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PRICE BEHAVIOUR OF COCONUT AND COCONUT PRODUCTS IN INDIA

By

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THESIS

submitted in partial fulfilment of the requirement for the degree of

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DECLARATION

I hereby declare that the thesis entitled **"Price behaviour of coconut and coconut products in India"** is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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CERTIFICATE

Certified that the thesis entitled **"Price behaviour of coconut and coconut products in India"** is a record of research work done independently by **Mr. N. Jaisal Babu,** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, associateship or fellowship to him.

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Dedicated

to

my belowed parents

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N. Jaisal Babu

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Introduction

1. INTRODUCTION

Coconut (*Cocos nucifera* L.) is socially, culturally, and religiously associated with millions of people around the world. The crop provides sustainable income to millions and helps provide food security, nutritional security and alleviate poverty. Coconut, apart from serving as a primary source of food component, provides considerable amount of foreign exchange through export of coconut and its products. Hence, the tree is eulogised as the "*Kalpavriksha*" or the "tree of abundance" (Thampan, 1981).

1.1 GLOBAL COCONUT SCENARIO

Coconut is grown in more than 93 countries across the world. It is cultivated in 10.8 million hectares world wide with a production of 53.5 million tonnes of copra equivalent. Indonesia is the largest producer (29.3%) followed by Philippines (25.6%). India ranks third in world production of coconut with a share of 18.1(Appendix I). Countries of the Asia-Pacific region produce 86 per cent of the coconut in the world. The major producers and exporters of copra in the world are Philippines, Indonesia and Sri Lanka. Although the share of India in world production of coconut is 18.0 percent, the production of milling copra is only around 12 percent of the world output, while Philippines accounts for 42 per cent and Indonesia 24 percent respectively (Government of Kerala, 2003).

Major expansion in global coconut area took place in the seventies and eighties. Philippines and Indonesia made remarkable strides in area and production of coconut where as area and production in India is almost stagnating. Area under coconut in Indonesia increased from 1.26 million ha in 1970 to 1.80 million ha in 1980

and to a figure of 2.26 million ha by 1990. The corresponding figures for Philippines were 1.88 million ha in 1970, 3.24 million ha in 1980 and 3.11 million ha in 1990. By the end of the millennium, Indonesia along with Philippines accounted for 54 per cent of coconut area in the world and 55 percent of its production. Productivity wise, India is ahead of Philippines, but lags behind Indonesia (Appendix II).

1.2 INDIAN COCONUT ECONOMY

Coconut is an important commercial crop to a vast majority of growers, playing a dominant role in their socio-economic and cultural life. Coconut farming is more a way of life to millions of Indian cultivators and a major source of employment to millions in the rural areas.

India accounts for 22.34 percent of the world coconut production. Currently the crop covers an area of 1.915 million ha with an estimated annual production of 11.73 billion nuts. Coconut production in the country has made greater strides during the eighties and nineties. There had been a tremendous progress in terms of growth in area and production of coconut during this period. The production of coconut reached 12.68 billion nuts in 2000-01 from 5.94 million nuts in 1980-81 recording a compound growth rate of 3.83 per cent per annum. Similarly, area under coconut increased from 1.083 million ha to 1.824 million ha during the same period showing a compound growth rate of three percent per annum.

The four south Indian states namely Kerala, Tamil Nadu, Karnataka and Andhra Pradesh account for over 90 per cent of the coconut production in the country. Kerala leads in terms of area as well as production followed by Tamil Nadu, Karnataka and Andhra Pradesh. But in terms of productivity, Kerala is third behind Tamil Nadu and Karnataka (Table 1.1). During 1970-71, Kerala alone accounted for

Table 1.1 **State wise area, production and productivity of coconut in India**

(A-area in '000 ha, P- production in million nuts and Y- yield in nuts per ha)

	KERALA			TAMIL NADU			KARNATAKA			ANDHRA PRADESH			INDIA		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
1950-51	409.4 (65.3)	2025 (61.7)	4948	66 (10.5)	462.6 (14.1)	7009	93.2 (14.9)	369.4 (11.3)	3964	33.2 (5.3)	306.1 (9.3)	9220	626.5	3281.7	5238
1955-56	448 (69.1)	3099 (73.4)	6917	51.5 (8.0)	417.3 (9.9)	8103	88.3 (13.6)	355.3 (8.4)	4024	35.6 (5.5)	233 (5.5)	6545	647.6	4224.4	6523
1960-61	501 (69.8)	3220 (69.4)	6427	55 (7.7)	445.3 (9.6)	8096	96 (13.4)	497.7 (10.7)	5184	33 (4.6)	297.4 (6.4)	9012	717.0	4639.1	6470
1965-66	586.3 (66.3)	3293 (65.4)	5617	90.2 (10.2)	843.6 (16.8)	9353	115.4 (13.0)	361.6 (7.2)	3133	33.3 (3.8)	287.9 (5.7)	8646	883.7	5035.4	5698
1970-71	719.1 (68.7)	3981 (65.5)	5536	95.1 (9.1)	941.5 (15.5)	9900	130.3 (12.5)	731.8 (12.0)	5616	37.1 (3.5)	157 (2.6)	4232	1045.5	6078.0	5813
1975-76	692.9 (64.7)	3439 (59)	4964	109.9 (10.3)	1098.6 (18.9)	9996	151.1 (14.1)	766.6 (13.2)	5073	40.5 (3.8)	167.4 (2.9)	4133	1069.9	5829.4	5449
1980-81	666.2 (61.5)	3036 (51.1)	4558	116 (10.7)	1354.4 (22.8)	11676	171.5 (15.8)	890 (15.0)	5190	42.4 (3.9)	175.3 (3.0)	4134	1083.3	5942.0	5485
1985-86	704.7 (57.5)	3377 (49.9)	4792	149.6 (12.0)	1494.5 (22.0)	9990	205.6 (16.8)	1062 (15.7)	5165	47.4 (3.9)	195.8 (2.9)	4131	1225.6	6770.0	5524
1990-91	864.1 (57.1)	4527 (46.7)	5239	226.4 (15.0)	2358.3 (24.3)	10417	232.9 (15.4)	1201.6 (12.4)	5159	61.2 (4.0)	730.6 (7.5)	11938	1513.9	9700.2	6407
1995-96	982.1 (53.6)	5905 (45.6)	6013	298.6 (16.3)	4345.7 (33.6)	14554	269.4 (14.7)	1406.5 (10.9)	5221	90 (4.9)	1231.4 (9.50	13682	1830.9	12952.3	7074
1999-00	899.1 (50.6)	5167 (42.1)	5747	304 (17.0)	3222 (26.3)	10599	320.6 (18.0)	1670.3 (13.6)	5210	101.7 (5.7)	1051.8 (8.6)	10342	1777.7	12251.6	6892
2003-04	902.8 (47.5)	5347 (44.6)	5923	358.14 (18.9)	2780.6 (23.2)	7764	374.5 (19.7)	1576.05 (13.1)	4208	104.3 (5.5)	1277.1 (10.7)	12244	1899.4	11988.8	6312
2004-05	886.9 (46.3)	5300 (45.2)	5976	379.2 (19.8)	2572.7 (21.9)	6785	390.1 (20.4)	1546 (13.2)	3963	102.6 (5.4)	1328.3 (11.3)	12946	1916.8	11728.3	6119

Source: Coconut Development Board, 2005

Figures in parentheses indicate percentage to the respective totals

68.7 percent of the country's coconut area where as Tamil Nadu, Karnataka and Andhra Pradesh together occupied only 25 percent. During the eighties and nineties, area and production of coconut in Kerala almost stagnated. But Tamil Nadu, Karnataka and Andhra Pradesh made remarkable progress in terms of area and production of coconut. As a result, percentage share of Kerala in the country's coconut area as well as production reduced considerably. Presently, Kerala occupies 46.3 per cent of area and contributes 45.2 per cent of the production. Tamil Nadu produces 21.9 per cent of the nuts from 19.8 per cent share of area while Karnataka produces 13.2 per cent of the nuts from 20.4 per cent share of area.

Coconut is marketed in a variety of forms in India. Copra and coconut oil and ball copra are some of the traditional forms in which bulk of the coconut is transacted. Newer forms like desiccated coconut, tender nut, coconut cream, spray dried powder, skim milk etc are also slowly gaining importance. Coconut is consumed domestically as well as industrially. Domestically, coconut is consumed as natural milk extracted from the kernel of fresh coconut for preparation of confection and non-confection and in the form of oil for both edible and non-edible uses. Coconut oil is the most popular vegetable oil used by the people of Kerala. It has been one of the most widely used oils from ancient days. Kerala is the only state where coconut oil is put to consumption purpose.

The main industrial use of coconut is production of copra from which coconut oil is extracted. Coconut is one of the essential ingredients in the production of soap, creams, shampoo's, cosmetics etc. Many of the ayurvedic and medicinal preparations are coconut oil based. Besides, coconut oil is finding innovative uses such as automobile lubricant and also as a source of bio fuel.

Despite India being a dominant producer of coconut, Indian coconut economy today is pitted against scores of odds. High cost of farming, uneconomic returns, price fluctuations, competition from substitute oil and threat of import flooding the domestic market are a few of the problems lurching Indian coconut sector. The low price fetched by coconut and its products and the volatile price fluctuations have almost been a perennial problem threatening the very existence of coconut economy. Coconut price plummeted to the rock bottom a couple of years back and the producers sometimes received much less than the cost of production. Price of coconut and coconut oil has an image of highly capricious one. Coconut price often exhibit high inter year and intra year fluctuations, which follow no definite trend. Both producers and end users are facing considerable sufferings as a result of these unexpected fluctuations in prices. Sudden and drastic fall in price will adversely affect millions of coconut growers and processors. This also results in market uncertainty and marketing stability is the prime need of the market for prosperous development.

Remunerative and steady price for any agricultural produce will go a long way in increasing production of that commodity by cultivators. Wide fluctuations in the price discourage farmers to undertake large-scale investment to improve productivity. Coconut is a perennial crop involving high investment compared to seasonal crops. Therefore price fluctuation is an important factor considered while planning to grow this crop.

1.3. GLOBALIZATION AND COCONUT ECONOMY

The economic reforms that were introduced by the Government of India since 1991 emerged as the major factor influencing the price of coconut in India. There were serious concerns and apprehensions that the surge of import of coconut products

and their substitutes can injure the domestic market. Almost a decade has passed since the advent of liberalized trade regime under the auspices of WTO. In the wake of mounting intense competition in global markets arising from the liberalised trade environment, the domestic coconut economy has also been pushed towards a situation of competition where coconut oil competes with other vegetable oils and fats in the international markets. Because of its amiability for substitution, coconut oil in the country has become a minor oil locked in a competitive battle with other oils and fats (Mathew *et al.*, 2005).

Though the threat of imports flooding the domestic market as a result of liberalisation and consequent opening up of the economy has often been highlighted, these areas are marked by conspicuous absence of any serious scientific study and many a time globalization is blamed as the villain responsible for the misery of poor coconut growers. These indicate that there are still grey and un-chartered areas which are to be re-examined. Even though agriculture is a state subject in India, it is increasingly becoming evident that the exim-policies of WTO members are being influenced and shaped by the provisions of WTO, which in turn, can have trade implication- both direct and indirect. Therefore, a policy analysis in this direction can throw light on the various inter linkages. The present study entitled '***Price behaviour of coconut and coconut products in India***' assumes significance in this backdrop. The study of temporal and spatial variation in the price of agricultural commodities can provide a better insight to design and implement appropriate policies for reducing price fluctuations. This will not only benefit the producers, but the consumers as well as the traders.

1.4. OBJECTIVE OF THE STUDY

The present study is undertaken with the specific objective of investigating the secular trend, seasonality and irregular movements in the price of coconut and major coconut products in India, and to assess the implications of liberalized exim policies.

1.5 ORGANIZATION OF THE THESIS

The study is organized into five chapters including the present one. Chapter two is a review of literature relevant to the study. Chapter three deals with a brief description of the methodological framework, analytical tools and conceptual issues. The results of the study and the discussion of the findings are presented in chapter four. The fifth chapter summarises the major findings and conclusions drawn from the analysis, along with the policy implications.

Review of Literature

2. REVIEW OF LITERATURE

A comprehensive review of the past literature has been attempted to throw light on the present status, strengths and weaknesses of the existing studies in the topic from the point of view of methodology as well as substance. The review of literature is presented under the following heads:

2.1 PRICE BEHAVIOUR

The study of price behavior of crops will provide guidelines to formulate effective price policy to safeguard the interest of growers (Gadhavi *et al.*, 2001). Any time series will have the following four components:

1. Secular movements
2. Seasonal movements
3. Cyclical movements and
4. Irregular movements

Therefore, the price behaviour is reviewed under the above four headings.

2.1.1 Secular Price Movements

In the long run a time series may show a tendency to increase, decrease or remain as such. The general direction in which the time series move over a long period of time is referred to as the secular trend (Croxton *et al.*, 1979; Spiegel, 1992).

A trend is usually established based on at least 10 to 15 years data. The long-term trend of price of any commodity or group of commodities is the net result of forces affecting either demand or supply over a long span. The trends in price of individual commodities usually follow the general price level in the economy. In India the general price level had been raising since second five year plan (Acharya and Agarwal, 1991).

Agarwal (1986) argued that even though four time period elements viz., trend, cyclical, seasonal and irregular movements were found associated with the changes in prices, secular and seasonal fluctuations played an important role in guiding the farmers and traders in decision making on production and marketing areas.

Thampan (1988) compared the price behaviour of coconut oil and groundnut oil at Kochi and Mumbai markets for the period from 1964-65 to 1975-76. He reported that average annual prices of both the oils showed an increasing trend over the entire study period. But the rate of price increase was steeper in coconut oil than in groundnut oil. He was of the opinion that coconut oil always enjoyed a price premium over groundnut oil during the period of analysis.

Dogra (1989) studied the export price trends for walnut shell and kernel and established simple linear equation for export price. Value of R^2 was statistically significant and it indicated that linear trend equation had a good fit. However, the coefficient of time was not statistically significant showing that there was no trend effect in both the cases.

Krishnankutty (1989) studied the secular trend in the price of construction timber in Kerala for the period from 1956-57 to 1984-85. Moving averages of real

prices were used in order to smoothen out the effect of year to year fluctuations in prices. From the real prices plotted, it was observed that the real price was increasing over the whole period. But the increase was not monotonic and three distinct periods could be identified during which the prices followed more or less linear pattern. It was found that prices registered a small decline prior to the period from 1966 to 1969 but thereafter increased at a normal rate. The period from 1976-77 to 1984-85 was characterized by a drastic increase in prices, which could be due to stoppage of clear felling of natural forest and the consequent drastic reduction in the timber supply.

Agarwal and Sharma (1990) analysed inter and intra year price variation in pulse crops in Rajasthan during the period from 1975 to 1990. The result showed that prices of pulses exhibit a general increasing trend over the whole period of study. The annual compound growth rate was high indicating that the rate of price increase was high for all the pulse crops.

Borah and Dutta (1991) studied the price behaviour of rape and mustard in Assam during the period from 1971-72 to 1989-90. They fitted linear trend equation to the wholesale price data of both the crops. The study revealed the existence of a positive price trend for rape and mustard in all the major markets of Assam.

Rajendran *et al.* (1991) collected the monthly wholesale price of broiler chicken in Madras city for the period from 1980 to 1986 and fitted a linear model to estimate the trend in price. The fitted equation was found to explain 95 per cent of the variation in the price.

Kesavan and Geetha (1992) subjected the wholesale price data of dairy and meet products from the four metropolitan centers of India for the period from 1978 to

1989 to trend analysis using simple linear equation. The trend analysis showed that the prices of milk always showed an upward trend, which could be due to the pressure of demand from the ever increasing population as well as the influence of cost factors.

Salam *et al.* (1992) estimated the trends in area, production and productivity of cashew in Kerala during the period from 1961-62 to 1987-88 using linear, quadratic, exponential, modified exponential and logistics functions. As none of the above functions could provide a satisfactory fit, a simple trend line using the three yearly moving average was used. It revealed that the area under cashew exhibited an increasing trend in Kerala over the time period considered while production and productivity revealed a declining trend from 1973-74 onwards.

Basavaraja (1993) analyzed the fluctuations in prices and arrivals of major crops in Bijapur market in Karnataka state by collecting monthly time-series data on prices and market arrivals from the regulated market in Bijapur for the period from 1971 to 1992. Orthogonal polynomial regression analysis was used to study the trends in prices and market arrivals and prices and market arrivals showed an increasing trend during the whole period.

Selvarajan *et al.* (1993) examined the data on the wholesale price of potato in Nilgiri district for a period of 30 years from 1961-62 to 1990-91. The trend value was calculated for production and price by using a second-degree polynomial function and noted that the prices in general exhibited an increasing trend though wide spread seasonal fluctuations were there.

Jain *et al.* (1994) subjected monthly retail price of milk and milk products in Andhra Pradesh for a period of 28 years to trend analysis by excluding seasonal effects and showed that an exponential growth model explained more than 90 per cent of the secular variation in price for each of the milk product.

Lekshmi *et al.* (1996) attempted to delineate the secular trend of natural rubber price, covering a period of 27 years from 1967-68 to 1994-95. The trend in price was examined by using a random test supplemented by an analysis of three-year moving average intended to even the seasonal fluctuations to capture the secular trend in price movements. A semi-log quadratic equation was fitted to detect the direction of price movements. The analysis revealed that natural rubber price in India did not show any statistically significant trend to move consistently towards particular direction in the long run.

Haridoss and Chandran (1997) estimated the growth rates in the price of coconut and coconut oil and found that the percentage increase in the price of coconut was higher than that of coconut oils. But both the prices had comparable trend coefficients suggesting that there was only marginal difference between the price behaviour of coconut and coconut oil. It implied the existence of a parity price behavior between coconuts and coconut oil in the long term.

Sairam *et al.* (1999) studied the trend in the price of coconut oil as compared to other major vegetable oils viz., groundnut, sesamum, rapeseed and mustard between 1970-71 and 1994-95 and reported that price of coconut oil was higher than other major edible oils including groundnut for most of the period under

investigation. This could be mainly due to the fact that coconut oil had more price inelasticity of demand when compared to other oils as it was mainly used for toiletry or industrial purposes. However the maximum growth rate of prices was for groundnut oil, followed by mustard, coconut and sesamum oil.

The monthly market prices of groundnut and cotton were subjected to trend analysis. The long-term trend component and the growth rate of prices over the years were estimated by fitting a linear regression equation to the de-randomized yearly data on groundnut and cotton prices. The trend analysis revealed that there was a significant annual increase in price of both the commodities (Hosmani, 2001).

Reddy *et al.* (2001) examined the price behavior of tamarind in the Anantapur and Chittoor districts of Andhra Pradesh using time series data for the period from 1990 to 1999. They reported that the secular trend and the seasonal variations were the important factors, which determined the pattern of price movement of tamarind.

In order to determine the nature of trend movement in the prices of tapioca and tapioca products, the prices of tapioca, tapioca starch and sago were de-seasonalized separately and removed the short period seasonal effects. Separate regression analyses were conducted to understand the influence of starch and sago price on tapioca price and the result showed that the price of starch and sago were influencing the price of tapioca (Srinivasan *et al.*, 2001).

Pradeep (2003) studied the trends in area, production and productivity of natural rubber in India during the period from 1960-61 to 1999-2000 using cubic,

logistic, compound, log and quadratic production functions. It was found that out of the different functional forms used, a growth model of the type $Y=e^{a+bt}$ was found to be the best fit for capturing the trend in area, production and yield while an exponential function explained the trends in consumption more satisfactorily.

Rethinam (2004) reported that price trend of coconut always fluctuated widely but various products from coconut and value added by products from coconuts had reasonably good and stable price compared to coconut oil.

2.1.2 **Seasonal Price Movement**

Seasonal movements refer to the identical or almost identical patterns of movement followed by a time series during corresponding months of successive years. Those movements, which recur, with some degree of regularity, with in a year are referred to as seasonal movements (Croxton *et al.*, 1979; Spiegel, 1992).

Gadhavi *et al.* (2001) were of the opinion that seasonality in supply and perishable nature of agricultural produce were the major cause of price fluctuation of agricultural commodities.

Thampan (1981) argued that the crop output of perennial trees like coconut was also known to be subjected to seasonal fluctuations even though production was round the year. Similarly, Radhakrishnan *et al.* (1988) reported the existence of seasonality in both the production as well as price of coconut. According to him, the peak level of production was in *Meenam* (mid March-mid April) and the trough was in *Karkitakom* (mid July- mid August). He further revealed that the price fluctuation

in coconut was following a reverse pattern with the seasonality in production. That is, the trough price coincided with peak in production and peak price coincided with trough in production. The variation was so much that the net returns from storage of coconut oil were negative in some years.

Borah and Dutta (1991) examined the wholesale price data of rape and mustard in Assam state for the period from 1971-72 to 1989-90. They observed the seasonal behavior in the whole price by working out seasonal price indices. Seasonal indices of the pre harvest months were compared with that of the post harvest months and reported that the seasonal price indices of rape and mustard in Assam state were higher in pre harvest months than in post harvest months indicating that a higher price prevailed during pre harvest period compared to post harvest period.

According to Raveendran (1991) the normal price trend of coconut and its products over a period of years was that the prices declined progressively from December-January to April-May. Thereafter the price improved progressively till November-December, with the peak in November. He explained that such a trend compared well with the harvest or arrival pattern of coconut with the trough price occurring at the time of peak production and peak price occurring during the lean season. However, he reported, on many occasions during the previous years this trend was found to be disturbed due to various reasons.

Chakraverty *et al.* (1992), while studying the arrival and price of coconut in Sakhigopal Regulated Markets of Orissa for seasonality, opined that in India apart from seasonality in production, the social tradition and religious functions also contributed to the seasonality of price of agricultural produces. Despite increased

supply during the monsoon months, prices tended to be higher in the post monsoon season for some crops because of social tradition and religious function.

Ghose (1993) in a similar line argued that there was considerable variation in the intra year demand pattern of coconut in Assam, mainly due to festivals and religious functions. According to him these festival oriented market demand and tender nut consumption explained much of the variation in the coconut price in Assam. So the coconut prices ruled high during festival periods in Assam. He differentiated this type of price behavior from that in South Indian states, where harvesting of mature nuts and seasonality in production affected the supply and price of coconuts.

Singh *et al.* (1993) studied the trends in arrivals and prices of potatoes in Jalandhar district of Punjab state during the period from 1975-76 to 1989-90 and identified the seasonal patterns in the movement of potato prices. They reported that during the post harvest period, the indices of prices remained low and fluctuated widely. These fluctuations were mainly because of the seasonal and perishable nature of the crops. They concluded that the seasonal nature of agricultural production resulted in price fluctuations.

Jain *et al.* (1994) identified the seasonal component in the price behaviour of milk and milk product based on the time series data on retail prices for milk, curd and ghee over the period from 1962 to 1989 in Andhra Pradesh. They reported that there were significant seasonal variations in the price of milk products. Milk prices tended to be higher in May to September with the peak price occurring in June, July or Aug. Curd prices showed similar trends but tended to be slightly lower than corresponding

milk prices. Prices for ghee varied within a narrower range than those for milk or curd.

Aravindakshan (1995) examined the data on the price of copra and coconut oil in India between 1988 and 1995 and concluded that there was wide seasonality in the price behavior. Prices of coconut and coconut products declined progressively from December-January to May-June and there after exhibited an increasing trend till November-December. He confirmed the fact that seasonality in coconut price compared well with the harvest arrival pattern. He also noted that there was no appreciable increase in the price during the entire period of investigation when taking into consideration, the inflationary effect of money.

