, Srivastava and Desai\textsuperscript{24} have analysed the supply projections of major as well as minor oilseeds for 1980-85 based on past-performance covering the period 1954-55 to 1973-74. The supply of oil seeds in 1980 and 1985 were determined by the area under oilseeds and the yield levels achieved. In projecting the area under the crop and the yield levels, three broad approaches were used; viz.,

(i) trend method;
(ii) analytical models; and
(iii) judgements based on the current developments

In order to estimate the trends, linear, semi-log, log inverse and double log functional forms were made use of.

In analytical models, it was assumed that the area under oilseeds was determined on the basis of the relative profitability of oilseeds and the cultivable area at the farmer's disposal. In the absence of expected relative profitability,

past-experience through lagged variables was used. The general models used for estimating acreage responses were explained by gross return of the oilseeds, gross return of the major competing crops, price of competing crops, net cultivable land, irrigated area under the crop, rainfall and trend variable. Yield responses were projected by taking into account the availability of improved technology and the use of intensive cropping practices. In the case of newly introduced crops such as sunflower, soyabean and minor oilseeds of tree origin, the projections were made on the basis of an assessment of factors like current development activities, the chance of success in the activities etc. Since there have been violent fluctuations in prices as well as yield levels of oilseeds, price risk and yield risk could have been included in explaining the acreage response relations. Market clearance and variation aspects are also not covered in the study.

Jhala25 has attempted to explore quantitatively the supply and demand relations pertaining to edible oilseeds and oils economy of India in a classical supply demand framework. The analysis was done for groundnut, rape/mustard, sesame, coconut oils and vanaspathi on the basis of time series data covering the period 1951 to 1971. The study examined both single equation approach and simultaneous recursive type model at a specific edible oil level. It was assumed that acreage response was the same as the output response and Nerlovian partial adjustment model was used to explain the

supply response of acreages for oilseeds. This was explained by farm harvest price, lagged yield, rainfall during sowing period and lagged acreage under the crop. In the case of groundnut, for many states the negative price response was found despite groundnut being a commercial crop. The agro-climatic factors, especially yield and rainfall, were found to be influencing the ground acreage in the country. The static demand relation, linear in logarithm, has been used to explain the per capita consumption of individual oil. This was explained by the real wholesale price index, per capita real income and trend variable. The time series data on per capita consumption were derived on the basis of the production approach. It was assumed that the supply of oilseeds was predetermined and was not likely to be different from demand. This assumption, however, is not warranted by the actual market functioning. Since oil traders / millers are few in number, having considerable influence over the market, they have a somewhat upper hand in determining the prices of oils and oilseeds. That is to say, oil millers / traders play a decisive role which brings the supply and demand into contact and thereby regulate the prices of oils and oilseeds. Thus, it is not the equality of supply and demand that explains fully the pricing mechanism of oils and oilseeds in the market. This requires a separate price equation which is a behavioural relation incorporating oil millers' / traders' role thinking that they have a two-fold economic function, viz., to bring the supply and demand into contact and to use their market influence to regulate prices of oils and oilseeds.
Sah and Hanumantha Rao's study concludes that: (i) the ratio of farm output to trade output is higher, (ii) the farmer's share is also higher, along with the higher ratio of farm harvest prices to oil prices, and (iii) on an average, the share of producers in the total value added is 83 per cent.

Madhoo Pavasker's study attempts to estimate demand for oils and oilseeds for the years 1980 and 1985. His estimates of demand for major oils and oilseeds in India are essentially in the nature of projections based on time series data covering the period 1960-61 to 1974-75. The study aimed at projecting the demand for domestic consumption, vanaspathi (hydrogenated vegetable oil) production and industrial purposes under various assumptions relating to changes in population, income and prices. The population assumption is based on the medium population projections of Registrar-General which yielded a population of 65.5 million for 1980 and 720 million for 1985. In the absence of reliable data on the consumer expenditures, income series have been used on the assumption that in India expenditures of most of the families are not much different from their incomes. The third assumption is about the prices. The author has taken constant five-year average price, namely, 1971-75 periods average price, for projections. He has not attempted to study the impact of changes in prices demand. Alternatively, a linear trend in real prices measured over the period 1961-75 could also have been tried. At wholesale level, prices do influence and, in turn, are influenced by consumers, producers

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and traders / oil millers. Therefore, it is more realistic to take price as endogenous variable to be determined within the model instead of assessing it to be exogenous.