Babu and Sebastian (1996) studied the price behaviour of coconut and coconut products in Kerala using monthly data from 1971 to 1990. They reported that the price of coconut was subjected to pronounced seasonal fluctuations despite the production of nuts round the year. The prices of coconut, copra and coconut oil showed seasonal buoyant phase from November to February for coconut and August to December for copra and coconut oil. A depressed phase was noted from March to October for coconut and February to June-July for copra and coconut oil. The seasonal peak in coconut production was coupled with seasonal trough in coconut prices and vice versa, thereby indicating the prevalence of a distorted market in the state to the disadvantage of coconut growers as bulk of their produce was disposed as raw nuts immediately after harvest when prices were abysmally low. It was also found that the seasonal behavior of coconut was influenced by seasonality in copra and coconut prices. Correlation among seasonal indices revealed that the seasonal indices of copra prices and coconut prices were highly associated and seasonal price behavior in coconut was following seasonality in copra and coconut prices with one month, two month and three months lag.

Kapadia *et al.* (1996) studied the effect of arrivals of coconut on the price of mature coconut at Mahuva in Gujarat during 1993. The month wise arrivals of mature coconut for ten years (1983-93) and corresponding prices were analyzed. The study revealed that maximum price of mature coconut was recorded during September and minimum in June. The price was maximum in September because it was the lean season and the market prices were directly influenced by arrivals of coconut and demand in the market.

Haridoss and Chandran (1997) after examining the price behaviour of coconut and coconut oil in Tamil Nadu observed that the period from January to June was period of high yield for coconut and the yield was low during the months from July to September. It was observed that the prices fall below the average during the months of plentiful yield. The price indices for both coconut and coconut oil were found to be the lowest during the month of February and the highest during the month of December

Gadhavi *et al.* (2001) observed seasonality in arrivals and prices of coconut. Low arrivals were observed during July to November and high arrival during the period from December to June. In the case of prices, low prices were observed during the periods of high production and vice versa. Thus seasonality in production induced the seasonal phenomenon in price.

Karunakaran *et al.* (2001) observed that the fluctuation in the import and export prices of cashew nut and kernels was mainly because of seasonality in production, processing and also because of market forces. During the harvesting time of the crop in India i.e. in May and June, the seasonal index of cashew nut import price were found to be less than 100. Maximum seasonal index was during July to

September as it was the off-season for the crop. Seasonal index of less than 100 percent during months of November, December, January and May, could be due to higher supply from the raw nut exporting countries.

Srinivasan *et al.* (2001) transformed the secondary data on monthly prices of tapioca, tapioca starch and sago from 1983 to 1995 into quarterly data and seasonal indices were constructed using ratio to trend method for tapioca, tapioca starch and sago price. Linear regression analysis was done to study the influence of starch and sago price on tapioca prices. Seasonal price index for starch price was lowest for January-March and highest for April- June. The range of difference between the minimum and maximum value of price indices was 11.09 and indicated that there was significant fluctuation in tapioca prices.

Mathew (2002) studied the market behavior of tender coconut in Maddur district of Karnataka for the period from 1993 to 2000. Seasonal behaviour was studied using seasonal indices for arrival and prices. For the estimation of seasonal indices a multiplicative model of the form O = TxSxCxI was used (where, O- Original data; T – Trend; S- Seasonal variation; C- Cyclic variation and I- Irregular variation).

Singh and Subburaj (2002) studied the normal price trend of coconut in Tamil Nadu over a period of 12 months during 2001. The study revealed that the coconut prices recorded a fluctuating trend through out the year. The lowest price was in March and September. There after price increased till December, with the highest price being in December. Such a trend coincided well with harvest pattern of coconut. They concluded that farmers experience seasonal variation in their income from coconut trees.

The price trend of coconut products in India was moving in tune with the seasonal fluctuation in Kerala. But with the expansion of coconut in other regions of the country especially in Tamil Nadu, the seasonal fluctuations in Kerala had little impact on price trend because the lean season of Kerala coincided with peak season of other regions and vice versa (Singh, 2003).

2.1.3 **Cyclical Movements**

Cyclical movements refer to the long-term oscillations or swing followed by a time series about a trend line. These cycles may or may not be period with the result that they may not recur at regular intervals (Croxton *et al.*, 1979; Spiegel, 1992). Sudhakar (1996) argued that a bundle of evil effects were associated with long and wide spread price cycles, like instability in the income of the producer- the producers sometimes receive much less than the cost of production. It also led to uncertainty in market.

Borah and Dutta (1991) analysed the wholesale price data of rape and mustard in Assam state for the period from 1971-72 to 1989-90, and found that price of rape and mustard exhibited cyclical variation. They reported that the length of price cycle for these crops varied from one to four years.

Selvarajan *et al.* (1993) using harmonic analysis reported that there existed nine complete cycles (from trough to trough) in the price of potato in Nilgiri district during the past 30 years with the maximum length of cycle being six years. He attributed the cyclic behaviour to the variation in production- characterized by the occurrence of drought, incidence of pest and diseases and favorable monsoon- that in turn influenced price levels. The length of price cycle was less as compared to production cycle indicating that fluctuation in price was comparatively high. The price cycle fluctuated about 61 per cent above and 38 per cent below the average.

Perishability, bulkiness and seasonality explained the greater amplitude in price cycle. Also the magnitude of the swing was high in the early years due to the lack of organized marketing facilities and absence of market information.

Sudhakar (1996) studied the price trend of turmeric in Andhra Pradesh from 1981-82 to 1993-94 with the help of a non-linear trend projection. The trend line showed the presence of wide cyclical movements in turmeric prices. Each cycle spread about eight year span, in which recession was observed for five years and revival for three years. The extent of fluctuation was also very sharp indicating the presence of huge gap between boom prices and depression price. They attributed the cyclic trend to the demand-supply gap existing in the case of turmeric and also to the fact that supply of turmeric was positively correlated to its price i.e. as the supply increases, price also increased.

Gadhavi *et al.* (2001) while studying the price behaviour of coconut in Saurshatra region of Gujarat found out that price of coconut in the region exhibited cyclical variation. The cycle length in the coconut oil price ranged from one to three years. According to them, these cycles were due to the occurrence of drought and boom period, which affected the prices.

Hosmani (2001) analyzed the cyclical component of fluctuations in the prices of cotton and groundnut in Dharwad district of Karnataka using twelve month centered moving average method. They graphically analysed the de-randomized data on prices for both the crops and found out the presence of a four to five year cycle in groundnut prices and a two to three year cycle for cotton price. They attributed the presence of such short duration cycles to the demand and price of cotton and groundnut prevailing in important markets of the state as well neighboring state.

2.1.4. **Irregular Movements**

Irregular or random movements refer to the sporadic motions of time series and represent the residue of movements after trend, cyclic and seasonal movements have been accounted for (Croxton *et al.*, 1979; Spiegel, 1992). In practice the cycle would be so erratic and interwoven with irregular movements that it would be nearly impossible to separate them. Hence, in the analysis of time series into its components, trend and seasonal movements are directly measured while cyclic and irregular fluctuation are left together after other elements have been removed (Gupta, 1984). Hence, research attempts to isolate irregular price components are also scanty.

According to Thampan (1988), coconut oil often exhibited daily fluctuation causing concern to producers, processors, traders and end users. According to him this uncertainty in the price development always bred an element of risk for all categories of producers, processors and traders of coconut.

Acharya and Agarwal (1991) argued that irregular price fluctuations are non-systematic price behavior. No generalization can be made about irregular price fluctuations because of diversity in their nature and irregularity of the cause and effect relationship in their occurrence. They are caused by factors outside the general trend, cycle and annual or seasonal component and therefore may not recur in future.

According to Agarwal (1991), oilseeds and edible oils were highly sensitive crops capable of misuse for speculative activities on a large scale. Unscrupulous traders and stockists resorted to large-scale black marketing and hoarding on the slight excuse of damage to the standing crops or increase in demand owing to approaching festival season. This resulted in making the edible oil price volatile with rampant and unpredictable day to day price movements.

Selvarajan *et al.* (1993) estimated the price of potato in Nilgiri district market using regression equation and accounted the difference between the computed price and actual price of potato to the cyclic and irregular variation arising as production and price were mainly influenced by the exogenous variables viz., vagaries of climate, perishability, seasonality and bulkiness.

Haridoss and Chandran (1997) reported that the variation in prices of coconut and coconut oil was only marginal due to seasonal, cyclical and trend component and much of the variation was found to be due to irregular components. But on the whole the effect of irregular component of variation was more reflected in coconut price than in coconut oil price.

Hosmani (2001) while studying the price behavior of groundnut and cotton in Dharwad district found out that there was irregular component of price variation. But he ignored the irregular component in the price trend, as it was not the major component of price variation in the case of these crops.

Mathew (2002) explained that extraneous factors like drought and flood were contributing to irregularity in price. He reported the *El Nino* phenomenon in 1997 when whole of south India was reported to be under the grip of a draught. As a result the production declined and the price of coconut and coconut products went up phenomenally.

2.2. LIBERALIZED TRADE POLICY AND WTO RELATED ASPECTS

The World Trade Organization came into being in 1995. The WTO is the successor to the General Agreement on Tariffs and Trade (GATT) established in the wake of the Second World War. The system was developed through a series of trade negotiations held under GATT. At the heart of the system–known as the multilateral trading system–are the WTO's agreements, negotiated and signed by a large majority of the world's trading nations, and ratified in their parliaments. These agreements are the legal ground-rules for international commerce. Essentially, they are contracts, guaranteeing member countries important trade rights (World Trade Organization, 2005).

According to Bhatia (1994), with the implementation of economic reforms and globalization of trade, the coconut oil economy of India was facing serious challenges as it was experiencing intense competition in international trade and instability in domestic price. He estimated the aggregate measure of support for Indian agricultural commodities as 12.1 per cent of the total value of production and concluded that contrary to the general belief, Indian agriculture was net taxed and not net subsidized. But even though the product specific support was negative for most of the crops for which the minimum support price was declared, it was positive for oilseed crops like groundnut, rapeseed, sunflower and copra. According to him the ratio of domestic to world price prevailing at a point of time depicts the situation of comparative advantage. He found out that during 1992, this ratio was significantly higher than one for edible oils as the world prices were almost 40 per cent of the wholesale price in India. Therefore India was at a disadvantageous position in the trade of edible oil: But the relative movement of Indian and world prices would decide whether India could enjoy a relative advantage in the future or not. That is if the world price increased at a faster pace than the domestic price, then export of that

commodity would become remunerative and India can gain a comparative advantage in the export of that commodity.

Virupakshappa and Kiresur (1997) reported that the government decision to place palm oil and other major oil seeds on the open general license (OGL) category and reduce the customs duty from 65 to 30 per cent brought stability in edible oil price during the lean season. The flush of supplies did not allow the prices to move upward even during the peak demand period of festivals. Despite the import liberalization and large-scale import of edible oils, domestic oil prices remained comparatively high. The hardening trend of international prices and the weakening of the rupee against dollar created new impediments to imports by making imports costlier.

Markose (1999) argued that the present liberalization policy resulted in unrestricted import of coconut products, other cheaper vegetable oils and also the reduction in import duty. Indian coconut industry must be competitive, both quality wise and cost wise to face stiff competition in the international market. But the high price variation of coconut product in the international market requires reduction in the cost of production.

Sachdeva (2000) reported that the two leading producers of palm oil viz., Indonesia and Malaysia were constantly vying to get hold of the Indian market by giving concessions to exporters. Both the countries have also designed their export duty structure such that they could retain the Indian market. Though India started import of edible oil to meet the demand supply gap, the imports were so cheap that imports crossed many times the gap. Moreover all these imports led to increased consumption of palm oil. The demand of other edible oil did not grow in recent years due to these cheap imports. This is harming oil seed farmers, as they are not able to

sell these in the market due to lower realizations. Many have already shifted to other crops and many are planning to do so in the near future.

Naik (2001) assessed the export competitiveness of major agricultural products in India, using the nominal protection coefficient (NPC). It was found that wheat and gram were globally competitive under exportable hypothesis. Though rice was also internationally competitive, the export competitiveness of Indian basmati and non-basmati rice were declining over time. Crops like sorghum, maize, tur, cotton, sugarcane and rubber were not competitive internationally. Among the oilseed crops, groundnut, soyabean and sunflower were competitive, where as rapeseed-mustard and copra were not competitive. Among the edible oils, rapeseed-mustard oil, soyabean oil, groundnut oil and sunflower oil were found to be non competitive on account of the inefficient in the processing sector.

After assessing the global competitiveness of Indian agriculture, Bhattacharya (2002) concluded that the key to survival in the liberalized post WTO trade regime is competitiveness. He considers this as the only strategy to withstand increase in imports due to the removal of the quantitative restrictions

In pursuance of the policy of liberalization, there have been progressive changes in the import policy in respect of edible oils during the past few years. Edible oil, which was in the negative list of import, was decanalised partially in April 1994. This was followed by enlargement of the basket of oils under Open General License (OGL) import in March, 1995. Duty structures were further rationalized in subsequent years in order to harmonise the interest of domestic oilseed growers, consumers and processors and to avoid large import of edible oils to the extent possible(Government of India, 2003).

Over the years, trade policy has undergone fundamental shifts to correct the earlier anti export bias through the withdrawal of quantitative restrictions (QR), reduction and rationalization of tariffs, liberalization in the trade and payment regimes and improved access to export incentives, besides a realistic and market based exchange rate. The focus of these reforms has been on liberalization with a basic thrust on outward orientation focusing on export promotion activity an improving competitiveness of Indian industry to meet global market requirements. The new export-import (EXIM) policy formed for the period 2002-07 and unveiled on 31 March, 2002 also seeks to usher in an environment free of restrictions and control (Government of India, 2004).

Kumar and Jha (2005) after analyzing the factors, which impact on the edible oil economy of the country, remarked that the impact of liberalization on Indian edible oil economy was phenomenal. The country was almost self-sufficient in edible oils during 1991-92 to 1994-95 when the sufficiency level was in the range of 95 to 98 percent. However, gradually it has declined to about 53 percent in 2002-03. Almost four out of 12 years, the country has spent 50 percent of the total expenses on agricultural imports for the import of edible oil. According to them, trade in oilseeds got completely deregulated within a short span of time with liberalization. They argued that the dramatic decrease in self-sufficiency was a clean indication that globalization has already made an impact of far reaching consequences in this sector.

Srinivasan (2004) examined the impact of alternative price stabilization policies for edible oils and oilseeds in India with the help of a multi market equilibrium dynamic simulation model. The study revealed that with lowering of the tariff protection on oil imports, not only the domestic prices decreased but also there was a reduction in price variability. He argued that while greater protection to the domestic processing sector increased domestic prices it also made them more

unstable. Freeing up of import was found to stabilize domestic prices even though world prices were more variable than domestic prices. Imposing tariff barriers prevented this from happening. According to him a fixed level of tariff even at a higher level was not useful in stabilizing oil prices. A system of variable levies, which adjust to international price and domestic supply situation is what would be required. As the bound rates of tariffs under WTO are fixed quite high for all edible oils with the exception of soyabean oil, there is enough room to adjust import duties for price stabilization purposes. The maximum import tariff rate required to stabilize prices within a reasonable price band is as low as 25 percent.

In pursuance of the policy of liberalization of the Government, there have been progressive changes in the import policy in respect of edible oils during the past few years. Edible oil, which was in the negative list of imports, was first decanalised partially in April 1994 with permission to import edible vegetable palmolein under Open General License (OGL) at 65 percent duty. The basket of oils under OGL import was enlarged in March 1995 by bringing all edible oils (except coconut oil, palm kernel oil, RBD Palm Oil and RBD Palm Stearin) under OGL import at 30 percent duty. However, virtually, there has been no import of oilseeds largely because of the following of safety measures imposed by the Government. This has been mainly due to splitting or cracking requirement of soyabean at the port and also due to quarantine restrictions (Government of India, 2005a).

The Uruguay Round of Agreement (URA) aims at a gradual reduction of potentially market distorting, direct government intervention in production, marketing and international trade of oilseed-based products has continued. However, more recently, as a result decreasing prices a number of exporting countries stepped up direct support to domestic producers and to increase export promotion efforts, while major importing countries tended to raise border protection in an effort to shield domestic industries form international competition. But in the oilseeds sector, WTO

member countries generally adhered to the commitments made under the URA (Food and Agricultural Organization, 2005b).

According to Mathew *et al.* (2005), the Indian coconut economy was subjected to a situation of global competition even before the liberalization era because coconut oil had to compete even then with other vegetable oils and fats in the international market due to its amiability for substitution. Liberalization enhanced the cheap and abundant availability of vegetable oils like palm oil, soyabean oil in the world market as the changed global trading environment has inadvertently affected the domestic prices.

Rethinam (2005) apprehends that, the major threats and challenges to be faced by the Indian coconut industry consequent to trade liberalization would be import substitution with cheaper products of similar nature for domestic users, greater competition for export and improper labelling and packaging.

Materials and Methods

3. MATERIALS AND METHODS

Appropriate research design is a pre-requisite to draw meaningful inferences about any study. The present investigation entitled 'Price behaviour of coconut and coconut products in India' is an attempt to study the secular trend, seasonality, cyclical variations and irregular movements in the price of coconut and major coconut products in India, and to assess the implications of liberalized exim policies. The present chapter outlines the relevant methodology of the study under appropriate heads.

3.1 TYPE OF DATA

The present study viz., "Price behaviour of coconut and coconut products in India" is based on secondary data published by various institutions and organizations. Data pertaining to the area, production and productivity of coconut in the major producing countries of the world as well as of the major producing states in India were collected to get a background picture of production and supply situation of coconut over a period of time from 1961 to 2004. The main items of observation were the monthly average prices of coconut, copra and coconut oil in the main market centres viz., Kochi, Alappuzha and Kozhikode. The international price of copra and coconut oil were also collected for the period from 1983 to 2005. Export details such as quantity and value of exports of items like coconut, copra, desiccated coconut, coconut oil and coir from India during the period from 1961 to 2003 were collected. Similarly, details of import (both quantity and value) of coconut, copra, coconut oil and desiccated coconut during 1961 to 2003 were collected. Import statistics of major edible oils to the country, viz., palm oil, soyabean oil and rapeseed mustard oil for the period from 1966 to 2003 were also collected

3.2 SOURCE OF DATA

Secondary data pertaining to the area, production and productivity of coconut in the major producing countries in the world were collected from the official website of Food and Agricultural Organization (FAO), Rome. Area, production and productivity data of coconut in the major coconut growing states in India was collected from the head quarters of Coconut Development Board, Kochi. Data on monthly average price of coconut and coconut products in the major market centres were collected from various issues of Indian Coconut Journal. The export and import details of coconut and coconut products were also collected from the official website of FAO, Rome.

3.3 PERIOD OF STUDY

The data on price were collected for the period from 1977-78 to 2004-05. In the case of Kochi market, the data on coconut price were available from 1981 to 2000 only. In order to study the influence of WTO accord on the coconut economy of the country, the total period of study was divided into two sub periods, viz., pre WTO period and post WTO period. Period before the signing of WTO agreement i.e. January 1995 was taken as the pre WTO period and period after January 1995 was considered as the post WTO period. The international prices of copra and coconut oil were collected from 1983 to 2004.

3.4 MAIN MARKET CENTRES STUDIED

Kochi, Alappuzha and Kozhikode markets were identified as the major market centres for the study, as these are the leading domestic markets where bulk of the transaction in coconut and its products are taking place. Though there are other market centres in the southern states like Tamil Nadu, Andhra Pradesh and Karnataka, they are comparatively new and emerging markets and therefore there

was limitation for the availability of corresponding time series data. The Cost Insurance Freight (c.i.f) price from Indonesia/Philippines to Europe was considered as the international price as these countries are the leading producers and exporters of copra in the world. In the case of coconut oil, the c.i.f. price to Rotterdam was considered as the international price. There are three main forms in which coconut is marketed in the country viz., coconut, copra and coconut oil. Therefore the price behaviour of coconut, copra and coconut oil were considered for the analysis.

3.5 TREND ANALYSIS

To understand the trend in the area, production and yield of coconut in the world, national and state level, a detailed trend analysis was carried out subjecting the respective time series data for the period from 1960 to 2004. Linear, quadratic, cubic, exponential, power and logistic models were tried for fitting trends of area, yield and production of coconut in Kerala, India and in the world. The final model was selected based on the adjusted R^2 values, standard error and outlier values (Croxton *et al.*, 1979; Spiegel, 1992).

3.6 ESTIMATION OF GROWTH RATES

Compound growth rates (CGR) of area, production and productivity for coconut was calculated from the exponential function fitted as:

$$Y = AB^t \quad \text{----------} \quad (3.1)$$

where,

A = intercept

$$B = (1+r),$$

where,

r is the CGR

The compound growth rate (CGR) was worked out as (Acharya and Madhnani, 1988 and Biradar and Annamalai, 1982):

$$r = (B - 1) \times 100 \text{ ---------- (3.2)}$$

3.7 INSTABILITY ANALYSIS

Coefficient of variation (CV), a measure developed by Karl Parson, is the most commonly used measure of relative variation. It is a very useful tool to measure the variability of time series. That series or group for which the CV is greater is said to be more variable or unstable. On the other hand the series for which coefficient of variation is less is said to be more stable or more consistent and more homogeneous (Gupta, 1984)

$$\text{Coefficient of variation (CV)} = \frac{\sigma}{\bar{X}} * 100 \text{ ---------- (3.3)}$$

where,

σ - standard deviation of each individual series and

$\bar{X}$ -arithmetic mean of the each individual series.

3.8 IMPORT AND EXPORT STUDIES

3.8.1 **Import and Export Status of Coconut Products**

An analysis was carried out to understand the trend in the import and export of coconut and coconut products of the country for the period from 1961 to 2003. The major coconut products imported to the country are coconut, copra,

coconut oil and desiccated coconut. The major export items from the country are coir and its products and oil cake. Other commodities like coconut, copra, coconut oil and desiccated coconut are also exported on a limited scale. The time series data pertaining to the import and export of these items- both in quantity and value terms- for the period from 1961 to 2003 were collected. Graphical analysis was carried out to decipher the underlying trends. Decade wise percentage composition of the export and import basket were also worked out to understand the major shift in import and export basket.

3.8.2. **Import of Substitute Oils**

The import of substitute oil is one of the major factors affecting the price of coconut oil in the domestic market. Various policies pursued by the governments over time have resulted in varied imports to the country. Therefore an attempt was made to understand the trend in edible oil import to the country. Palm oil, soyabean oil and rapeseed oil are the prominent edibles imported to the country. The import statistics of these three major oils and edible oil as a whole were collected for the period from 1961 to 2003. For assessing the influence of major policy shifts in the edible oil sector, graphical method was followed. Percentage analysis was carried out to assess the shifts over the decades to understand the relative prominence of different oils in the import basket.

3.9 ANALYSIS OF PRICE BEHAVIOUR

Price behaviour of coconut and coconut products were studied using the techniques of classical time series (Croxton *et al.*, 1979; Spiegel, 1992). The time series data were decomposed into the trend, seasonal, cyclic and irregular components. The price behaviour was studied using a multiplicative model of the following form:

$$Y(P) = TxCxSxI \text{ ---------- } (3.4)$$

Where, Y (P) = Monthly average price of coconut, copra or coconut oil

T= Secular trend

C= Cyclical movement

S= Seasonal index

I= Irregular movement

3.9.1 **Estimation of Trend Values**

In order to understand the long run behaviour of the prices of coconut, copra and coconut oil, a detailed trend analysis was carried out. Trend equations were tried separately for each commodity in the three major markets. Method of least squares was employed for the fitting of trend lines and functional forms were chosen by taking the R^2 values, standard errors and outlier values as the criteria. The following models, both linear and non linear, were tried:

Linear

$$Y_0 = b_0 + b_1 t \text{ ---------- (3.5)}$$

Quadratic

$$Y_0 = b_0 + b_1 t + b_2 t^2 \text{ ---------- (3.6)}$$

Compound

$$Y_0 = b_0 \times b_1^t \text{ ---------- (3.7)}$$

Growth

$$Y_0 = e^{(b_0 + b_1 t)} \text{ ---------- (3.8)}$$

Cubic

$$Y_0 = b_0 + b_1 t + b_2 t^2 + b_3 t^3 \text{ ---------- (3.9)}$$

Exponential

$$Y_0 = b_0 \times e^{b_1 t} \text{ ---------- (3.10)}$$

Power

$$Y_0 = b_0 \times t^{b_1} \text{ ---------- (3.11)}$$

The power function was estimated by standard procedure prescribed by the SPSS package, version 9.0.

Y_0 is the estimated price (trend value); b_0 is the Y intercept; b_1, b_2 and b_3 are the regression coefficients and t is the time. The fitted trend lines were examined for secular price movements and the original data was compared with the predicted data. Trend lines were fitted separately for the pre WTO period and post WTO period and the two patterns were observed for significant change of trend.

3.9.2 **Estimation of Seasonal Variation**

Seasonal fluctuations are variations that are occurring with in the span of a year with regular periodicity. Seasonal indices are worked out to obtain a statistical measure of the patterns of seasonal variations. Seasonal indices show the typical intra year movement of price and measure how much lower or higher is the price of particular month compared to price of an average month. Ratio to moving average was employed to work out the seasonal index (Croxton *et al.*, 1979; Spiegel, 1992).

In order to work out the seasonal indices, the data were first made free from the effect of other components viz., trend, cyclical and irregular components. For this moving averages were used. Since the prices were in monthly terms, a 12-point centred moving average was used to estimate the seasonal index.

3.9.3 **Estimation of Cyclical Components**

Cyclical movements differ from seasonal variation in that they are of longer duration, usually extending a few years and are of different periodicity.

Residue method (Croxton *et al.*, 1979; Spiegel, 1992) was employed for the estimation of cyclical components. The estimation of cyclical indices was done in three steps. They were,

1. Removal of trend component
2. Removal of seasonal effect (deseasonalization)
3. Removal of irregular component (smoothening)

3.9.3.1 ***Removal of trend component***

The influence of secular trend is removed from the time series data by dividing each of the original values by the corresponding trend values and expressing the same in percentage. This would give,

$$TxCxSxI / T = CxSxI \quad \text{----------} \quad (3.12)$$

So the detrended data consists of cyclical, seasonal and irregular variations.

3.9.3.2 ***Removal of seasonal effect***

The trend eliminated data for each month is divided by the corresponding seasonal index and the result is multiplied by 100. That is,

$$CxSxI / S = CxI \quad \text{----------} \quad (3.13)$$

Thus the de-seasonalized data is a mix up of cyclical and irregular components.

3.9.3.3 ***Removal of Irregular Components***

The irregular movements are highly entangled with cyclical movements and therefore cannot be completely eliminated from a data with out accompanying the danger of over smoothening. But in order to bring the cyclical variations into a clearer picture the irregular movements can be smoothened by the use of short period moving averages. This was achieved by using 12-month moving averages.

3.9.4 **Estimation of Irregular Variation**

The interplay of a multitude of forces, other than those eliminated already, is largely responsible for the irregular movements. Irregular movements are of two types, episodic and accidental variations. The episodic variations are readily identifiable movements due to specific events. They will be reflected in the annual data itself. Occasionally it will be difficult to distinguish between episodic and cyclic movements. On the other hand accidental variations are minor fluctuations not attributable to specific episode and too small to merit individual consideration. The accidental variation will normally be random in nature. Irregular indices are obtained by dividing the cyclical- irregular indices by the cyclical indices. Symbolically,

$$CxI/\ C = I \text{ ----------} \quad (3.14)$$

The result expressed in percentage term is the irregular index.

3.10. MARKET INTERGRATION STUDIES

In order to understand the degree of market integration of the major market centres in India, an inter correlation matrix was developed for each of the market pairs for coconut, copra and coconut oil both during the pre WTO period

and post WTO period, involving Kochi, Alappuzha and Kozhikode market centres.

Inter correlation matrix was also worked out between the copra and coconut oil prices prevailing in the international market with that in the three main domestic markets viz., Kochi, Alappuzha and Kozhikode on the one hand and international price from Indonesia/Philippines on the other hand. For coconut oil, the c.i.f. price to Rotterdam was considered as the international price.

3.11. COMPETITIVE ADVANTAGES

The idea of competitive advantage is more comprehensive as it involves segmented markets, differential products, technology and differences in economics of scale. The export competitiveness of copra and coconut oil in the present study has been calculated using the Nominal Protection Coefficient (NPC) as indicated below (Appleyard, 1987; Tweeten, 1992; Gulati *et al.*, 1994 and Datta *et al.*, 2001).

$$NPC = P_d / P_b \quad \text{----------} \quad (3.15)$$

where,

NPC = Nominal Protection Coefficient of the commodity under consideration

P_d = Domestic price of the commodity

P_b = Border price or reference price the commodity after taking care of transportation and marketing expenses.

The objective of the procedure of calculating the nominal protection coefficient (NPC) is to measure actual divergences or distortions between any given commodity's domestic price and international (border) price. The

underlying rationale is that such divergence represents the presence of market interventions such as taxes, subsidies government controlled prices and other policy instruments (Appleyard, 1987).

This coefficient can be calculated either under exportable hypothesis or importable hypothesis depending upon whether the commodity under consideration is an exportable or an importable item. Since the present study aims to evaluate the export potential of the domestic coconut produced, NPC was worked out under the exportable hypothesis, in which the domestic good competes at a foreign port. A value of these NPC less than unity confirms export competitiveness, while value of NPC greater than unity confirms of competitive weaknesses (Datta *et al.*, 2001).

3.12. POLICY ANALYSIS

A review of the policy of Government of India with regard to edible oil sector was also carried out using a calendar of policy shifts in order to identify areas of policy fine-tuning required especially in the light of new WTO provisions to which India is also a signatory.

Results and Discussion

4. RESULTS AND DISCUSSION

Coconut palm, grown in 93 countries, supports 80 million people across the globe for their livelihood security. The financial security of these people depends up on the marketability and price realization from coconut and coconut products. Understanding the price behaviour of coconut and coconut products is of paramount importance in this context. The present study is an attempt in this direction. The salient results of the study are furnished under the following heads:

4.1. Area, production and productivity status

4.2. Export status

4.3. Import status

4.4. Price behaviour

4.5 Secular trend

4.6. Seasonal variations

4.7. Cyclical variations

4.8. Irregular variations

4.9. Export competitiveness

4.10. Policy analysis

4.1. AREA, PRODUCTION AND PRODUCTIVITY STATUS

The supply situation of any crop depends on its area, production and productivity and the changes there of. Against this backdrop the analysis of trends in area, production and productivity of the crop at state, national and world level is attempted.

4.1.1. **Trends in the Area, Production and Productivity of Coconut**

In order to explore the underlying patterns in the growth of coconut plantations at the state, national and world level, the time series data pertaining to the area, production and productivity of coconut were subjected to trend analysis. Different functional forms, both linear and non linear, were tried to explain the trend in area, production and productivity and the model with the highest adjusted R^2 value was selected as the model of best fit in each case.

The best fitted models along with the standard errors and adjusted R^2 values are provided in table 4.1. The cubic model was found to be the best fit for area, production and yield. The regression coefficients were highly significant. The models fitted were found to explain more than 90 percent of the variation in the dependent variable under consideration. However, the productivity data was found to be highly fluctuating and consequently lower was the explaining power of the fitted models.

4.1.1.1. *Global Situation*

The global area under coconut is witnessing a sharp expansion during the sixties, seventies and also in the eighties. World coconut area went up to reach its peak during 1999 (Fig. 4.1). But productivity wise coconut showed a highly fluctuating trend over the period under consideration. There was declining trend till the year 1983, but an increasing trend was noted thereafter (Fig. 4.2). Even though the world production of coconut has increased in the long run, the increase was steeper in the eighties. A closer inspection of the graph reveals that the increase in world coconut production was contributed more by area expansion than by productivity enhancement (Fig. 4.3).

Table 4.1 **Best fitted models for area, production and productivity of coconut in world, national and state level along with adjusted R^2**

Variable	Region	Model	Adjusted R^2 value
Area	World	$Y = 52.336 + 1.085t + 0.0499\,t^2 - 0.001049\,t^3$	0.992 (1.76)
	India	$Y = 8.209 + 0.083t + 0.0052t^2 - 2.062e^{\wedge}(-0.5t^3)$	0.948 (1.82)
	Kerala	$Y = 361.841 + 15.731\,t - 0.174\,t^2 + 0.001487t^3$	0.898 (1.55)
Production	World	$Y = 25.725 - 0.165\,t + 0.032\,t^2 - 0.000289t^3$	0.972 (2.56)
	India	$Y = 4.458 - 0.165\,t + 0.015\,t^2 - 0.000289\,t^3$	0.910 (2.96)
	Kerala	$Y = 2172.713 + 135.171\,t - 4.989\,t^2 + 0.066\,t^3$	0.751 (2.68)
Yield	World	$Y = 48.220 - 1.070t + 0.031\,t^2 - 0.000113t^3$	0.784 (1.48)
	India	$Y = 50.967 - 2.019\,t + 0.100\,t^2 - 0.001208t^3$	0.751 (2.11)
	Kerala	$Y = 5901.697 + 82.071\,t - 6.604\,t^2 + 0.0968\,t^3$	0.497 (2.36)

(Figures in parenthesis indicate Durbin Watson D- statistics)

Fig. 4.1 Trend in world area under coconut during 1961-2004

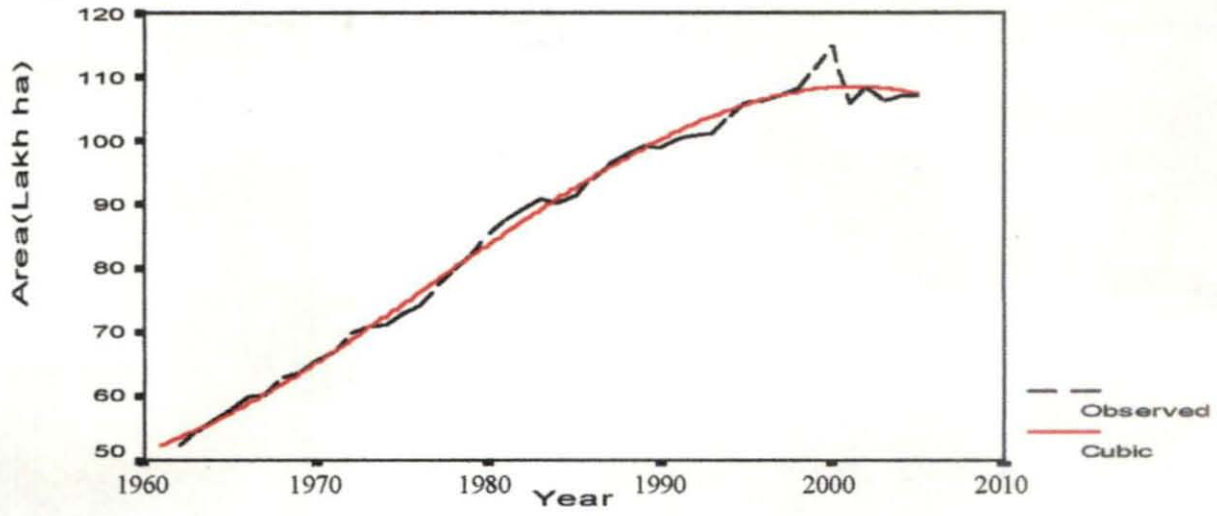


Fig. 4.2 Trend in productivity of coconut in the world during 1961-2004

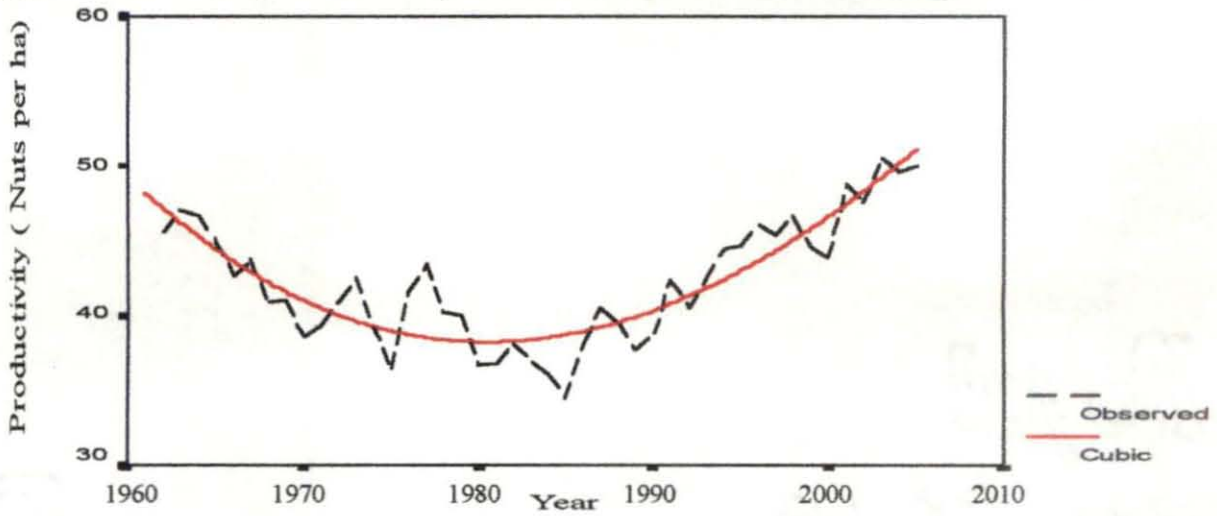
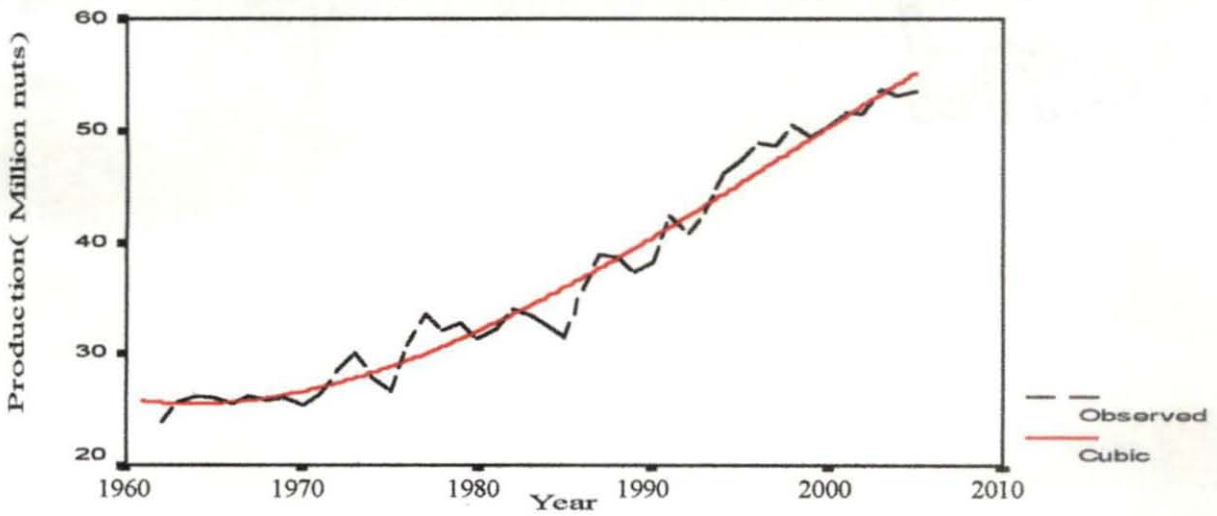


Fig. 4.3 Trend in production of coconut in the world during 1961-2004



4.1.1.2. Indian Scenario

Area under coconut in the country increased significantly during the sixties. However, the pace of area expansion was found to be slowing down during the seventies. But during the eighties and nineties, the growth in area was found to regain momentum. However a more or less stagnating tendency was observed during the early years of twenty first century (Fig. 4.4).

Even though the yield of coconut in the country has increased in the long run, a declining trend was visible during the sixties, seventies and early part of eighties. But a sharp recovery was noted during the nineties. However, in the recent past, the productivity has shown symptoms of stagnation (Fig. 4.5). The production of coconut in India remained almost stagnant till the middle of the eighties. There after a sharp rise was noted, which continued till 1994-95 (Fig. 4.6). In contrast to the world scenario, the trend of coconut production in the country has been influenced more by yield rather than by area expansion.

4.1.1.3. ***Kerala Scenario***

The area under coconut in the state expanded significantly during the fifties, sixties and early seventies. There was large-scale shift in cropping pattern in favour of coconut in Kerala during the seventies. The expansion in coconut area was mainly from large-scale conversion of rice area taking place in the state. (George and Joseph, 1976; Lakshmi and Pal, 1988). However, there was a drastic decline in the cultivated area during the late seventies and early eighties. This period was characterised by the rapid expansions made by the rubber plantations in the state. Coconut, cashew and tapioca were the major crops, which were generally replaced by rubber (Kerala Agricultural University, 1989). The Coconut Development Board came into existence

Fig. 4.4 Trend in area under coconut in India during 1961-2004

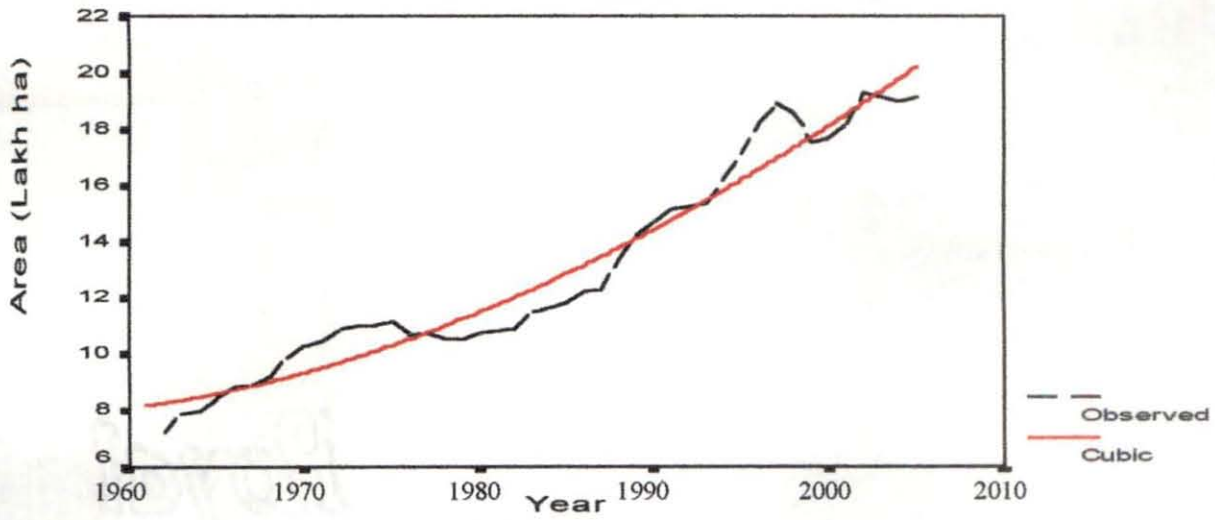


Fig 4.5 Trend in productivity of coconut in India during 1961-2004

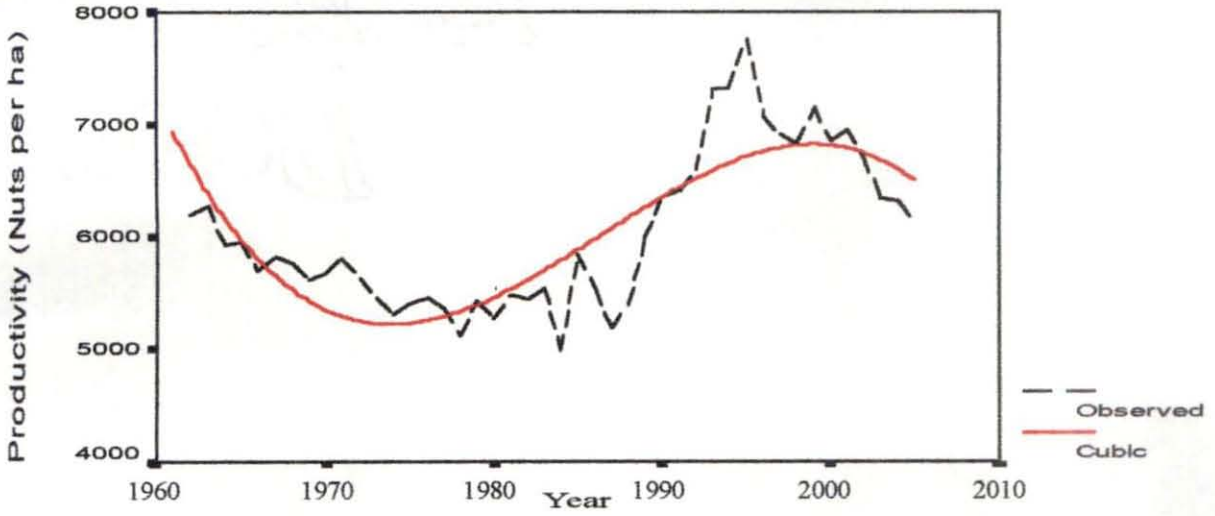
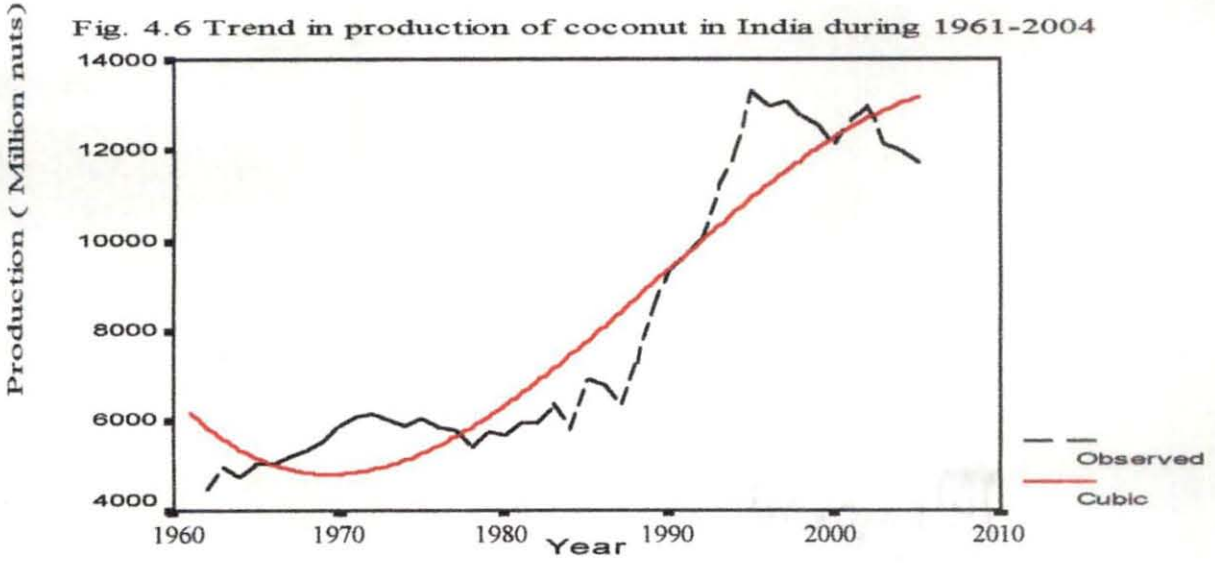


Fig. 4.6 Trend in production of coconut in India during 1961-2004



in the year 1982 through the CDB Act of 1979. Because of the concerted efforts made by the Board in the fronts of area expansion, coconut area expansion was found to regain the lost momentum during the later part of the eighties and nineties (Fig 4.7).