Kasar, D.V. and Kapase, P.M.'s\textsuperscript{28} survey came to the conclusions that:
(i) the area, production and productivity of groundnut did not show any specific trend; but they were characterized by annual fluctuations during the period from 1960-61 to 1977-78 in the country; (ii) the prospects of the crop are dependent upon the adequacy and regularity of monsoon; (iii) the area under groundnut showed significant increase in Andhra Pradesh, Tamilnadu and Uttar Pradesh, while it showed a decline in Maharashtra and Gujarat; (iv) the growth in production and productivity of the crop was positive in Andhra Pradesh, Gujarat and Karnataka States, while it was negative in Maharashtra and Tamil Nadu States; and (v) on the whole, there was no significant increase in area and productivity of groundnut. However, the output of the crop showed an increase of 1.03 per cent per annum during the last 18 years which may also be insignificant looking to the constant increasing demand for this commodity and its products.

Jhala, M.L.'s\textsuperscript{29} survey concludes that: (i) the decisive influence of weather on groundnut yield is significant; (ii) the problems of allocating land resources among different crops so that balanced supply of all crops was available could be properly tackled if only the influence of weather factors on decision making of farmers via their effect on yield was properly accounted for.


Kusum Chopra\textsuperscript{30} showed that due to adoption of technology in cereal crops, the non-cereals as well as non-food grains suffered in production in the total sown area. The production of five major oil seeds which showed rising trend up to 1970, revealed constant / decreasing trends thereafter. Kusum Chopra also showed that a growing population and a declining oil seeds production is adversely affecting the per capita supply of oil seeds in recent years.

Shanti Sarup and S.C. Rai's\textsuperscript{31} survey arrived at the following conclusions: (i) the area under groundnut has shown an increasing tendency in recent years in the States of Orissa, Rajasthan, Karnataka and Madhya Pradesh. In dominating groundnut states of Gujarat and Andhra Pradesh, it has exhibited a downward trend. The area in other states has practically remained constant; (ii) it has been observed that increase in groundnut production is primarily due to improvement in productivity. The states of Gujarat, Tamilnadu and Rajasthan have exhibited an increasing trend, but, the other important states like Karnataka and Uttar Pradesh have shown a declining trend. Productivity in the remaining states has remained static; and (iii) the area, production and productivity of the crop are characterized by violent annual fluctuations with few exceptions. Thus, there is no specific trend observed in respect of area, production and productivity of groundnut crop in the country.


Mehan, V.K.\textsuperscript{32}, McDonald, S.N. Nigam and B. Lalitha have conducted a study to test the contamination of groundnut seeds which are produced some strains of fungus, for which they obtained seeds for the year 1978 crops at the ICRISAT Centre and Gujarat Agricultural University, Junagadh, Gujarat State of India and from the 1979 crop at ICRISAT. In their study, they recorded a high degree of resistance in a commercial Spanish variety. And it is expected that the resistance exhibited by these cultivars might be extremely valuable under conditions of poor storage and unfavourable drying conditions in the field.

Ranade, Hanumantha Rao and Sah\textsuperscript{33} study concluded that the income of the cultivators, after vertical integration through co-operatives, would be about 35 to 115 per cent higher depending upon the marketing channel through which integration will be effected. The macro study rates with concern the declining share of groundnut growers in the total value generated in the system during the period 1963-64 to 1977-78. The study recounts various difficulties and hurdles which the co-operative sector may face and therefore argues for a cautious adoption of vertically integrated groundnut co-operatives.

Pandey, R.K. and Shanti Sarup Survey\textsuperscript{34} revealed that the area, production and productivity of oil seeds are characterized by violent annual fluctuations with a few exceptions. It is further observed that the high variability


in production was occurred mostly due to wild fluctuations in productivity. The production of groundnut crop can be doubled if farmers are persuaded to adopt recommended package of practices on their farms.

Uma Kapila\(^{35}\) observed that large-scale vegetable oil imports were due to stagnation in yield and instability in production and prices. She has studied the cost and profitability aspects of groundnut with the competing crop. She also showed that the cropped area has been the major source of growth in groundnut economy. Cropped area accounted for 79 per cent of growth rate of output and the yield contributed only 21 per cent to the growth rate of output during 1951-52 to 1974-75. The fluctuations in the output were mainly due to rain-fall variations. Irrigated facility could increase yield rate considerably. Further observed that, the basic problem facing oil seed economy has been the problem of stagnation in yield on one hand and instability in output and price on the other.

Ranade\(^{36}\) showed that oil seeds production assumed high priority due to deficit in its production. He mainly focused on groundnut which occupies 65 per cent of total oil seeds. He observed that a high risk is involved in unirrigated areas. In irrigated areas, groundnut farmers were shifting to sugar-cane or paddy assured of higher returns.


In his survey, V.M. Rao's\textsuperscript{37} observed that (i) both the marginal and small farmers sell about 76 per cent of produce in the market at lower price soon after the harvest, (ii) among all costs, transportation is the major cost and all the cost items, more or less, showed a decreasing trend from marginal to large farms. Even though, the farmers have the knowledge of the prices prevailing in the market, owing to non-availability of transportation, storage and credit facilities they are not getting a remunerative price for the produce, (iii) there is an inverse relationship between farm size and productivity and development of an approach road will promote the transport facilities and reduce the transport cost.

Narasimham, N.V., Parthasarathi Rao, P. and M. Vonoppen\textsuperscript{38}, in their study, observed that (i) price integration in many cases was found to be unidirectional indicating that substitution is possible only in one direction and not both ways. This is due to the cost and technology constraints involved in substituting one type of oil for another apart from consumer preferences, (ii) Although the market share of groundnut oil is the largest, its price varies with changes in the prices of other types of oils, while with its own price it influences other oils to a limited extent. Prices of industrial oils like neem and castor influence edible oil prices, indicating that edible oils are substitutable for industrial purposes and not vice-verca, (iii) Results on vertical integration confirm hypothesis that changes in prices of oilseeds are linked to changes in prices of oils and cake, and (iv) The vertical integration in the prices of oilseed is much faster as compared to horizontal integration in oil prices.

Anil K. Saxena and Vinod K. Khare have concluded that the importance of price is unquestionable from the viewpoint of stability or the moderate increase in groundnut acreage, but when attempts are made to go beyond this range, prices will become ineffective.

Ninan, K.N. has analysed the growth and instability of two major edible oilseeds, viz., groundnut and rapeseed-mustard. The following important conclusions emerge out of his analysis viz., (i) area has been the main source of growth in output of groundnut and rapeseed-mustard and the yields of both crops have by and large, remain stagnant, (ii) green revolution has affected the fortunes of both oilseeds, while the area under groundnut declining or remaining stagnant in all states except Gujarat and Orissa; whereas, in the case of rapeseed-mustard, the area was extended significantly in most States during the post-green revolution period, (iii) in the States where there has been a significant extension of area under the two oilseeds, technological factors (like yield, irrigation) and/or prices as well as rainfall were mainly responsible for this trend. In the states where their area declined, the spread of irrigation was found to be inducing farmers to shift from oilseeds to other lucrative crops, (iv) instability in production, area and yield per hectare varied widely from state to state and fluctuations in yield were more pronounced than the fluctuations in the area though this was not true in all the states. Instability in groundnut yield rates

increased during the post-green revolution period as compared to that in the previous period, and (v) instability in the yield of groundnut was found to vary inversely with the proportion of the crop’s area under irrigation.