The productivity in the state was observed to be a highly fluctuating one. Coconut productivity was at its peak during the later half of the fifties in Kerala. From there, the yield declined drastically and consequently the lowest ever productivity of the state was reported during 1983-84. George (1984) observed that despite the improvement in agricultural technology, agricultural productivity in Kerala remained stagnant except in the case of a few crops like rubber and tapioca. He attributed this stagnation more to economic and social reasons than technological. A sizeable proportion of the bearing palms had reached the stage of senility and every year the percentage of senile plants went on increasing substantially. This resulted in the fall in productivity (Thampan, 1986). Aravindakshan (1991) attributes the low productivity of coconut in Kerala to the low genetic potential of the native cultivars.

During the phase of area expansion in Kerala, coconut cultivation was being extended to new areas. Many of these new tracts were marginal land, or areas not suited for coconut cultivation, as for example, the reclaimed paddy lands. Similarly, coconut is believed to be a lazy man's crop and farmers devoted attention to the crop only during those years when coconut fetched high prices. Being a perennial crop, the years of neglect got often carried over to the subsequent years, and as a result productivity dwindled. The periodic droughts also inflicted stress to the bearing capacity of the palm (Babu *et al.*, 1993). A sizeable percent of the palms in the state was affected by the dreaded root wilt and eriophid mite attack. This has adversely affected the yield of palms (Mathew *et al.*, 2005). The yield however was observed to be recovering during the later half of the nineties. In the recent years the yield, however, shows tendency to get stagnated (Fig. 4.8).

Fig. 4.7 Trend in area under coconut in Kerala during 1961-2004

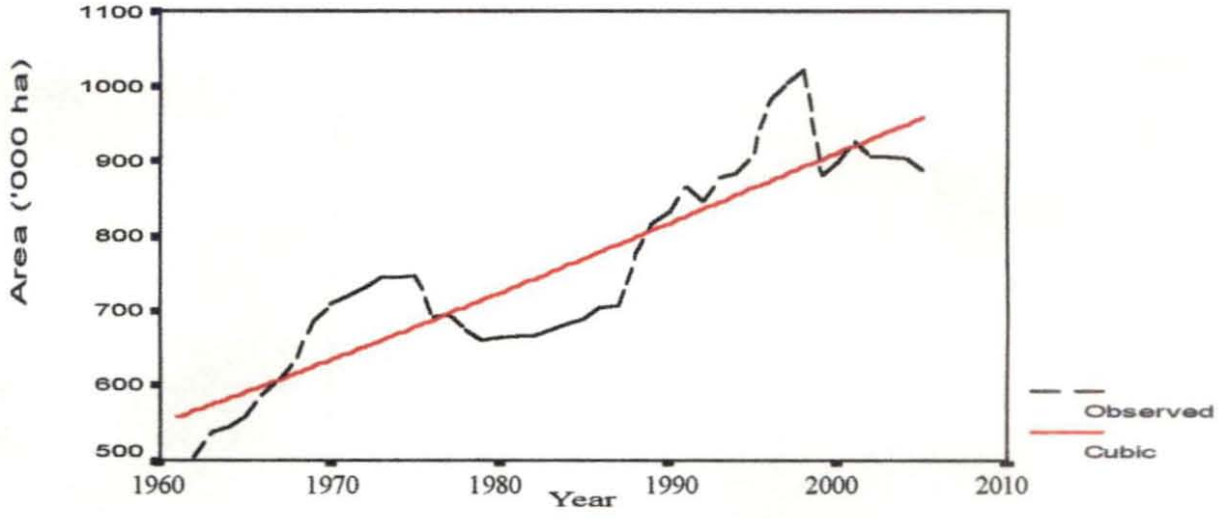


Fig. 4.8 Productivity of coconut in Kerala during 1961-2004

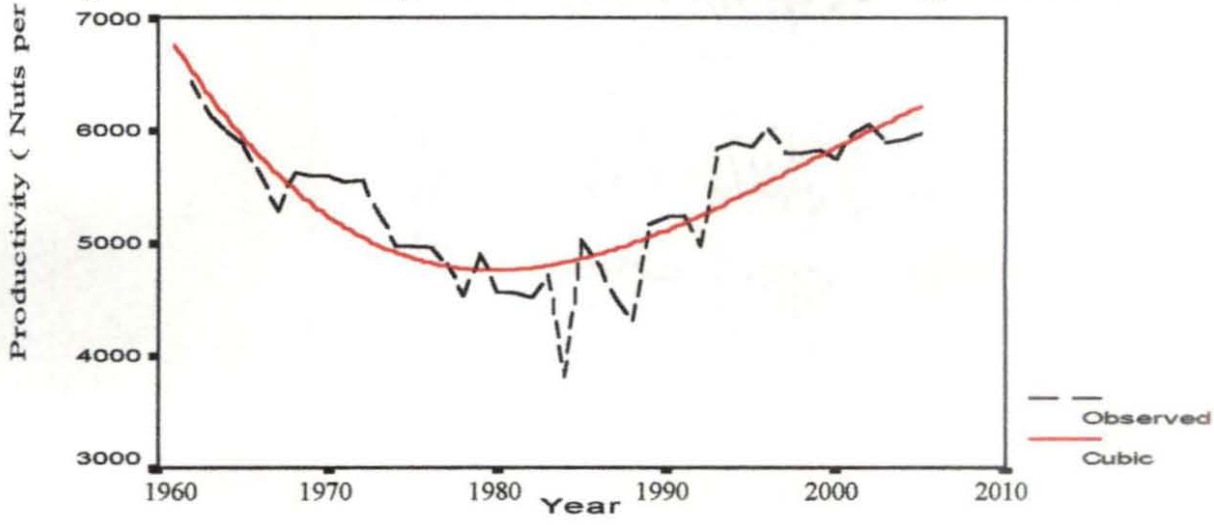
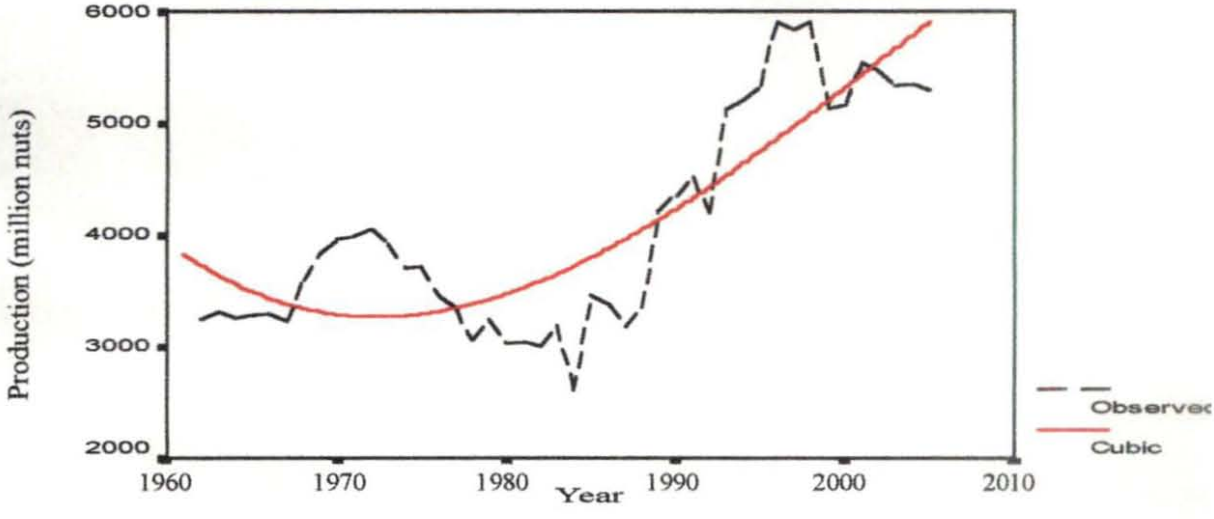


Fig. 4.9 Production of coconut in Kerala during 1961-2004



The trend in the growth of production was in tandem with the area expansion. A comparison of the graph of area, yield and productivity indicates that yield improvement has not made commendable contribution to the growth in coconut production (Fig. 4.9).

4.1.2 Growth Rates in Area, Production and Yield of Coconut

An attempt was made to examine the magnitude and extent of changes that have taken place in area, production and yield of coconut over the decades. Though there are different tools available to quantify growth, in a biological production process like agriculture, the Compound Growth Rate (CGR) is more appropriate (Rath, 1971). Therefore compound growth rate was used as the tool in quantifying the growth and the results are provided in table 4.2 to 4.7.

4.1.2.1 *Compound Growth Rate for Area under Coconut*

The estimated compound growth rates of area under coconut in the major producing countries are outlined in the table 4.2.

Table 4.2 **Compound growth rates of area under coconut for major producing countries of the world**

Year	Indonesia	Philippines	India	World
1961-70	0.75	5.31	4.10	2.71
1971-80	3.64	5.55	-0.17	2.69
1981-90	1.79	-0.28	3.47	1.44
1991-00	1.26	2.02	2.34	1.05
2001-04	-1.76	0.20	0.83	-0.30

From the table we find that maximum growth in area took place globally during the sixties and seventies. The figures showed that global coconut area grew annually by 2.71 percent per annum during the sixties and a slightly lower growth rate of 2.69 percent was recorded in the decade followed. The growth rate was further found to subdue during the eighties and nineties. However, there was a negative growth rate in acreage in the new millennium. Among the major coconut cultivating countries, Philippines showed an annual growth of more than five percent during the sixties and seventies. Indonesia recorded the highest growth rate of 3.64 percent during the seventies, while a negative growth rate was recorded in the new century.

Coconut plantations in India underwent significant improvement in area during the sixties, eighties and nineties. Area under coconut in India registered an impressive growth of 4.10 percent per annum during the sixties. However, coconut area was found to decline at the rate of 0.17 percent during the seventies. But the eighties witnessed remarkable recovery and consequently a higher growth rate of the tune of 3.47 percent was registered. A slightly lower but appreciable growth rate of 2.34 percent was noted during the nineties. However, the progress made in the eighties and nineties could not be sustained in coming years, of late, growth rate shows signs of deceleration (Table 4.2.). The policy of the Government of India during the seventh (1985-90) and eighth (1990-95) five year plan (FYP) periods was expansion in area under cultivation of coconut by bringing more area under coconut cultivation in non-traditional areas like Maharashtra, Orissa, Assam, Tripura etc. However, productivity enhancement received more thrust from the ninth FYP (1995-2000) onwards. This explains why the pace of area expansion slowed down during the new millennium.

The estimated compound growth rates in coconut area for major producing states in India are as furnished in table 4.3.

Table 4.3 **Compound growth rates for area under coconut in major producing states in India**

Year	Kerala	Tamil Nadu	Andhra Pradesh	Karnataka
1961-70	4.01	6.01	0.67	2.36
1971-80	-1.33	1.11	0.80	2.92
1981-90	2.61	7.62	2.95	3.14
1991-00	1.14	3.70	5.89	3.85
2001-04	-0.89	3.90	-0.03	3.19

A glance at the table revealed that pattern of improvement in coconut area of the state was not monotonous, but instead has shown a highly fluctuating scenario. However, the period of rapid area expansion in the state was during the sixties, during which the area was found to register a spectacular growth of the tune of 4.01 percent per year. But the growth in area suffered serious set backs in the seventies when a negative growth rate of 1.33 percent per year was recorded. During the eighties and nineties, moderate improvements of 2.61 and 1.14 percent respectively per annum were observed. A declining growth in area is visible recently. It can also be seen from the table that states likes Tamil Nadu and Karnataka have made tremendous strides in coconut cultivation during the last two and a half decades. In the case of Andhra Pradesh, an area expansion of more than five percent could be observed during the nineties. However, this trend could not be sustained and the state is also witnessing negative growth in area during the new millennium.

4.1.2.2. *Compound Growth Rate for Productivity of Coconut*

The compound growth rate for the yield of coconut in the major producing countries of the world is detailed in the table 4.4.

Table 4.4 **Compound growth rates for productivity of coconut in major producing countries**

Year	Indonesia	Philippines	India	World
1961-70	0.39	-5.78	-1.45	-2.17
1971-80	-0.08	-2.57	-0.85	-0.97
1981-90	2.28	1.25	1.18	1.20
1991-00	0.27	2.07	0.35	1.24
2001-04	2.47	0.92	-3.11	1.31

A glance at the table revealed that world coconut productivity declined drastically during the sixties and seventies. However the situation was found to improve later. It can also be noted from the table that the productivity in India recorded negative growth during the sixties, seventies and in the new millennium. It has shown a modest growth rate of 1.18 percent during the eighties.

The table 4.5 details the compound growth rate of coconut productivity in the main producing states of India.

Table 4.5 **Compound growth rates for productivity of coconut in main producing states in India**

Year	Kerala	Tamil Nadu	Andhra Pradesh	Karnataka
1961-70	-1.85	0.28	-3.76	-0.16
1971-80	-2.07	1.96	-0.56	0.16
1981-90	1.33	-2.94	12.40	-0.14
1991-00	1.14	-0.53	-6.56	0.05
2001-04	-0.22	-8.65	5.42	-5.06

The productivity enhancement was at its peak during the eighties for Kerala. But coconut productivity took a downturn in the state during the sixties and seventies. However, during the periods 1980-90 and 1990-2000, positive growth in yield was

again found. The trend again got reversed by the closing of the millennium. Other producing states are also witnessing negative growth during the new century. It may also be seen that only Andhra Pradesh has made remarkable progress in the productivity in the twenty first century.

4.1.2.3. ***Compound Growth Rate for Production of Coconut***

Growth rate pertaining to the production of coconut in the world along with the major producing countries is as outlined in the table 4.6.

Table 4.6 **Compound growth rates for production of coconut in major producing countries**

Year	Indonesia	Philippines	India	World
1961-70	1.15	-0.78	2.59	0.48
1971-80	3.56	2.84	-1.02	1.69
1981-90	4.12	0.97	4.69	2.65
1991-00	1.53	4.13	2.70	2.30
2001-04	0.66	1.12	-2.31	1.01

The global coconut production experienced consistent improvement during the seventies, eighties and nineties. However, the growth in production decelerated towards the end of the millennium. As can be discerned from the table, coconut production in India has shown a fluctuating trend. Coconut production recorded a positive growth during the sixties, eighties and nineties only; where as negative growth can be observed during the seventies and also in the new millennium.

The compound growth rates in the production of coconut in major producing states are presented in table 4.7.

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Table 4.7 **Compound growth rates for production of coconut in main producing states in India**

Year	Kerala	Tamil Nadu	Andhra Pradesh	Karnataka
1961-1970	2.09	6.31	-3.11	2.20
1971-1980	-3.37	3.09	0.24	3.09
1981-1990	3.98	4.45	15.72	3.00
1991-2000	2.30	3.15	-1.05	3.90
2001-2004	-1.11	-5.09	5.39	-2.04

Among the major producing states, Kerala, Tamil Nadu and Karnataka are showing negative growth in production during the new millennium. This is due to the large-scale eryophid mite attack that occurred in these states of late. Only Andhra Pradesh is showing positive growth in production of late. The incidence was less severe in the state of Andhra Pradesh. Another reason for the higher production levels in Andhra Pradesh can be attributed to the state growing more tender coconut varieties like *Gangabondham*, which is known to have higher productivity than the traditional varieties cultivated in other states.

4.1.3 **Instability in Area, Production and Yield of Coconut**

The instability in area and production of any crop enterprise provides useful information regarding the nature of supply, which in turn can influence the price behaviour. So, an attempt was also made to measure the magnitude of instability in the area, production and yield of coconut in terms of the coefficient of variation (CV).

Table 4.8 **Coefficient of variation in the area, production and yield of coconut in major producing countries**

	Indonesia			Philippines			India			World		
Year	Area	Prod.	Yield	Area	Prod	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1961-70	5.56	5.34	3.07	15.57	13.05	20.78	12.25	8.26	4.83	8.08	2.85	7.04
1971-80	10.78	10.85	2.32	17.05	17.94	17.99	2.13	3.73	3.51	8.27	7.37	6.25
1981-90	5.88	13.07	8.38	1.83	17.93	17.86	10.90	17.00	7.14	4.42	9.47	5.84
1991-00	4.88	5.48	3.71	10.75	13.59	13.76	8.34	10.45	5.56	3.98	7.28	5.11
2001-04	3.39	2.41	5.54	0.32	1.79	1.47	2.25	4.13	5.18	0.76	1.85	2.58

Table 4.9 **Coefficient of variation in area, production and yield of coconut in major producing states**

	Kerala			Tamil Nadu			Andhra Pradesh			Karnataka		
Year	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1961-70	12.23	7.985	6.54	18.28	23.24	14.90	3.15	22.19	24.23	8.61	16.42	15.22
1971-80	4.88	10.69	7.03	5.22	10.19	6.85	3.00	2.94	2.44	8.77	10.26	4.56
1981-90	8.74	15.93	9.13	24.20	20.44	13.28	9.97	60.52	49.88	9.34	8.94	0.50
1991-00	6.80	10.78	5.73	15.56	19.86	11.62	17.01	21.64	26.32	11.49	11.69	0.87
2001-04	1.54	1.884	0.97	6.13	9.14	14.96	1.05	8.581	8.91	5.65	6.586	12.54

Data pertaining to the coefficient of variation in the area, production and productivity of coconut in the major producing countries are presented in table 4.8. It can be noted that over the years, instability in the world area and productivity of coconut has declined considerably. This is reflected in the reduced instability in world coconut production also. Among the major producing countries, Philippines was found to show fairly high fluctuation in area, production as well as productivity compared to Indonesia or India.

But in India, coconut acreage was more or less stable except during the sixties and eighties. The yield in India also showed fairly stable nature through out period under consideration. The variability in the production was less than ten percent through out the period except during the eighties when the variability was 17 percent.

When the instability in area, production and productivity of major coconut producing states in India are examined, the highest instability in area under coconut was observed in Kerala during the sixties. Thereafter, the instability has been declining over a period of time. On the other hand the instability in area was highest during the eighties for Tamil Nadu, nineties for Andhra Pradesh and Karnataka. Maximum variability in coconut yield was observed for Kerala during the eighties, which subsequently tapered down in the decades followed. Though variability in the yield was low for Andhra Pradesh during the new millennium, it was higher for Tamil Nadu and Karnataka during the same period. Considerable fluctuations prevailed in the production of coconut in Kerala through out the period except during the sixties and in the new millennium. The instability in production was highest in Tamil Nadu and Karnataka during the sixties, while it was highest during eighties for

Andhra Pradesh. Of late, instability in production has reduced considerably in all the major producing states of India.

4.2. EXPORT STATUS

The details of export of coconut and coconut products from the country are detailed in table 4.10. During the sixties and seventies, India exported substantial quantities of coconut in the raw form. The coconut exports from the country during the eighties and in the first half of the nineties were not substantial. However, from the mid nineties, coconut export was found to exhibit a sharp increase. In 2003, 1402 tonnes of coconuts worth 0.761 million dollars were exported from the country (Fig. 4.10).

But copra does not find a place in the export basket of the country. The export of copra from India has never attained substantial proportion except during the period from 1976 to 1982. As of now, 95 metric tonnes of copra worth 73000 US dollars are exported from India (Fig. 4.11). Export of coconut oil from the country was meagre till the eighties. But coconut oil export was found to exhibit a phenomenal increase in the nineties. Bangladesh, Bahrain, Brazil, Italy, Kuwait, Nepal, New Zealand, Oman, Saudi Arabia, USA and UK are the main export destinations. Presently we are exporting 6014 tonnes of coconut oil worth 5.55 million US dollars (Fig. 4.12).