Raju and Vonoppen\textsuperscript{41}, Jasdanwalla\textsuperscript{42} and Balwinder Singh\textsuperscript{43} and B.S.Arora studied whether movements in groundnut prices across markets and various product farms are synchronized or divergent. A common conclusion was that the groundnut prices in different markets and various product farms are significantly correlated implying thereby perfect system of price signalling.

Sundaram, G.P., Nagabhushanam, T.D.J. and J. Krishnaiah’s study\textsuperscript{44} observed that (i) the yield obtained in rabi season was more than double the yield in kharif season. From a comparison of the yields, it is inferred that small farmers recorded the lowest and the research station farms at Warangal recorded the highest in both the seasons (ii) it can be inferred that the gaps were more capicuous in rabi season compared to that of kharif. The yield gaps range from 0.50 to 8.50 quintals per hectare in kharif and 3.50 to 16.0 quintals per hectare in rabi season, (iii) Kharif season, the functional analysis reveals that bullock-power (Gap V) small and pooled farms, (Gap II, Gap III, IV) pesticides (Gap I, III, IV) and Technology (Gap I, III, IV) are the most important

\textsuperscript{43} Balwinder Singh and Arora, B.S., “An Analytical Study on Special Price Differentials in Groundnut in Punjab Markets”, Agricultural Marketing, XVIII, 3 October, 1975, pp. 5-12.
factors influencing yield gap in *kharif* season. Nitrogen and Phosphorous applications have not contributed to yield gaps. In *rabi* season, by and large, similar trend is observed here also.

Narappanavar, S.R.\(^{45}\) in his study, concluded that it is evident from the acreage response (supply) relation \((Y_{1t})\) for each of these oilseeds that farmers do respond positively to changes in relative farm harvest prices and negatively to price risk and yield risk. The results of the estimates of the production relation \((Y_{2t})\) reveal that the non-acreage factors do play a significant role in the production behaviour of oilseeds and more so in the case of groundnut, cotton and rape and mustard. Fertilizer consumption and area under irrigation are found to be highly significant influences in this relation. The analysis also reveals that oilseeds production has not yet established a convincing breakthrough.

Shivappa H.\(^{46}\), in his study, revealed that cost computation by the farmers does not include implicit costs. Growing paddy is more advantageous than groundnut in irrigated areas. Growing cotton and jowar are more remunerative than groundnut in the dry zone. The farmers switch over from groundnut cultivation to paddy cultivation in irrigated areas and to cotton and jowar in dry belts.

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Cauvery R.\textsuperscript{47} in her study observed that quantitative assessment of the contribution of the various factors to the growth of groundnut output is helpful in reorienting the programmes and priorities of agricultural development so as to achieve higher rate of growth. The study of thirteen districts in the State of Tamil Nadu has shown that yield has been an important factor in promoting growth in agriculture over recent twenty three years. In the study of district-wise compound growth rates of groundnut, no uniform trend is seen. These variations, therefore, would lead to an overall instability unless arrested by a suitable stabilization policy.

In their study, Nagaraj, G.C.\textsuperscript{48} and Srinivasa Gowda, M.V., concluded that the lagged area and lagged yield of the substitute crop were important factors influencing the decision of farmers regarding area allocation. Change in mean yield was the major component contributing to the increase in average production of groundnut in the State. Instability in groundnut production was mainly due to change in yield variance. This was due to the fact that the yields of groundnut were erratic and these fluctuations were, in turn due to vagaries of the monsoon. The production of groundnut was also subjected to instability because of changes in the area-yield co-variance and this happened due to variability of area and yields as well as due to changes in the correlation between area and yield.

\textsuperscript{47} Cauvery, R., "Inter-District Disparities in the Growth of Groundnut : A Study of Tamil Nadu", \textit{Southern Economist}, October 1, 1981, Bangalore, p. 11.

Shrikant S. Kalamkar in his study observed that the variability was found to be more in production as compared to area and yield. The growth in the production of castor, niger, safflower and sesame is mainly attributable to growth in productivity, whereas, production of groundnut, soyabean, rape seed, mustard and sunflower increased owing to the extension of area.

Hence, various international studies has concentrated to examine the demand and supply conditions, elasticity of demand and trends in production of oilseeds whereas the national and local studies has concentrated to examine the production and productivity trends, comparative analysis of acreage response among the various agricultural products and seed, area and period-wise problems and prospects of oilseeds at micro and macro levels.

1.2 NEED FOR THE STUDY

The foregoing review of literature shows that most of the studies examined the oilseed’s production and its related problems at the macro level. Even the regional studies too confined themselves to one or two aspects of oilseeds; except sporadic studies, not many micro-level in-depth studies are made to evaluate the production and productivity of oilseeds and its related aspects such as impact of time-lags, acreage response and profitability. Since green revolution in India, the Government has concentrated on the production of oilseeds, keeping the increasing demand from the people. Hence, it is appropriate to make a region specific, evaluative study to gain clearer and

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deeper insights into the dynamics of oilseeds production / economy in India, especially, intra-regional, category-wise and seed-wise increase in the growth and its impact on the pace of economic development.

These and other issues call for an empirical study. In India, several studies, official as well as non-official, have been undertaken from time to time as mentioned earlier, in the domain of oil seeds at the macro-level. These studies have provided solutions to some of the questions only. And, yet area and agency specific studies are comparatively limited in number. Such studies assume great importance in the context of vast regional and institutional variations in a developing country like India. The present study is an humble attempt in this direction.

1.3 OBJECTIVES

The major objectives of the study are as follows:

i. to review the trend of oil seeds production during pre and post-green revolution period and Post Technological Mission of Oilseeds (TMO) period;

ii. to analyse the causal factors for the stagnation in yield and instability in production;

iii. to examine the impact of time-lags on production of groundnut; and

iv. to analyse the acreage response and profitability of groundnut.
1.4 HYPOTHESES

The following hypotheses have been tested.

i. There is no instability in production and stagnation in productivity of oil seeds in the District.

ii. There is no significant impact of time-lags on production of groundnut.

iii. There is no significant variation in acreage response and profitability of groundnut.

1.5 METHODOLOGY

(a) Sample Design

Out of the 66 mandals in the District, four mandals purposively chosen with a high acreage of groundnut for the present study. Four hundred sample farmers in the sample four mandals was selected on the basis of proportional stratified random sampling procedure based on the size of their holdings. The five size groups viz., marginal (0.04 to 2.46 hectares) 45 per cent, small (2.47 to 4.93 hectares) 29 per cent, semi-medium (4.94 to 9.87 hectares) 19 per cent, medium (9.88 to 24.7 hectares) 10 per cent and large (24.7 and above hectares) 1.0 per cent are indicated in the Table 1.1. Sample farmers comprise of 180 marginal, 116 small, 60 semi-medium, 40 medium and 4 large farmers.

Data from the sample farmers were collected through personal interview by administering the schedules to them, and the schedules elicited data pertaining to socio-economic profile of the sample farmers, production procedures, various stages of production, time-lags in production process, the gap between actual and excess time taken for completion of the production and impact of time-lags on production and profitability of the farmers.
### TABLE 1.1: Sample Design