Coconut oil cake was one of the prominent coconut products exported from the country during the sixties. Malaysia and Nepal were the major importers of Indian coconut oil cake. However, as the domestic consumption grew faster than the domestic production, the quantity of coconut oil cake exported declined significantly in the decades that followed. India even resorted to importing oil cakes in certain

Table 4.10. **Export of coconut and coconut products from India**

(Quantity in Metric tonnes and Value in 1000 $)

	Coconut		Copra		Desiccated coconut		Coconut oil		Coconut oil cake		Coir		Total	
Year	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1961	295 (2.77)	21 (3.20)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.01)	0 (0.0)	10357 (97.22)	636 (96.80)	0 (0.0)	0 (0.0)	10653 (100)	657 (100)
1971	232 (5.70)	25 (12.14)	0 (0.0)	0 (0.0)	13 (0.32)	2 (0.97)	9 (0.22)	9 (4.37)	3813 (93.75)	170 (82.52)	0 (0.0)	0 (0.0)	4067 (100)	206 (100)
1981	118 (4.31)	24 (3.73)	485 (17.71)	274 (42.61)	0 (0.0)	0 (0.0)	1 (0.04)	2 (0.31)	1975 (72.11)	217 (33.75)	160 (5.84)	126 (19.60)	2739 (100)	643 (100)
1991	4 (2.90)	7 (3.98)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	70 (50.72)	139 (78.98)	0 (0.0)	0 (0.0)	64 (46.38)	30 (17.05)	138 (100)	176 (100)
1992	28 (2.18)	7 (0.86)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	112 (8.74)	353 (43.21)	0 (0.0)	0 (0.0)	1142 (89.08)	457 (55.94)	1282 (100)	817 (100)
1993	23 (0.85)	7 (0.62)	16 (0.59)	9 (0.0)	17 (0.63)	6 (0.53)	318 (11.78)	731 (64.63)	1521 (56.35)	145 (12.85)	804 (29.79)	233 (20.60)	2699 (100)	1131 (100)
1994	160 (5.34)	42 (2.13)	10 (0.33)	8 (0.41)	5 (0.17)	8 (0.41)	542 (18.08)	1213 (61.45)	0 (0.0)	0 (0.0)	2281 (76.08)	703 (35.61)	2998 (100)	1974 (100)
1995	80 (3.46)	55 (2.99)	1 (0.04)	0 (0.0)	0 (0.0)	0 (0.0)	544 (23.53)	1216 (66.12)	110 (4376)	10 (0.54)	1577 (68.21)	558 (30.34)	2312 (100)	1839 (100)
1996	123 (5.43)	67 (2.79)	200 (8.82)	180 (7.50)	174 (7.68)	138 (5.75)	787 (34.72)	1552 (64.64)	20 (0.88)	4 (0.17)	963 (42.48)	460 (19.16)	2267 (100)	2401 (100)
1997	96 (2.87)	97 (2.25)	2 (0.06)	2 (0.05)	257 (7.69)	344 (7.98)	1256 (37.58)	2756 (63.91)	40 (1.20)	9 (0.21)	1691 (50.60)	1104 (25.60)	3342 (100)	4312 (100)
1998	182 (4.06)	138 (4.41)	0 (0.0)	0 (0.0)	134 (2.99)	189 (6.04)	860 (19.17)	1560 (49.89)	42 (0.94)	10 (0.32)	3268 (72.85)	1230 (39.33)	4486 (100)	3127 (100)
1999	319 (4.95)	178 (3.58)	20 (0.31)	16 (0.32)	211 (3.28)	214 (4.30)	1535 (23.84)	3035 (61.01)	30 (0.47)	2 (0.04)	4323 (67.15)	1530 (30.75)	6438 (100)	4975 (100)
2000	554 (5.30)	377 (6.20)	93 (0.89)	130 (2.14)	209 (2.0)	228 (3.75)	2393 (22.90)	3630 (59.70)	1434 (13.72)	190 (3.13)	5768 (55.19)	1525 (25.08)	10451 (100)	6080 (100)
2001	439 (2.87)	248 (3.84)	12 (0.08)	15 (0.23)	144 (0.94)	70 (1.08)	3134 (20.51)	3365 (52.15)	12 (0.08)	2 (0.03)	11538 (75.52)	2753 (42.66)	15279 (100)	6453 (100)
2002	1188 (3.33)	642 (6.19)	31 (0.09)	22 (0.21)	197 (0.55)	125 (1.20)	5676 (15.93)	4897 (47.19)	6435 (18.06)	658 (6.34)	22114 (62.05)	4034 (38.87)	35641 (100)	10378 (100)
2003	1402 (3.93)	761 (6.23)	95 (0.27)	73 (0.60)	482 (1.35)	309 (2.53)	6014 (16.86)	5551 (45.42)	482 (1.35)	106 (0.87)	27191 (76.24)	5422 (44.36)	35666 (100)	12222 (100)

(Source: Food and Agricultural Organization, 2005)

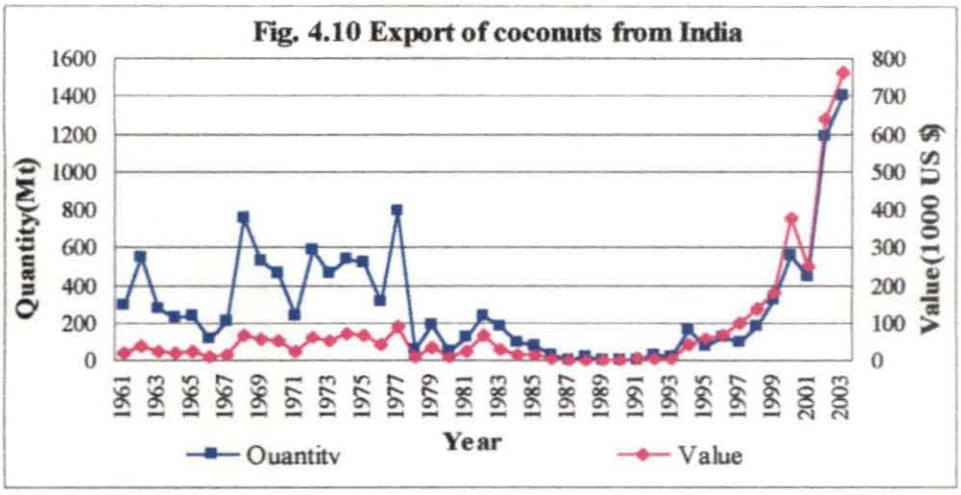


Fig. 4.10 Export of coconuts from India
Quantity(Mt)
Value(1000 US $)
Year
Quantity
Value

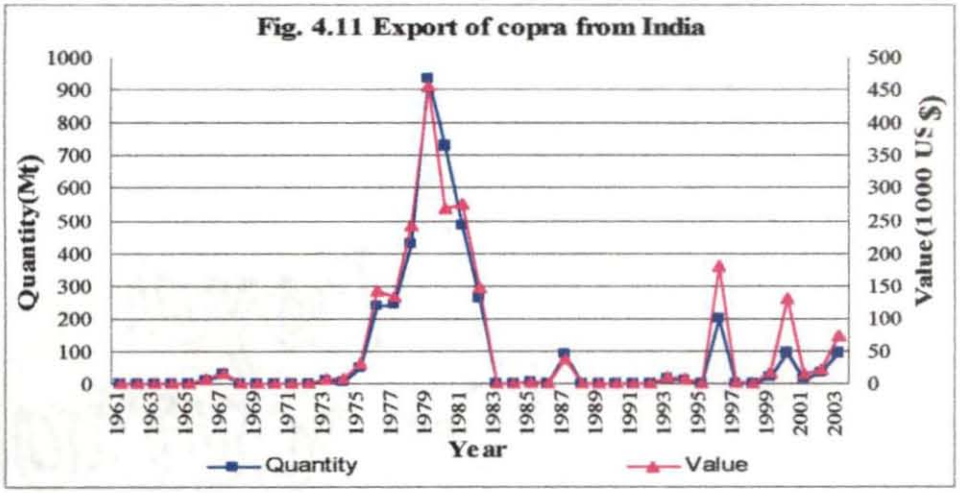


Fig. 4.11 Export of copra from India
Quantity(Mt)
Value(1000 US $)
Year
Quantity
Value

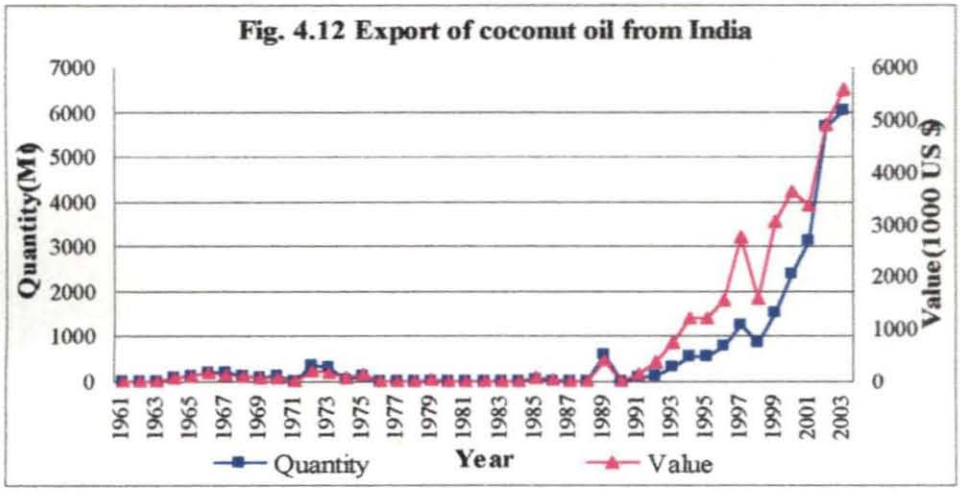


Fig. 4.12 Export of coconut oil from India
Quantity(Mt)
Value(1000 US $)
Year
Quantity
Value

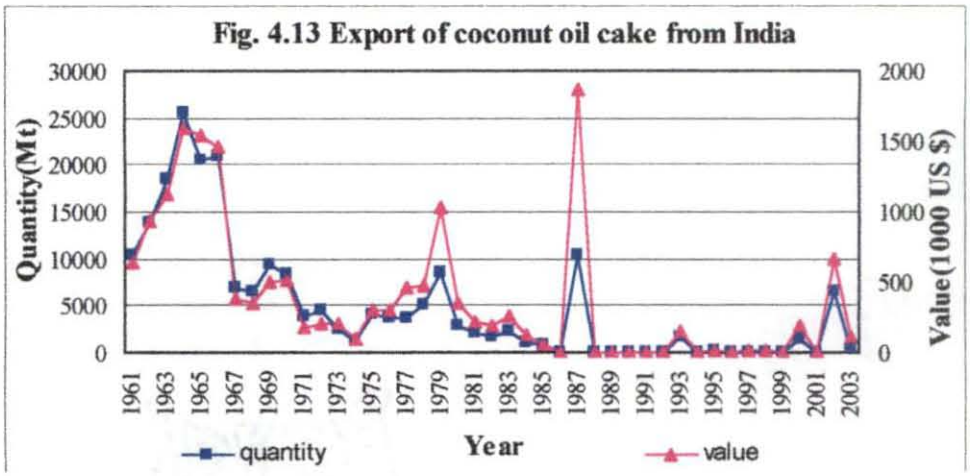


Fig. 4.13 Export of coconut oil cake from India

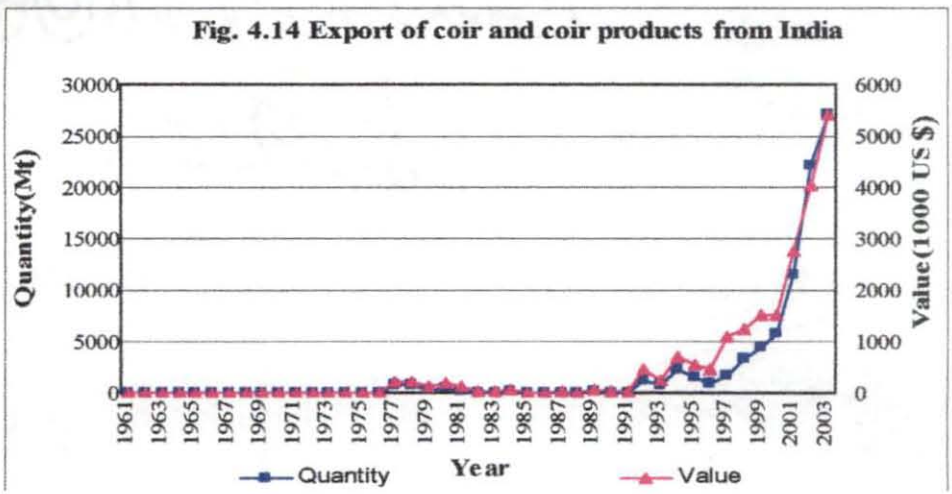


Fig. 4.14 Export of coir and coir products from India

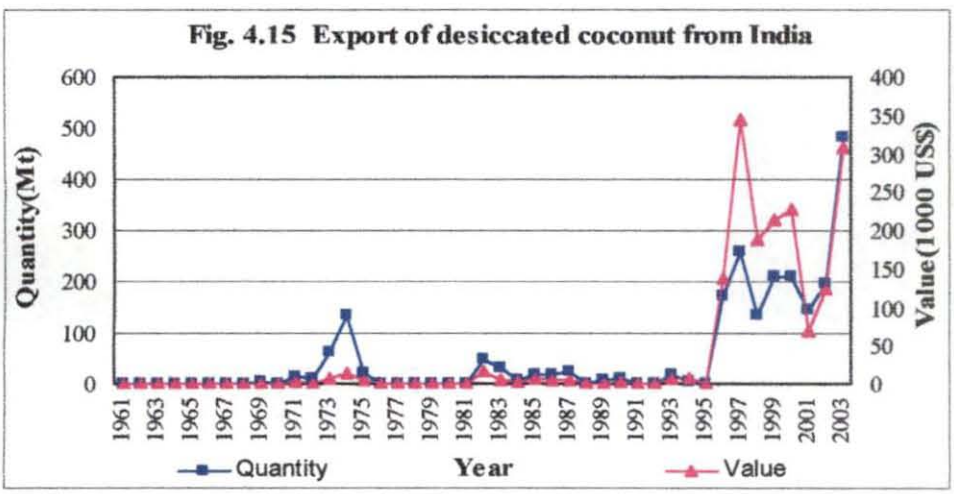


Fig. 4.15 Export of desiccated coconut from India

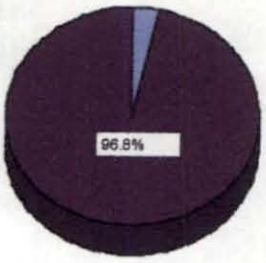
years to overcome the shortage in its availability. Currently, 482 tonnes of coconut oil cake worth 0.106 million US dollars are exported from the country (Fig. 4.13).

The export of coir and its products from the country assumed significance only in the nineties. A sharp increase was noted in the coir product export in the late nineties. As on 2003, we are exporting 27191 tonnes of coir worth 5422 million US dollars (Fig. 4.14).

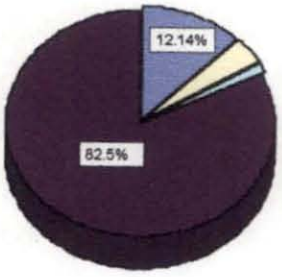
Though India was not exporting coconut in the desiccated form till the nineties, desiccated coconut has found its way into the status of one of the major export item from the nineties onwards. The export of desiccated coconut showed a rapid increase during the late nineties. Presently, we are exporting 482 tonnes of desiccated coconut which fetches an amount of 0.309 million US dollars (Fig. 4.15).

The details of percentage share of different coconut products to the total export earning of coconut products can be obtained from table 4.10. A perusal of the same showed that during the sixties, 97 percent of the export earning from the coconut products was realised from the export of coconut oil cake. The balance share was accounted by coconut. But in the decade followed, share of oil cake to the export value came down to 83 percent. Coconut and coconut oil occupied a share of 12 percent and 4.3 percent respectively (Fig. 4.16). Similarly, copra was found to be the biggest export earner of the group accounting for 43 percent of the export value during the eighties. The share of coconut cake decreased to 33 percent. Coir and its products occupied the third place with a share of 19 percent. In the nineties coconut oil came into the picture with a share of 79 percent. Coir products contributed 17 percent of the foreign exchange earnings occupying the second place. The major exporters of coir products in the world market are India and Sri Lanka. Thailand, Indonesia and Philippines also export coir products, but it is at non-significant levels.

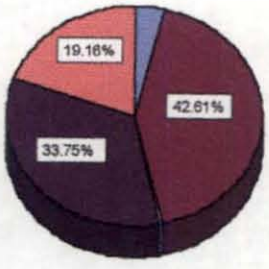
Fig. 4.16 Composition of export basket of coconut product from India



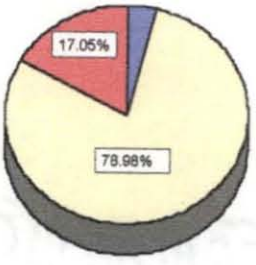
1961



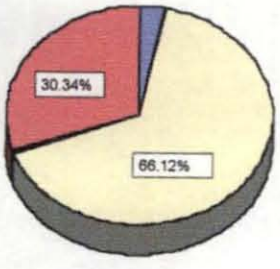
1971



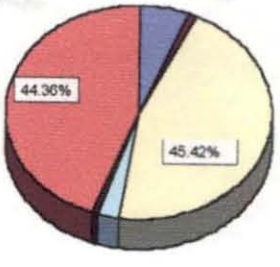
1981



1991



1995



2003

The shift in consumer preference for environment-friendly products has been the major driving force for increased demand for coir fibre products in the world market. Another factor contributing to the growth in coir products in the world market is the diversification in coir industry into non-traditional applications such as construction, automotive manufacture and assembly. India exports coir fibres in the form of high value-processed products like coir yarn, coir mats, coir matting and rubberised coir fibre. Sri Lankan export consists mainly of raw coir such as mattress fibre and coir yarn.

Coconut oil also accounted for 45 percent of the export earnings. Desiccated coconut emerged as new exportable product during this period accounting for 2.53 percent. There was no export of either copra or oil cake during this period. A new trend was slowly emerging by the mid nineties, whereby the share of coconut oil decreased to 66 percent and that of coir increased 30.3 percent.

4.3 IMPORT STATUS

4.3.1 **Import of Coconut and Coconut Products**

The item wise import of the major forms of coconut products to the country are furnished in the table 4.11. A glance at the table revealed that coconut in the raw form has never been an item of importance in the import list of the country except in the year 1962 when 300 metric tonnes was imported. But it is interesting to note that from the year 1997 onwards, India started importing coconut. However, this is only in small quantities, and these imports wee more to meet market access commitments than due to production shortfalls. During the year 2003, import of coconut reached a record high of 19 metric tonnes worth10000 US dollars (Fig. 4.17).

Table 4.11. **Import of coconut and coconut products into India**

(Quantity in Metric tonnes and Value in 1000 $)

	Copra		Coconut oil		Desiccated coconut		Coconut		Total	
Year	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1961	89716 (99.98)	20351 (100.0)	0 (0.00)	0 (0.0)	5 (0.01)	1 (0.00)	9 (0.01)	0 (0.0)	89730 (100)	20352 (100)
1971	8134 (100.00)	1812 (100.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.0)	0 (0.0)	8134 (100)	1812 (100)
1981	6063 (12.18)	3121 (10.04)	43718 (87.82)	27977 (89.96)	0 (0.00)	0 (0.00)	0 (0.0)	0 (0.0)	49781 (100)	31098 (100)
1991	83 (5.89)	44 (7.39)	1325 (94.11)	551 (92.61)	0 (0.00)	0 (0.00)	0 (0.0)	0 (0.0)	1408 (100)	595 (100)
1992	4700 (30.72)	1800 (25.35)	10600 (69.28)	5300 (74.65)	0 (0.00)	0 (0.00)	0 (0.0)	0 (0.0)	15300 (100)	7100 (100)
1993	359 (10.13)	168 (8.94)	3186 (89.87)	1711 (91.06)	0 (0.00)	0 (0.00)	0 (0.0)	0 (0.0)	3545 (100)	1879 (100)
1994	8 (0.21)	6 (0.24)	3803 (99.79)	2506 (99.76)	0 (0.00)	0 (0.00)	0 (0.0)	0 (0.0)	3811 (100)	2512 (100)
1995	0 (0.00)	0 (0.0)	3583 (100.0)	2509 (100.0)	0 (0.00)	0 (0.00)	0 (0.0)	0 (0.0)	3583 (100)	2509 (100)
1996	0 (0.00)	0 (0.0)	4760 (100.0)	3634 (100.0)	0 (0.00)	0 (0.00)	0 (0.0)	0 (0.0)	4760 (100)	3634 (100)
1997	995 (41.06)	467 (30.29)	1319 (54.44)	1033 (66.99)	25 (1.03)	28 (1.82)	84 (3.47)	14 (0.91)	2423 (100)	1542 (100)
1998	1600 (53.82)	1000 (49.04)	1373 (46.18)	1039 (50.96)	0 (0.0)	0 (0.00)	0 (0.00)	0 (0.00)	2973 (100)	2039 (100)
1999	0 (0.00)	0 (0.00)	3938 (99.54)	3129 (99.49)	0 (0.00)	1 (0.03)	18 (0.46)	15 (0.48)	3956 (100)	3145 (100)
2000	0 (0.00)	0 (0.0)	8578 (99.32)	3748 (98.32)	19 (0.22)	15 (0.39)	40 (0.46)	49 (1.29)	8637 (100)	3812 (100)
2001	371 (1.55)	88 (0.04)	23609 (98.44)	8371 (98.89)	3 (0.01)	6 (0.07)	0 (0.00)	0 (0.00)	23983 (100)	8465 (100)
2002	227 (0.74)	87 (0.67)	30416 (99.13)	12825 (99.23)	24 (0.08)	9 (0.07)	15 (0.05)	4 (0.12)	30682 (100)	12925 (100)
2003	1144 (6.37)	409 (4.76)	13760 (76.56)	6399 (74.45)	3049 (16.97)	1777 (20.67)	19 (0.11)	10 (0.12)	17972 (100)	8595 (100)

(Source: Food and Agricultural Organization, 2005)

During the sixties, copra was the major form in which coconut was imported to the country accounting cent percent of the aggregate import value. But there after copra import was found to decline drastically. Excepting the year 1978, there had not been copra import in significant proportions (Fig. 4.18). Coconut oil was found to assume significance as an item of import during the eighties. The import of coconut oil peaked during the year 1981 when import worth of 27.977 million US dollars. Coconut oil import remained more or less stagnant during the late eighties and the nineties. But its import showed buoyancy during the early years of the new millennium with edible oils being put in the open general licence (OGL). Presently we are importing 13760 tonnes of coconut oil for 6.4 million US dollars (Fig. 4.19). Desiccated coconut is one of the recent items to find a place in the import list. Desiccated coconut import in moderate quantities was observed from the 1997. But in the year 2003, the import grew suddenly to a figure of 3049 tonnes valued at 1.7 million US dollars (Fig. 4.20).