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Thamballapalle</th>
<th>Peddamandyam</th>
<th>Molakalacheruvu</th>
<th>Kurabala-kota</th>
<th>Total</th>
<th>Thamballapalle</th>
<th>Peddamandyam</th>
<th>Molakalacheruvu</th>
<th>Kurabala-kota</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Marginal</td>
<td>3753</td>
<td>2852</td>
<td>3902</td>
<td>3002</td>
<td>13509</td>
<td>50</td>
<td>38</td>
<td>52</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>(0.04-2.46 Hc)</td>
<td>(45.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Small</td>
<td>2624</td>
<td>2024</td>
<td>2099</td>
<td>1947</td>
<td>8696</td>
<td>35</td>
<td>27</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>(2.46-4.92 Hc)</td>
<td>(29.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Semi-Medium</td>
<td>1397</td>
<td>854</td>
<td>1242</td>
<td>1164</td>
<td>4657</td>
<td>18</td>
<td>11</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>(4.94-9.87 Hc)</td>
<td>(15.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Medium</td>
<td>719</td>
<td>575</td>
<td>862</td>
<td>719</td>
<td>2875</td>
<td>10</td>
<td>8</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>(9.87 to 24.7 Hc)</td>
<td>(9.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Large</td>
<td>27</td>
<td>65</td>
<td>31</td>
<td>35</td>
<td>158</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(24.7 and above)</td>
<td>(0.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>8520</strong></td>
<td><strong>6370</strong></td>
<td><strong>8136</strong></td>
<td><strong>6869</strong></td>
<td><strong>29895</strong></td>
<td><strong>114</strong></td>
<td><strong>85</strong></td>
<td><strong>109</strong></td>
<td><strong>92</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(28.5)</td>
<td>(21.3)</td>
<td>(27.2)</td>
<td>(23.0)</td>
<td>(100.0)</td>
<td>(28.5)</td>
<td>(21.3)</td>
<td>(27.2)</td>
<td>(23.0)</td>
</tr>
</tbody>
</table>

**Note**: Figures in parenthesis indicate percentages.

**Source**: Field Survey Data
(b) Source of Data

The study has made use of both the secondary and primary data. The secondary data, the secondary were drawn from the various reports published by the Government of India and of the Government of Andhra Pradesh such as Reports on Statistical Abstracts of India and Statistical Abstracts of Andhra Pradesh. Various publications and reports of Directorate of Economic and Statistics, University of Agriculture, Government of India. Secondary data were also drawn from various sources such as Season and Crop Reports, Agricultural Situation in India, District Gazette, Handbook of Statistics, published and unpublished data, books, documents, files of the Chief Planning Officer of Planning and Agricultural Departments. Further, primary data were collected by administering the schedules among the sample farmers of the District. The entire study period was split into four sub-periods in order to evaluate the impact of the new production technology on growth in area and production and to assess the changes in relative contribution of different factors to the output growth. The sub-periods formed were, viz.,

Period-I : 1950-51 to 1964-65 Pre-green Revolution period
Period-II : 1965-66 to 1979-80 Green Revolution period
Overall : 1950-51 to 1999-2001 Overall period
1.6 SCOPE AND LIMITATIONS OF THE STUDY

In order to test the hypotheses postulated above pertaining to the stagnation of productivity, the impact of time-lags, acreage response and profitability of groundnut, an attempt has been made to study it with reference to groundnut in Chittoor District, in the state of Andhra Pradesh. The District of Chittoor and production of groundnut have been chosen specifically for reasons such as:

a. Chittoor is one of the four districts of the drought-prone area of Rayalaseema region in the state of Andhra Pradesh;
b. The District ranks third in production of groundnut in Andhra Pradesh; and
c. The share of groundnut, in the total production of oilseeds is more than ninety-nine per cent in the district.

A doctoral thesis is too small a tool to tackle the multifarious factors in the production of groundnut in the district of Chittoor. As the secondary data available were inadequate, effort had been made to collect the primary data, by conducting a field survey of the sample Mandals statistically selected in the District. Owing to time and resource constraint, the present study is confined to an in-depth study of the production of groundnut, a predominantly produced oilseed in the District. The results of the study may be generalised for the entire region as the produce under study, viz., groundnut, is the major commercial crop and source of edible oil in the region. However, the conclusions arrived at
may not be application to regions of diverse agro-climatic conditions. Thus, the major conclusions drawn in the study may be taken note of subject to the geographical limitations of the study.

1.7 STATISTICAL TOOLS OF ANALYSIS

Apart from the simple averages and percentages, the following statistical tools were applied to analyse the secondary and primary data collected for the present study.

To study the trends in growth of oilseeds production and productivity, the following formula had been applied.

**Compound Growth Rate 'g' is**

The model is

\[ Y = a + bX \]

taking logarithms on both sides.

\[ \log Y = \log a + X \log b \]

\[ y = A + X B \]

\[ \hat{B} = \frac{\sum XY - \left( \frac{\sum X \sum Y}{n} \right)}{\sum X^2 - \left( \frac{(\sum X)^2}{n} \right)} \]

\[ \hat{A} = \bar{Y} - \hat{B} \bar{X} \quad \text{where} \quad \bar{X} = \frac{\sum X}{n}, \quad \bar{Y} = \frac{\sum Y}{n} \]

\[ \hat{b} = \text{Anti log} \left( \hat{B} \right) \]
Compound Growth Rate = \((\hat{b} - 1) \times 100\)

**Correlation**

\[
r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \times \Sigma y^2}}
\]

where \(x\) and \(y\) stands for deviations and \(X\) and \(Y\) series.

To test the significance of an observed correlation co-efficient, the following test has been used.

\[
|t| = \frac{r \sqrt{n-2}}{\sqrt{1-r^2}} \sim t_{n-2}
\]

where \(r\) = correlation co-efficient

\(n\) = number of pairs

**Co-efficient of Variation (CV)**

\[
CV = \frac{\sigma}{\bar{X}} \times 100
\]

where, \(\sigma\) = Standard deviation

\(\bar{X}\) = Mean

**Decomposition**

\(P_o = A_o \times Y_o\) and \(P_n = A_n \times Y_n\) \hspace{1cm} \text{..... (I)}

where \(P_o\) and \(P_n\) is the production in the base year and \(n^{th}\) year respectively.

\(A_o\) and \(A_n\) represent the area and \(Y_o\) and \(Y_n\) represent the yield in the base year and \(n^{th}\) years respectively.

\(P_n - P_o = \Delta P, A_n - A_o = \Delta A, Y_n - Y_o = \Delta Y\) \hspace{1cm} \text{..... (II)}
From Equation I and II we can write

\[ \Delta P = A_0 \Delta Y + Y_0 \Delta A + \Delta A \Delta Y \]

**Gini Co-efficient**

\[ R = \frac{\frac{1}{2} \sum (y - x + 1) - (x - y + 1)}{5000} \]

't' test for two means of the following form is used to study the

\[ |t| = \frac{x_1 - x_2}{S \left( \frac{1}{n_1} + \frac{1}{n_2} \right)} \sim t_{n_1 + n_2 - 2} \]

where \( S^2 = \frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2} \)

\( x_1 \) = sample mean of \( X_1 \)

\( x_2 \) = Sample mean of \( X_2 \)

To test the significance of variation of excess days taken, loss in yield among the mandals and size groups, the analysis of variance, 'F' test of the following form is used.

\[ F = \frac{\text{Variance between samples}}{\text{Variance within samples}} \]

where Variance between samples = \( \frac{\text{Sum of squares between samples}}{\text{Degrees of freedom}} \)

Variance within the samples = \( \frac{\text{Sum of square between samples}}{\text{Degrees of freedom}} \)
1.8 CHAPTERISATION SCHEME

The chapter scheme of the present study is as following:

The first chapter states that the problem under the study, reviews, the literature, and describes objectives, hypotheses, database, sample design, tools of analysis, scope, limitations and plan of the study.

The second and third chapters present a profile and performance appraisal of oilseed production and productivity in India and in the state of Andhra Pradesh.

In chapters four to six, the secondary and survey field data pertaining to four sample mandals of the Chittoor District, were analysed in the light of objectives of the study and the corresponding hypotheses. Besides, in the fourth chapter, a critical analysis was made of the socio-economic characteristics and causes conducive to instability and stagnation in production and productivity of oil seeds in the District.

In the fifth chapter, the mandal-wise and size-wise impact of time-lags on production of groundnut was critically analysed. Mandal-wise and size-wise acreage response and profitability of groundnut was examined in the sixth chapter.

And in the seventh and last chapter, major findings of the study were summarised, important conclusions were drawn and suggestions were made for better performance of the oil economy in the District, in the light of the empirical study.