The details of shift in the share of import basket are presented in table 4.11 and fig. 4.21. Copra monopolised the import basket during the sixties. Coconut was hardly imported in any other form during this period. A similar situation was observed in the year 1971 also. The picture was found to alter completely by 1981. Coconut oil came to the top of the list accounting for nearly 90 percent of the import value. Copra lost its prominence and was found to constitute only 10 per cent of the import basket. Desiccated coconut and raw coconut did not find a place in the import basket either during the eighties or early nineties. The coconut oil import increased substantially by the mid nineties accounting for the whole of the import basket by the year 1995. Recent trends also show that coconut oil continue to dominate the import of coconut products, accounting for three fourth of the import basket. But a

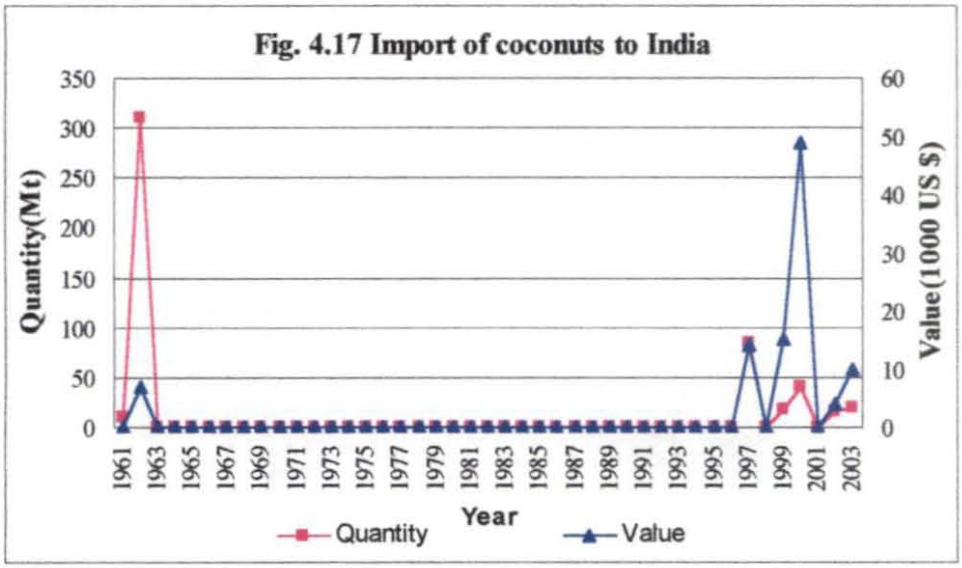


Fig. 4.17 Import of coconuts to India
Quantity(Mt)
Value(1000 US $)
Year
Quantity
Value

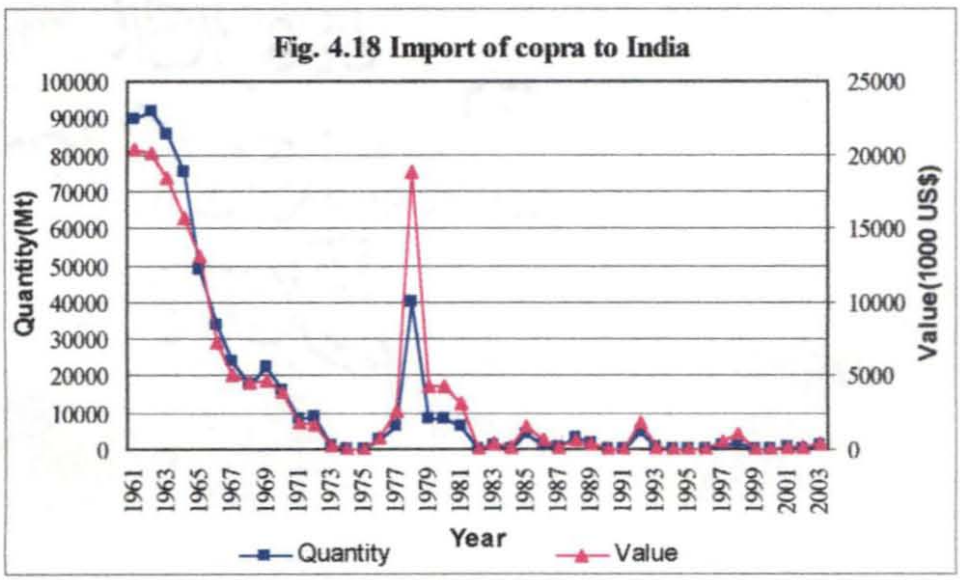


Fig. 4.18 Import of copra to India
Quantity(Mt)
Value(1000 US$)
Year
Quantity
Value

Fig. 4.19 Import of coconut oil to India

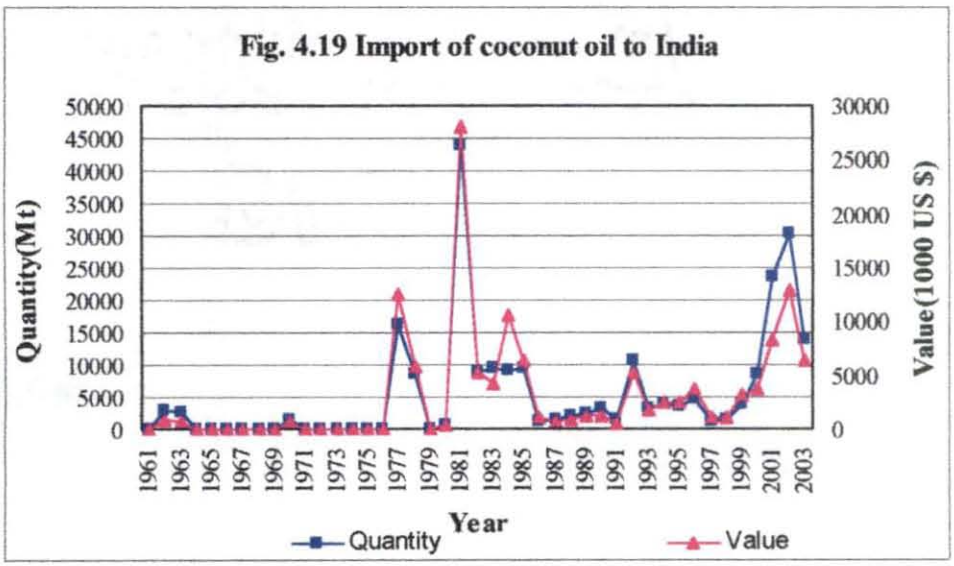


Fig. 4.20 Import of desiccated coconut to India

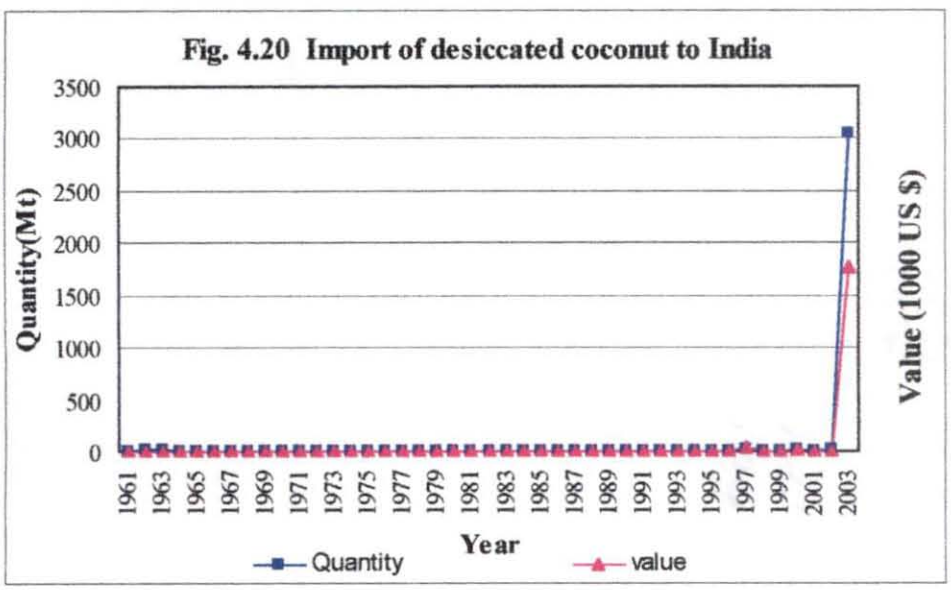
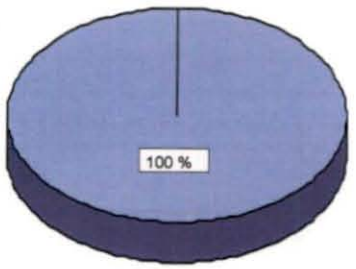
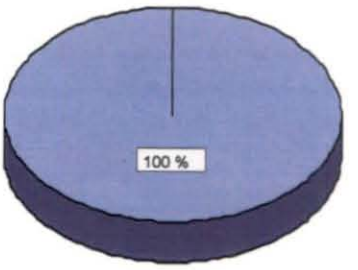


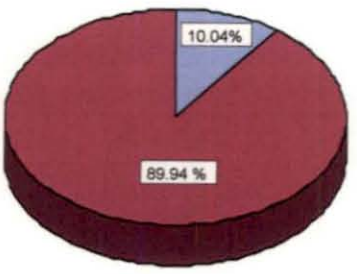
Fig. 4.21 Composition of import basket of coconut products to India



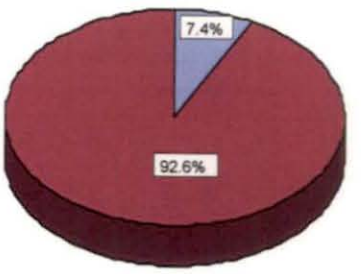
1961



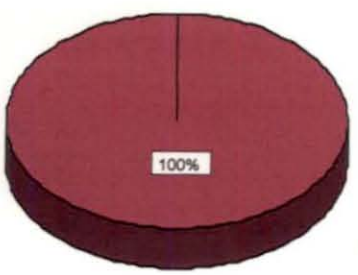
1971



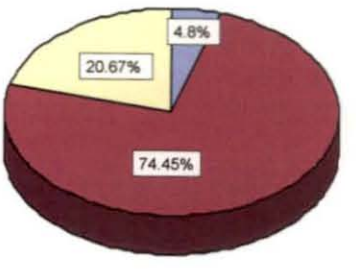
1981



1995



1995



2003

copra
coconut oil
desiccated coconut
coconut

noticeable shift in pattern is the importance gained by desiccated coconut, constituting around 20 percent of the import value.

4.3.2. **Import of Edible oil**

Close substitutes and their supply situation can influence the price behaviour of any commodity. Keeping this point in mind, an analysis of the import trend of the major substitutes of coconut oil viz., palm oil, soyabean oil and rapeseed oil is attempted. The quantum of import of the major edible oils to India is included in the table 4.12. India was self sufficient in edible oil in the fifties and sixties and consequently edible oil import to the country was less in that period. But during the seventies and eighties, growth in edible production could not pace up with the growth in domestic demand and in order to meet the growing demand, the government through the State Trading Corporation (STC) imported substantial quantities of edible oil mainly palm oil soyabean oil and rapeseed oil from the second half of seventies onwards. Substantial import of these oils took place during the eighties also. But with the launching of Oilseed Mission by the Government of India in the year 1986, India tried to reach self-sufficiency in edible oil trade. In order to ensure reasonable price to the domestic oilseed growers, greater check was imposed on further import, which is evident in the low import till the middle of the nineties. But with the signing of WTO pact in the year 1995 and the consequent placing of palm oil in the Open General Licence (OGL) category, it became possible to import any quantity of edible subject to tariff restrictions alone. As a result, there was a surge of import of edible oils to the country. The import statistics for the year 2003 reveal that we are importing 5.29 million tonnes of edible oils spending around 2.51 billion US dollar of which palm oil alone account for 4.03 million tonnes costing 1.81 billion US dollars (Fig. 4.22 to 4.25).

Table 4.12. **Import of vegetable oils into India**

(Quantity in tonnes and Value in 1000$)

Year	Palm oil		Soya oil		Rape seed oil		Sunflower oil		Others		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1971	669 (0.86)	198 (0.70)	76685 (98.77)	28019 (98.68)	5 (0.01)	1 (0.00)	0 (0.00)	0 (0.00)	284 (0.37)	176 (0.62)	77643 (100)	28394 (100)
1981	545962 (39.31)	202724 (32.23)	635300 (45.74)	288588 (45.89)	129517 (9.33)	86658 (13.78)	0 (0.00)	0 (0.00)	78086 (5.62)	50947 (8.10)	1388865 (100)	628917 (100)
1991	191717 (84.22)	72320 (70.28)	21729 (9.54)	20543 (19.96)	2682 (1.18)	3072 (2.99)	0 (0.00)	0 (0.00)	11521 (5.06)	6967 (6.77)	227649 (100)	102902 (100)
1995	850397 (78.47)	552899 (77.12)	101485 (9.36)	72060 (10.05)	23224 (2.14)	16363 (2.28)	79368 (7.32)	54901 (7.66)	29204 (2.69)	20745 (2.89)	1083678 (100)	716968 (100)
1996	1113851 (76.65)	648730 (77.08)	21363 (1.47)	14254 (1.69)	793 (0.05)	858 (0.10)	272155 (18.73)	150501 (17.88)	45017 (3.10)	27329 (3.25)	1453179 (100)	841672 (100)
1997	1044407 (82.22)	612617 (81.60)	45737 (3.60)	33812 (4.50)	5689 (0.45)	3758 (0.50)	162361 (12.78)	92218 (12.28)	12112 (0.95)	8351 (1.11)	1270306 (100)	750756 (100)
1998	1608056 (60.29)	1114188 (59.92)	439625 (16.48)	299721 (16.12)	227741 (8.54)	159243 (8.56)	316834 (11.88)	225459 (12.12)	75154 (2.85)	60945 (3.28)	2667410 (100)	1859556 (100)
1999	2868429 (67.28)	1229079 (64.96)	609825 (14.39)	283931 (15.01)	287589 (6.79)	140483 (7.43)	414097 (9.77)	204352 (10.80)	58290 (1.38)	34146 (1.80)	4238230 (100)	1891991 (100)
2000	3054923 (70.97)	906661 (65.86)	582984 (13.54)	201281 (14.62)	49983 (1.16)	19288 (1.40)	530742 (12.33)	209638 (15.23)	86027 (2.00)	39748 (2.89)	4304659 (100)	1376616 (100)
2001	2733119 (63.11)	836225 (57.81)	1357919 (31.35)	506187 (34.99)	16060 (0.37)	8436 (0.58)	133516 (3.08)	61385 (4.24)	90201 (2.08)	34228 (2.37)	4330815 (100)	1446461 (100)
2002	3052625 (69.98)	1211810 (67.07)	1196535 (27.43)	540146 (29.90)	750 (0.02)	586 (0.03)	37417 (0.86)	20926 (1.16)	74737 (1.71)	33265 (1.84)	4362064 (100)	1806733 (100)
2003	4026436 (76.14)	1808277 (72.01)	993498 (18.79)	565440 (22.52)	24 (0.00)	13 (0.00)	111961 (2.12)	65504 (2.61)	155987 (2.95)	71755 (2.86)	5287906 (100)	2510989 (100)

(Source: Food and Agricultural Organization, 2005)

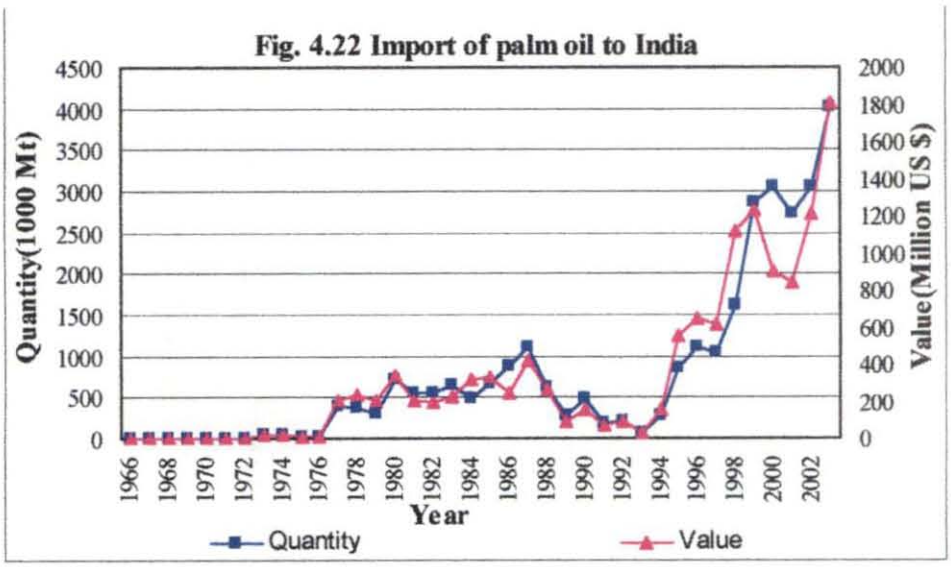


Fig. 4.22 Import of palm oil to India
Quantity(1000 Mt)
Value(Million US $)
Year
Quantity
Value

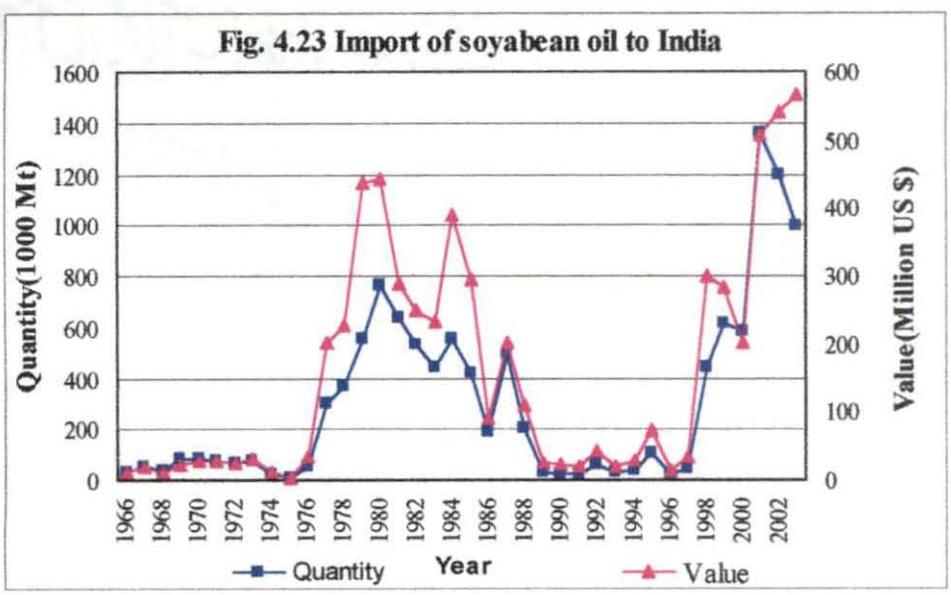


Fig. 4.23 Import of soyabean oil to India
Quantity(1000 Mt)
Value(Million US $)
Year
Quantity
Value

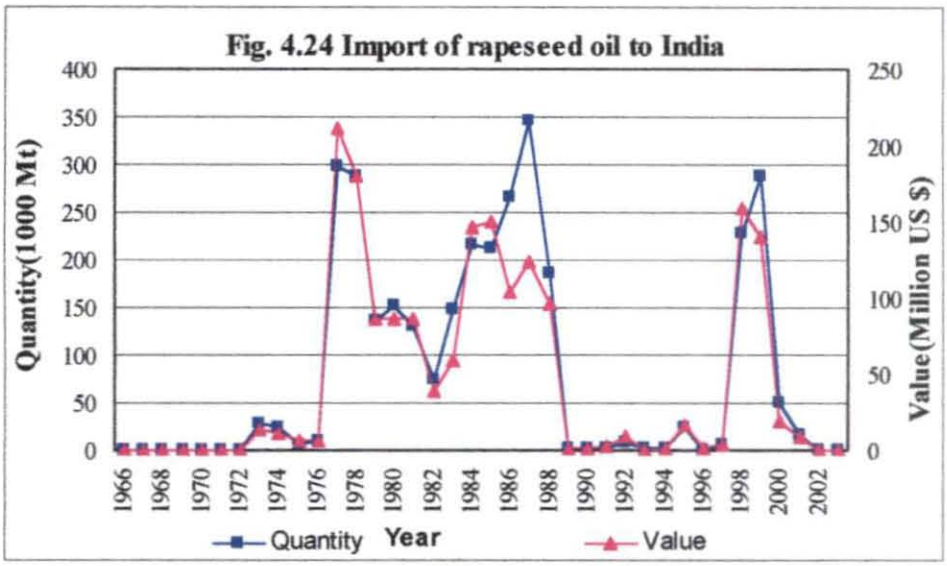


Fig. 4.24 Import of rapeseed oil to India
Quantity(1000 Mt)
Value(Million US $)
400
350
300
250
200
150
100
50
0
250
200
150
100
50
0
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
Quantity
Year
Value

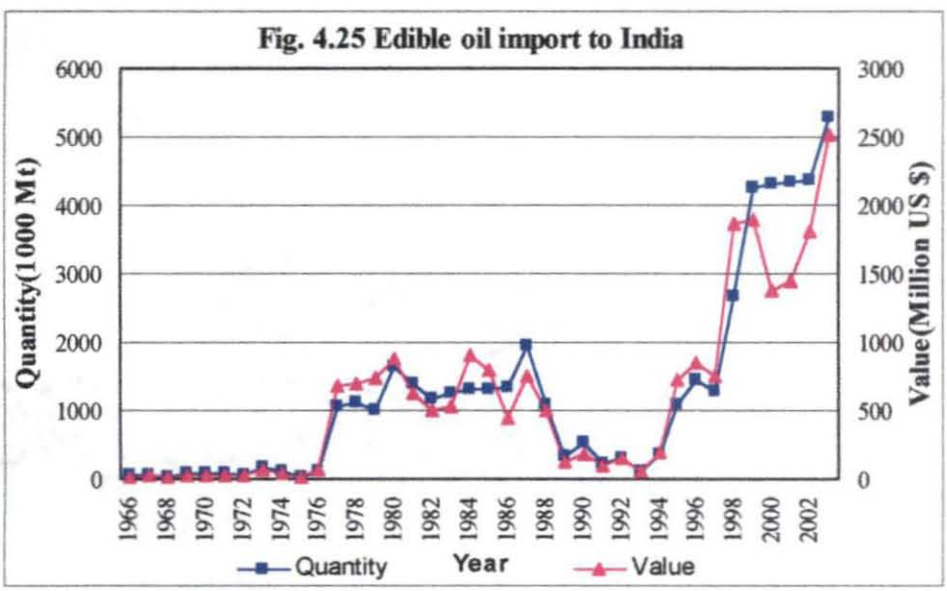
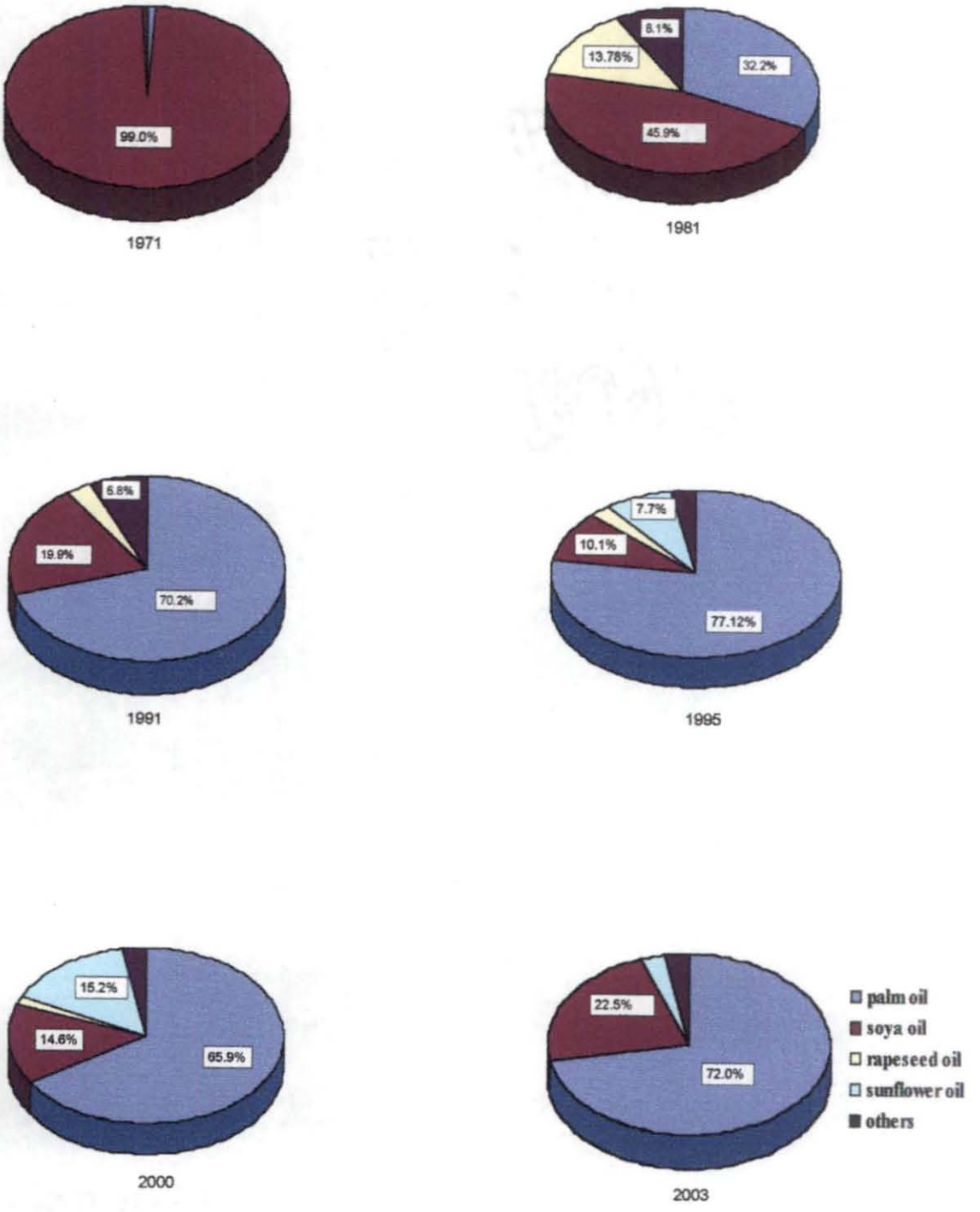


Fig. 4.25 Edible oil import to India
Quantity(1000 Mt)
Value(Million US $)
6000
5000
4000
3000
2000
1000
0
3000
2500
2000
1500
1000
500
0
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
Quantity
Year
Value

Fig. 4.26 Composition of import basket of edible oils to India



A decade wise comparison of the composition of the edible oil import basket shows that at the start of the seventies, soyabean oil was the major edible oil imported to the country accounting for nearly 98 percent of the import value. But as years passed, soyabean oil lost its share in the import basket and palm oil gained importance as an importable edible oil. By the year 1995, palm oil import alone filled three fourth of the import pool. But in the recent years, soyabean oil is re-emerging as a significant import item accounting for a share of 23 percent (Fig. 4.26 and table 4.12)

4.4 PRICE BEHAVIOUR

Instability in the prices of farm products has far reaching consequences. Not only is it necessary that the price of particular farm commodity should have reasonable stability by permitting it to fluctuate within narrow limits, but it should also be in balance with that of other farm commodities. A precipitous fall in the prices of farm products takes away at a stroke the gains of cultivation accruing to the farmers. Farmers are thus dissuaded from making long-term investments (Government of Kerala, 1974). The study of price behaviour of crops will provide valuable information to formulate effective price policy to safeguard the interest of growers. With this background, an attempt has been made to analyze the price behaviour of coconut, copra and coconut oil in the main market centres viz., Kochi, Alappuzha and Kozhikode during the period from 1978-78 to 2004-05.

The year 1995 marked a significant turning point so far as Indian agriculture is considered. It was on 1 January 1995 that the World Trade Organization (WTO) came into existence. Ever since the inception of WTO, India has been trying to open up its economy to competition, both foreign and domestic. It was in the year 1995 that agriculture featured in a major way in the multilateral trade negotiations for

the first time. There is lot of concern about the impact of trade and other reforms followed since 1995 on growth rate of agricultural output, food security, nutrition, regional equity, price stability, farm income, welfare of consumers and producers as affected by changes in prices brought about by the liberalized trade regime. So the total study period from 1978-78 to 2004-05 was divided into two viz., period before 1995 (pre WTO period) and period after 1995 (post WTO period) so as to understand the difference in price behaviour (if any) between the sub periods.

The monthly average price data for coconut, copra and coconut oil were subjected to the techniques of classical time series analysis and decomposed into its four components viz., secular trend, seasonal fluctuations, cyclic fluctuation and irregular variation which are described in following section under appropriate headings.

4.5 TREND ANALYSIS OF PRICE OF COCONUT AND COCONUT PRODUCTS

Trend analysis was carried out separately for each product-market combination by applying the method of least squares. Different functional forms were tried to explain the underlying trend in the price behaviour and the model having the highest adjusted R^2 value was taken as the best fit. The model form, regression sum of square, and standard errors for the fitted model are outlined in tables 4.13 to 4.15 and the plotted graphs and their fitted trend lines are provided in the fig. 4.27 to 4.44.

It was found that the adjusted R^2 values were statistically significant for all the models fitted. But the explaining powers of the models were comparatively low and none of the model could explain more that 90 per cent of the price variation. This could be due to the fact that a host of factors influence the price of a commodity other than the historical trend. The socio-economic and climatic parameters could not be

Table 4.13. Fitted models for coconut prices along with adjusted R^2 values and Standard Errors (SE)

Period	Market	Model	Adj R^2 value	SE	b_0	b_1	b_2	b_3
Pre WTO period	Kochi	Power	0.57	0.22	1459.14	0.34	-	-
	Alappuzha	Compound	0.81	0.21	951.52	1.09	-	-
	Kozhikode	Compound	0.77	0.22	930.02	1.08	-	-
Post WTO period	Kochi	Quadratic	0.28	718.73	2259.60	1557.22	-230.75	-
	Alappuzha	Cubic	0.06	611.77	3007.33	565.32	53.89	-22.29
	Kozhikode	Cubic	0.50	611.86	639.18	2337.32	-522.21	33.24

Table 4.14 Fitted models for copra prices along with adjusted R^2 values and Standard Errors (SE)

Period	Market	Model	Adj R^2 value	SE	b_0	b_1	b_2	b_3
Pre WTO period	Kochi	Compound	0.79	0.21	711.09	1.08	-	-
	Alappuzha	Compound	0 .80	0.22	716.10	1.08	-	-
	Kozhikode	Compound	0.79	0.21	712.18	1.08	-	-
Post WTO period	Kochi	Cubic	0.66	441.00	1524.57	1371.15	-337.09	23.30
	Alappuzha	Cubic	0.60	472.12	1465.39	1451.90	-342.58	23.12
	Kozhikode	Cubic	0.63	469.96	1336.04	1511.10	-354.78	23.93

Table 4. 15. Fitted models for coconut oil price along with adjusted R^2 values and Standard Errors (SE)

Period	Market	Model	Adj R^2 value	SE	b_0	b_1	b_2	b_3
Pre WTO period	Kochi	Compound	0.75	0.23	1082.00	1.08	-	-
	Alappuzha	Compound	0.79	0.22	1070.05	1.08	-	-
	Kozhikode	Compound	0 .81	0 .21	1060.78	1.08	-	-
Post WTO period	Kochi	Cubic	0.61	727.35	2204.04	2137.40	-520.86	35.77
	Alappuzha	Cubic	0.61	718.75	2251.68	2091.55	-509.25	35.01
	Kozhikode	Cubic	0 .61	700.29	2355.53	2116.88	-509.70	34.76

considered in the study due to constraints of time and resources. Moreover, the sharp fluctuations in the slope made it difficult to explain the behaviour by a general geometrical trend. The low R^2 value is also suggestive of the presence of the other three components of the times series viz., seasonal, cyclic and irregular variation. A visual examination of the data also verified the presence of highly predominant cyclical and irregular variations. The remaining unexplained variation in the time series could be due to these reasons.

4.5.1 **Trends in the Price of Coconut**

The models fitted for coconut prices in the three major market centres along with the R^2 values and standard errors are given in the table 4.13. The trend analysis showed that in spite of the regular ups and downs, coconut price in the long run had shown an increasing trend. The pre WTO situation was explained by a power function for Kochi where as the compound function explained the trend for Alappuzha and Kozhikode (Fig. 4.27 to 4.29). The post WTO situation was explained by quadratic function in the case of Kochi market where as cubic function found to give better fit in the case of the other two markets viz., Kozhikode and Alappuzha (Fig.4.30 to 4.32).

4.5.2 **Trends in the Price of Copra**

Secular price behaviour of copra price for the period from 1977-78 to 1994-95 (pre WTO period) was explained satisfactorily for all the markets studied, by the compound growth function. The regression coefficients and the R^2 values are provided in the table 4.14. Though the price showed wide spread instability, in the long run the price has increased. The prices in the main market centres are moving in close association with each other indicating mutual dependencies of the three major

Fig. 4.27 Trend in coconut price in Kochi market during the pre WTO period

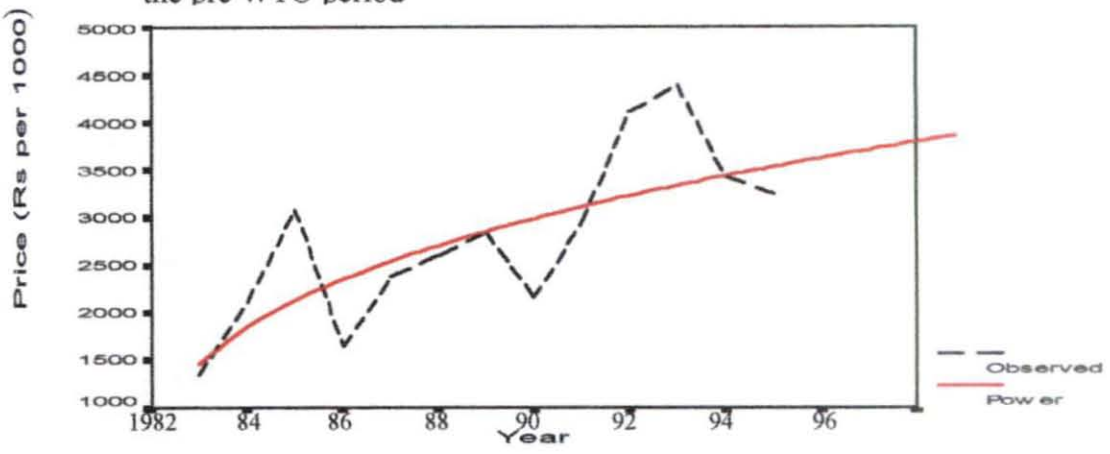


Fig. 4.28 Trend in coconut price in Alappuzha market during the pre WTO period

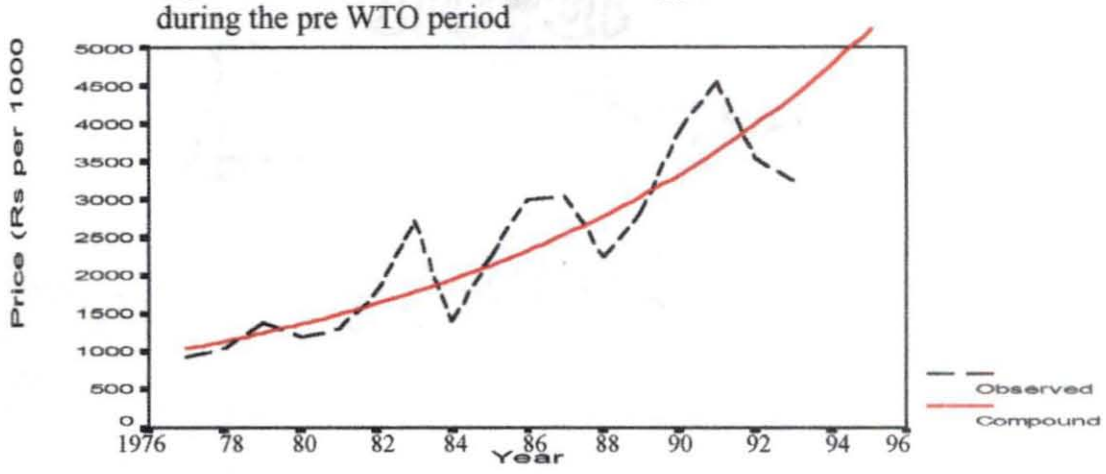


Fig. 4.29 Trend in coconut price in Kozhikode market during the pre WTO period

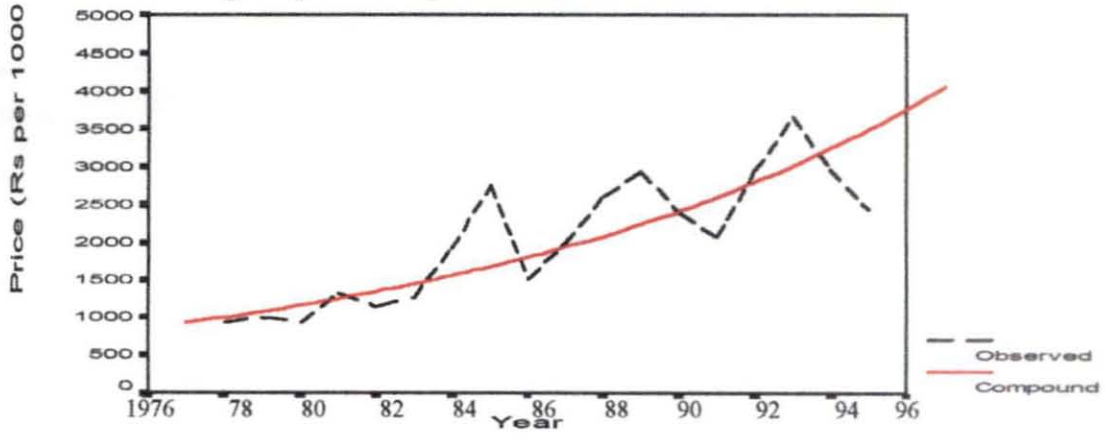


Fig. 4.30 Trend in coconut price in Kochi market during the post WTO period

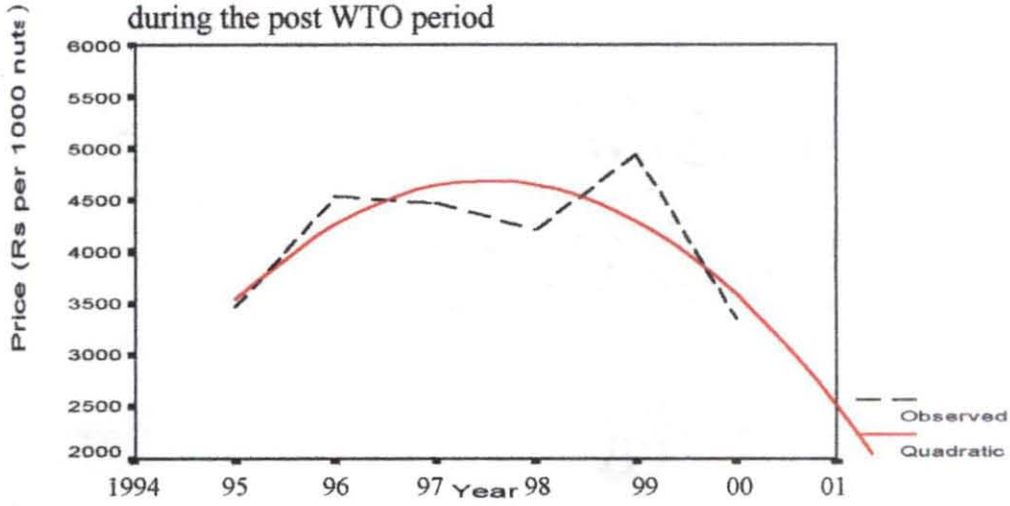


Fig. 4.31 Trend in coconut price in Alappuzha market during the post WTO period

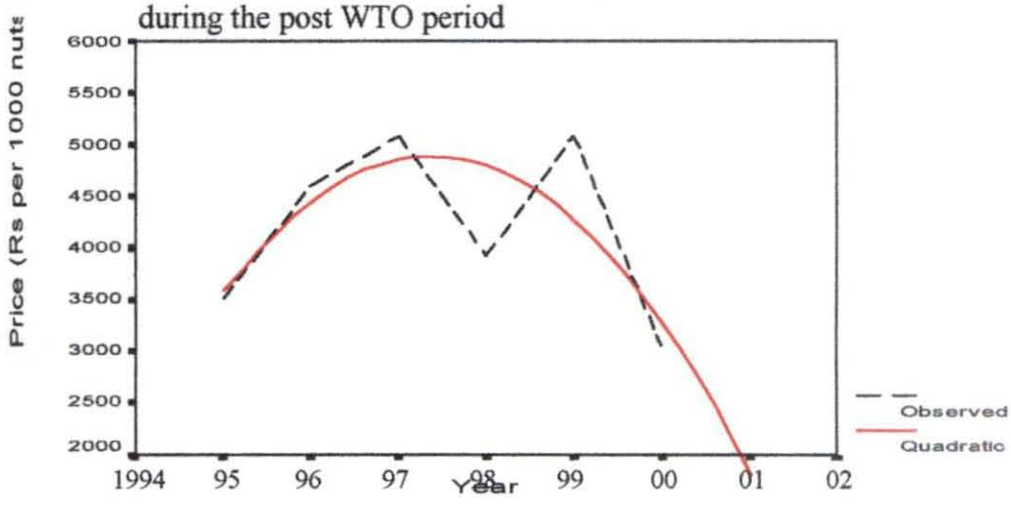


Fig. 4.32 Trend in coconut price in Kozhikode market during the post WTO period

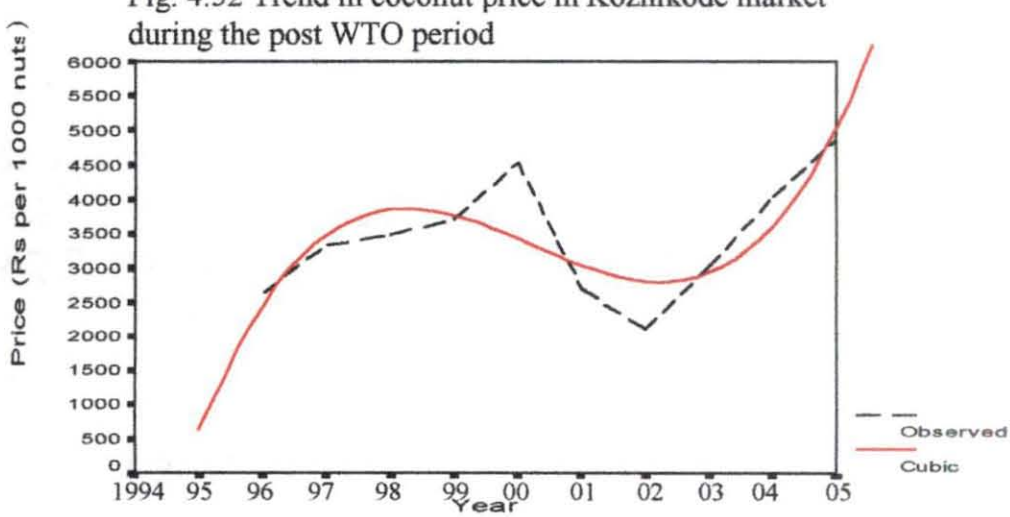


Fig. 4.33. Trend in copra price in Kochi market during the pre WTO period

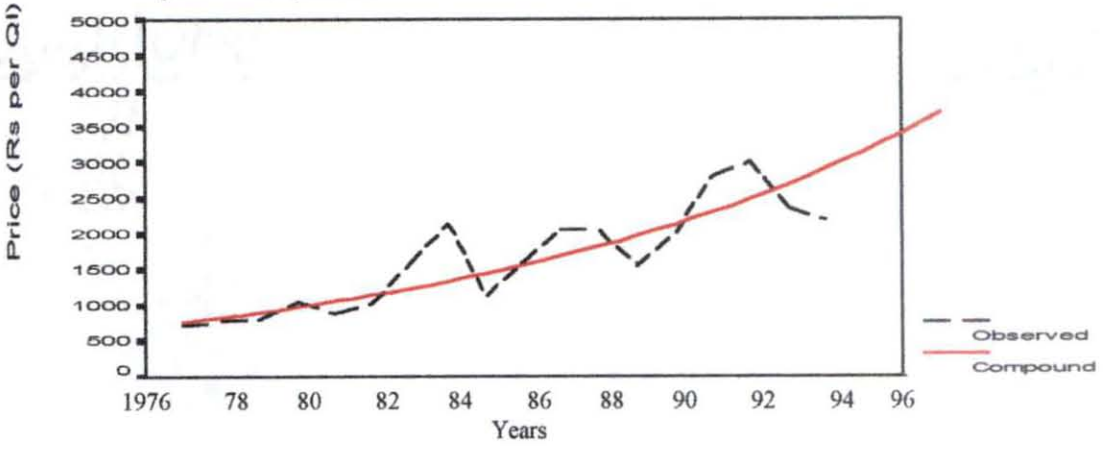


Fig. 4.34. Trend in copra price in Alappuzha market during the pre WTO period

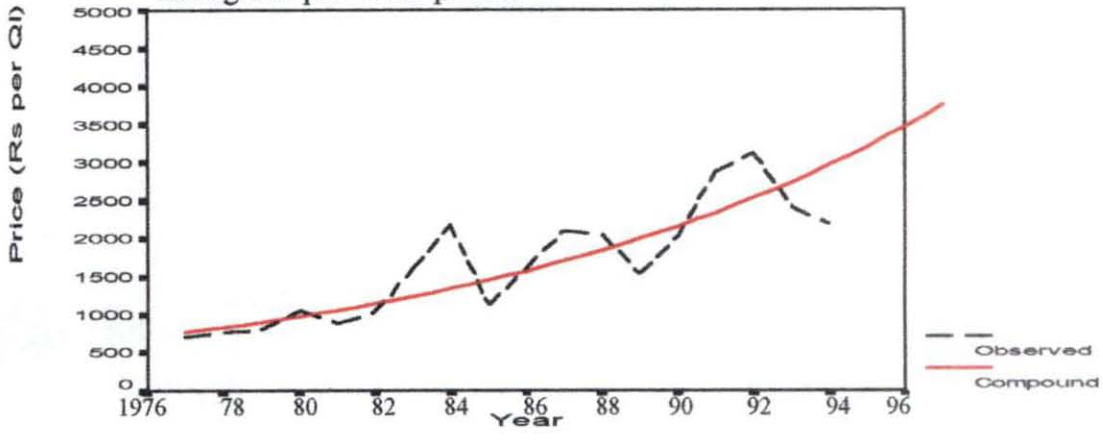


Fig. 4.35 Trend in copra price in Kozhikode market during the pre WTO period

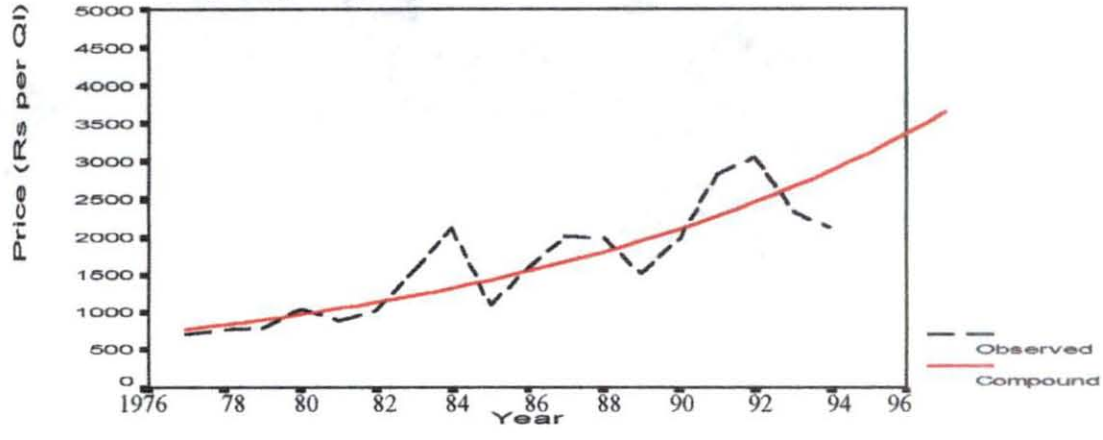


Fig. 4.36 Trend in copra price in Kochi market during the post WTO period

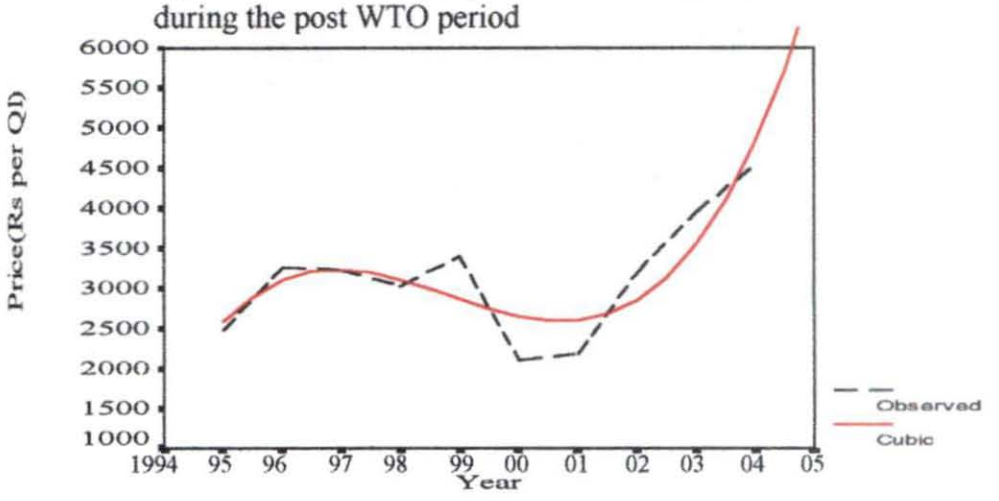


Fig. 4.37 Trend in copra price in Alappuzha market during the post WTO period

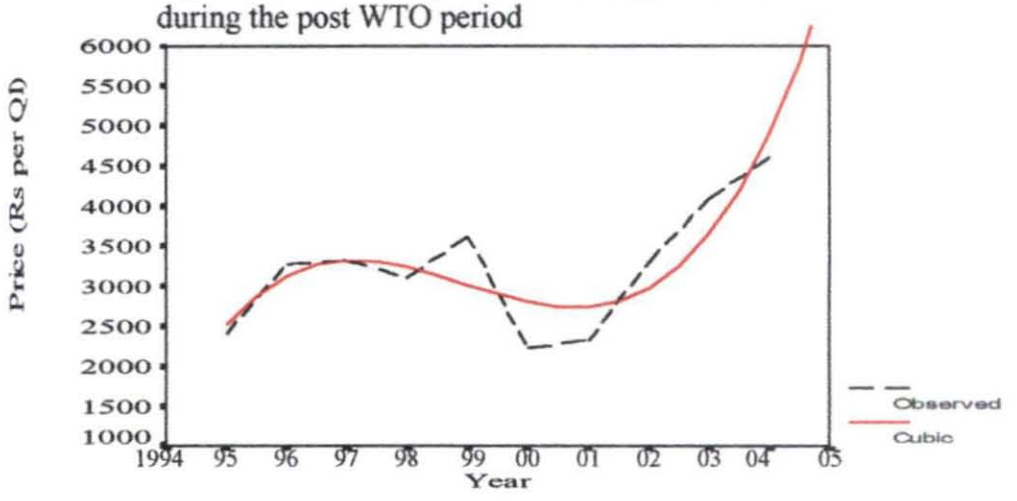


Fig. 4.38 Trend in copra price in Kozhikode market during the post WTO period

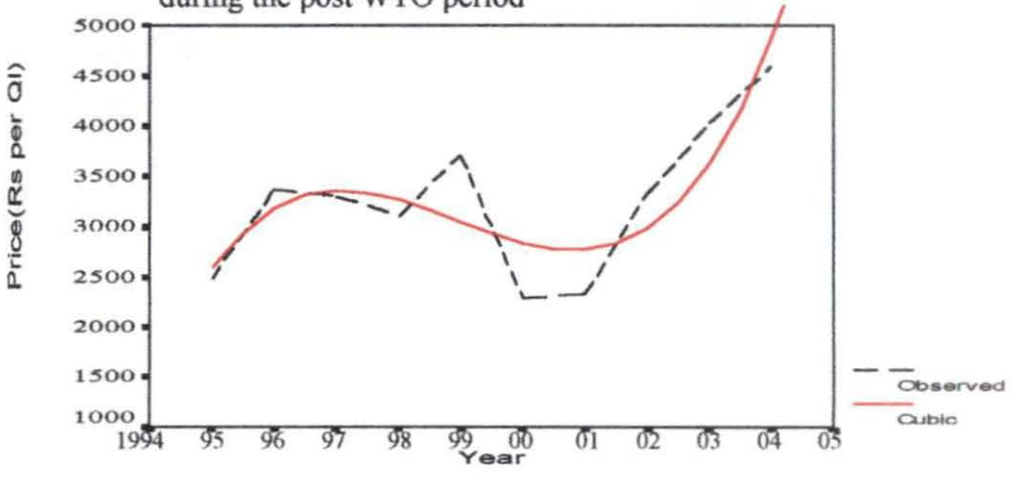


Fig. 4.39 Trend in coconut oil price in Kochi market during the pre WTO period

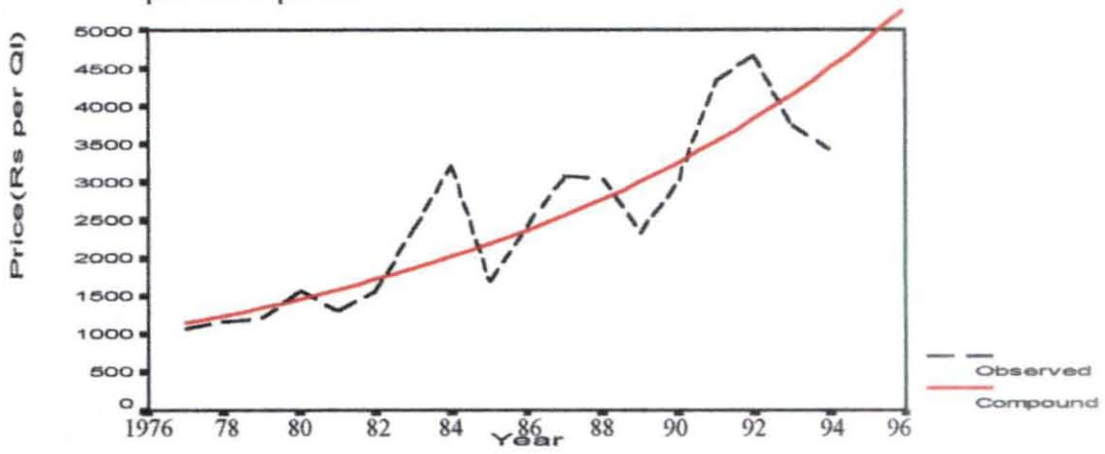


Fig. 4.40 Trend in coconut oil price in Alappuzha market during the pre WTO period

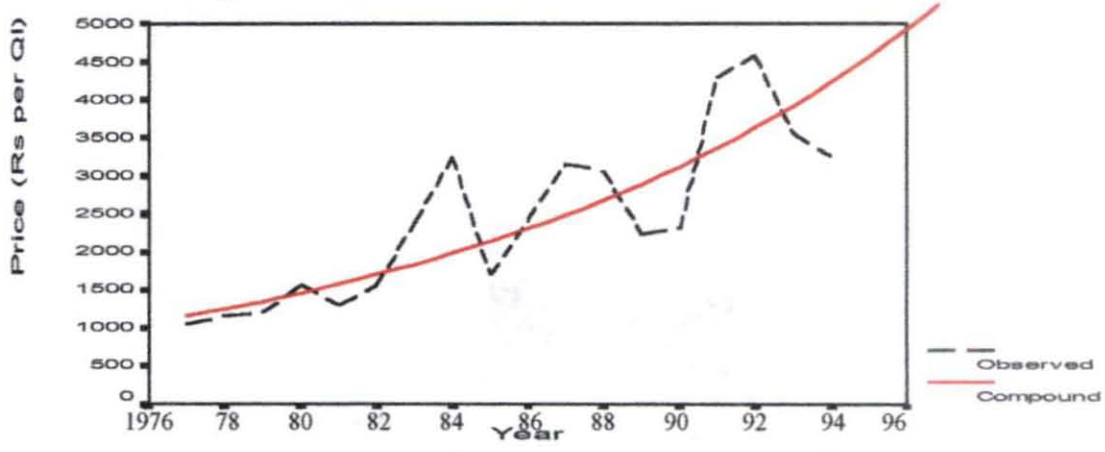


Fig. 4.41 Trend in coconut oil price in Kozhikode market during the pre WTO period

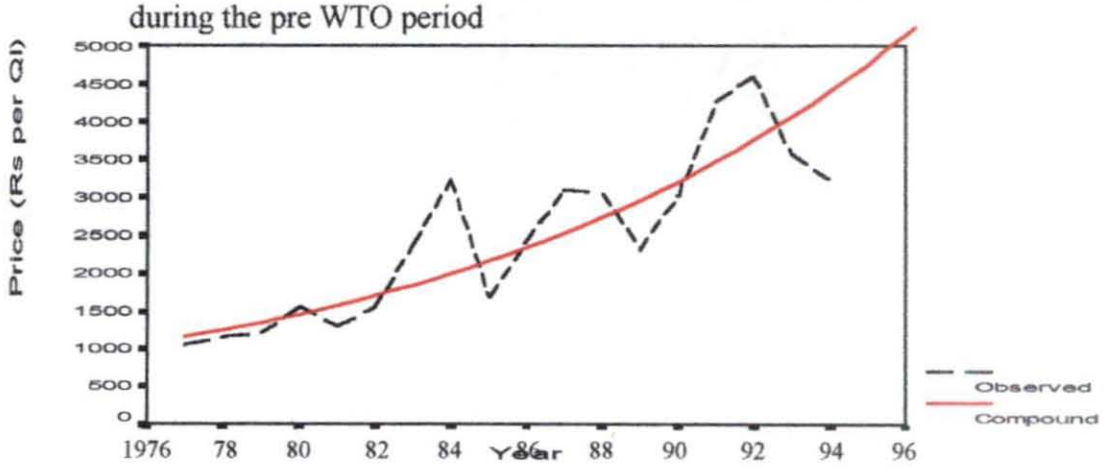


Fig. 4.42 Trend in coconut oil price in Kochi market during the post WTO period

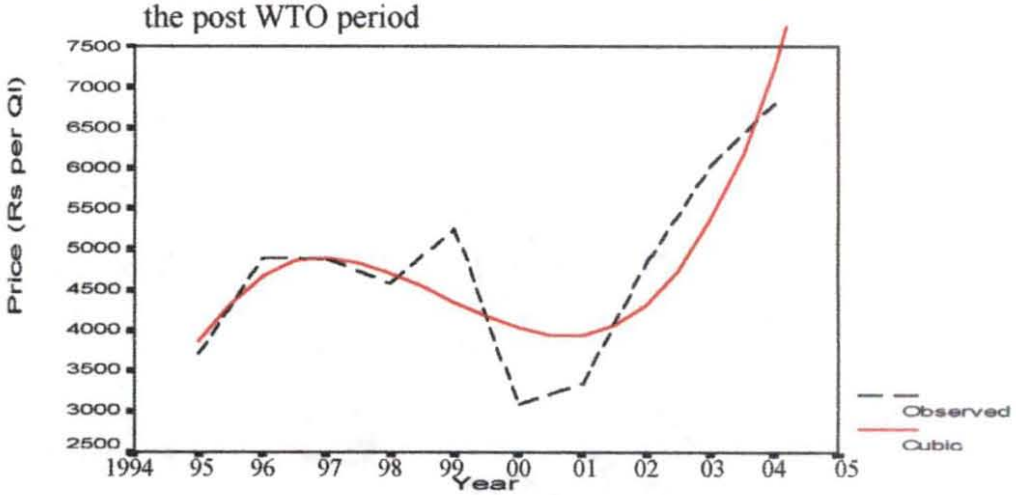


Fig. 4.43 Trend in coconut oil price in Alappuzha market during the post WTO period

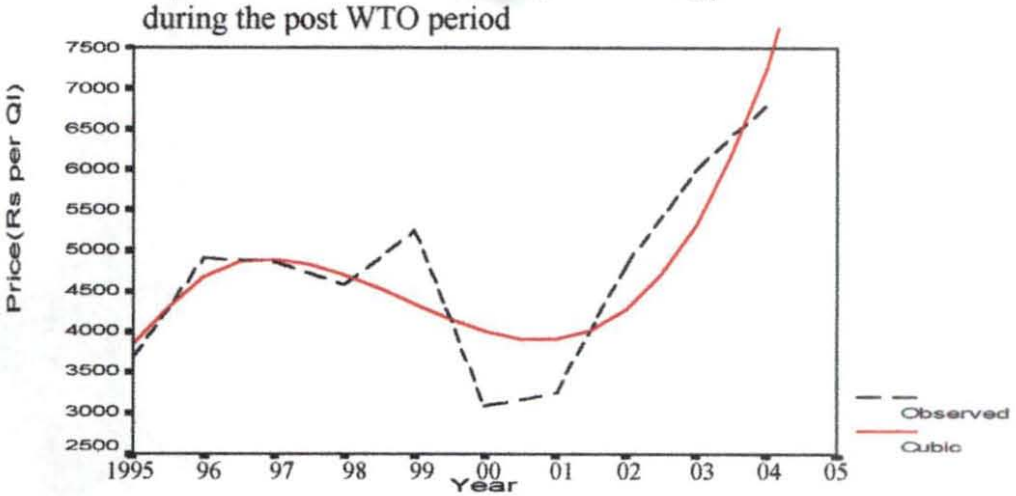
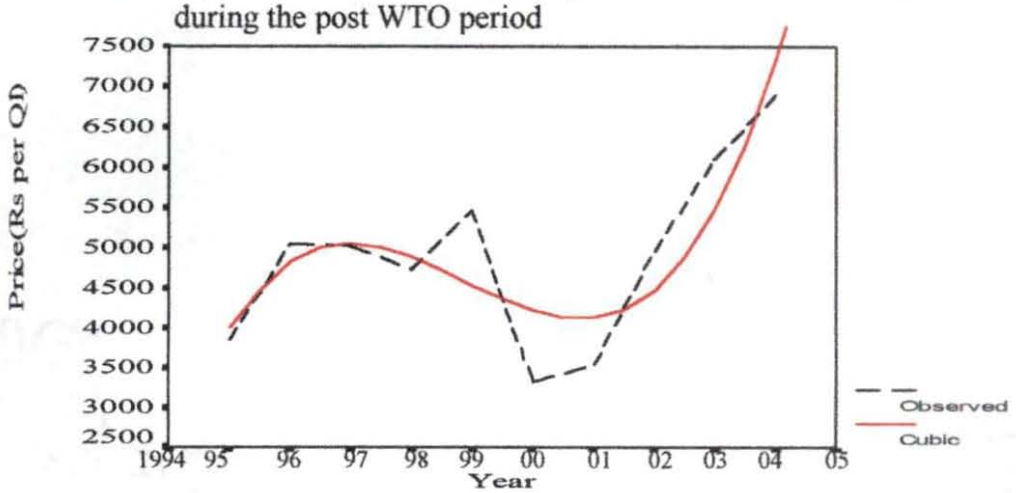


Fig. 4.44 Trend in coconut oil price in Kozhikode market during the post WTO period



copra markets in the state (Fig.4.33 to 4.35). The post WTO situation was represented by a cubic function. The explaining powers of the models for the post WTO period were comparatively lower because of the shorter period under consideration and also because of more instability in prices (Fig.4.36 to 4.38).

4.5.3 **Trends in the Price of Coconut oil**

The secular price trend of coconut oil for the pre WTO period was represented by compound growth function and the post WTO situation was represented by cubic function (Table 4.15). Very often, coconut oil prices exhibited widespread fluctuation causing concern to the producer, processors, traders and end users. However, coconut oil prices have shown a clear upward movement through out the period of study. The price movement of coconut oil was similar in all the main market centres considered. It is a general trend that copra and coconut prices are determined by the prevailing prices of coconut oil. The secular price movement of coconut oil was remarkably similar to that of coconut and copra (Fig. 4.39 to 4.44). This observation is suggestive of the presence of a coconut oil driven market in the state, with the fortune of millions of small and marginal farmers cultivating coconut depending on the price of a single commodity viz., coconut oil. This situation emphasizes the need of going for product diversification in coconut.

4.5.4 **Market Integration of Domestic Markets**

In order to get an idea into the extent of market integration, inter correlation matrix was worked out for domestic market as well as for the international market.. The inter correlation matrix is shown in table 4.16. All the correlation coefficients were significant at one percent level of significance.

Fig. 4.16. **Inter-correlation matrix of coconut, copra and coconut oil prices in the domestic markets during the pre WTO and post WTO periods**

Commodity	Market	Pre WTO period			Post WTO period		
		Kochi	Alappuzha	Kozhikode	Kochi	Alappuzha	Kozhikode
Coconut	Kochi	1.000	0.972	0.908	1.000	0.940	0.768
	Alappuzha	0.972	1.000	0.939	0.940	1.000	0.901
	Kozhikode	0.908	0.939	1.000	0.768	0.901	1.000
Copra	Kochi	1.000	0.998	0.999	1.000	0.995	0.997
	Alappuzha	0.998	1.000	0.999	0.995	1.000	0.998
	Kozhikode	0.999	0.999	1.000	0.997	0.998	1.000
Coconut oil	Kochi	1.000	0.996	0.996	1.000	1.000	0.990
	Alappuzha	0.996	1.000	0.999	1.000	1.000	0.999
	Kozhikode	0.996	0.999	1.000	0.999	0.999	1.000

Fig. 4. 17. **Inter-correlation matrix of copra and coconut oil prices in the international markets with that in domestic markets in the pre WTO and post WTO**

Market	International market			
	Copra		Coconut oil	
	Pre WTO	Post WTO	Pre WTO	Post WTO
Kochi	0.632	0.648	0.635	0.638
Alappuzha	0.624	0.642	0.643	0.636
Kozhikode	0.625	0.626	0.679	0.643

A perusal of the table revealed that both during the pre WTO and post WTO period of the study, the prices of coconut, copra and coconut oil prevailed in the different markets viz., Kochi, Alappuzha and Kozhikode were highly correlated. This was indicative of the high level of market integration among the three market centres in Kerala, viz., Kochi, Alappuzha and Kozhikode for coconut, copra and coconut oil.

4.5.5 **Integration of Domestic Markets with the International Market**

In order to know the similarities in the price movement of copra and coconut in the domestic market with that in the international market, inter correlation matrices between the domestic price and international price of copra and coconut oil was worked out separately for the pre WTO period and post WTO period. For copra, cif price to Europe from Indonesia/Philippines was taken as the international price and for coconut oil cif price to Rotterdam was considered as the international price. The correlation matrices are as depicted in table 4.17. The table shows that both during the pre WTO and post WTO periods, prices prevailing in the three main domestic markets in India viz., Kochi, Alappuzha and Kozhikode were found to be correlated with the international price, but the level of association was low.

4.6 SEASONAL VARIATION

It is an established fact that the seasonality in the production of crops and the consequent changes in market arrival is the main reason for seasonality in the price of agricultural commodities. Many workers have highlighted the importance of seasonal variation in agricultural decision-making (Radhakrishnan *et al.*, 1988; Das, 1991 and Babu and Sebastian, 1996). Since coconut is a long duration crop and involves higher investment compared to seasonal crops like cereals and vegetables, price fluctuation is an important factor to be considered while planning to grow this crop. It is widely

Table 4. 18. **Seasonal indices for coconut, copra and coconut oil along with the coefficient of variation during pre WTO period**

	Coconut			Copra			Coconut oil		
Month	**Kochi**	**Alappuzha**	**Kozhikode**	**Kochi**	**Alappuzha**	**Kozhikode**	**Kochi**	**Alappuzha**	**Kozhikode**
April	97.12	93.49	95.38	94.63	93.92	93.44	94.87	95.00	94.55
May	91.99	95.40	95.06	93.69	93.30	91.81	91.21	91.31	92.30
June	90.96	94.25	98.49	95.07	92.96	91.46	94.85	95.50	96.58
July	89.02	96.13	101.86	95.65	94.26	95.29	95.96	95.72	98.09
August	90.16	94.76	100.15	98.36	96.95	97.27	99.20	99.27	98.66
September	90.48	94.74	105.83	96.43	97.63	95.53	96.96	96.13	96.39
October	113.24	103.15	100.84	102.47	103.13	100.94	101.33	102.11	103.66
November	102.94	108.77	102.56	109.83	110.95	110.55	109.49	109.27	108.79
December	109.77	109.74	100.33	108.13	107.48	114.01	108.37	108.34	107.82
January	107.35	105.20	97.65	104.61	105.50	106.02	104.82	105.06	105.51
February	106.96	102.98	102.05	100.98	103.23	101.53	102.01	101.41	101.49
March	110.01	101.37	99.79	100.16	100.63	102.16	100.90	100.88	96.16
CV	9.27	5.93	3.06	5.38	6.08	7.29	5.61	5.58	5.38

Table 4. 19. **Seasonal indices for coconut, copra and coconut oil along with the coefficient of variation during post WTO period**

	Coconut			Copra			Coconut oil		
Month	Kochi	Alappuzha	Kozhikode	Kochi	Alappuzha	Kozhikode	Kochi	Alappuzha	Kozhikode
April	96.50	94.98	107.10	93.72	92.90	93.45	94.91	94.42	93.93
May	96.10	95.34	104.07	93.50	94.42	94.20	93.89	93.67	94.10
June	95.00	97.59	100.65	95.75	96.16	95.75	96.11	97.09	97.03
July	94.02	96.13	94.35	96.21	96.20	95.15	97.09	96.55	96.88
August	97.90	97.71	91.44	97.79	99.36	99.72	99.47	100.96	100.58
September	102.14	102.36	93.35	103.67	104.12	103.91	102.43	104.36	104.67
October	103.29	104.01	95.05	104.97	103.74	103.04	104.58	104.18	103.66
November	105.95	106.56	94.25	111.97	111.17	110.36	109.88	110.32	108.93
December	109.53	103.88	94.88	106.20	105.42	104.25	105.66	104.32	103.99
January	104.01	104.49	105.40	103.88	103.83	104.85	103.70	102.75	103.18
February	100.84	100.67	110.60	99.36	99.66	101.89	99.35	98.53	99.93
March	94.71	96.27	108.90	92.98	93.03	93.38	92.91	92.84	93.12
CV	5.04	4.13	6.88	6.06	5.72	5.55	5.29	5.35	5.03

believed that price fluctuation is one major reason for the slow pace of area expansion in coconut. It is against this backdrop an attempt has been made to measure the pattern of seasonal variations in coconut, copra and coconut oil. For this the seasonal price indices were worked out by the ratio to moving average method for each of the product. The seasonal indices were worked out separately for the pre WTO and the post WTO period and are depicted as in tables 4.18 and 4.19 respectively.

4.6.1 **Seasonal Variations in the Price of Coconut**

The peak price for coconut in the Kochi market during the pre WTO period was observed in October, where as the trough price was noted in July. The period from October to March was a buoyant phase where as the period from May to September was found to be the depressed phase (Fig. 4.45). In the post WTO period, though a major shift in seasonality is not discernible, the price peak was found to have sifted to December where as the trough continued to be during July (Fig. 4.48).

In the Alappuzha market, during the pre WTO period, the period from October to February was found to be the buoyant phase with prices peaking in December and the period from April to September was observed as the depressed phase with the trough being in April (Fig. 4.46). During the post WTO period, the price peak was also observed in December and the trough was found to be in April. The price buoyancy and depression remained more or less the same. This price behaviour in Alappuzha was in similar line to that in Kochi market (Fig. 4.49).

During the pre WTO period, in Kozhikode market, coconut prices ruled higher than annual average price during July-December and the prices peaked during September. The depressed phase was observed from March to June and the trough

was noted in May (Fig. 4.47). In the post WTO period, an entirely different seasonal behaviour emerged for coconut in the market with the price peaking up during February and the period from January to May was the buoyant phase. The lowest prices were observed during August (Fig. 4.50)

Thus, it can be found that even though the Kochi, Alappuzha and Kozhikode markets were highly integrated, the seasonal price behaviour was more similar for Kochi and Alappuzha markets while, it was distinctly different for the Kozhikode market. The similarity exhibited by the Kochi and Alappuzha market was due to their vicinity with each other and also due to similar market arrivals from the erstwhile Travencore region. The Kozhikode market is a far-flung market from these two and the market arrivals are from the Malabar region. The market arrival pattern in Kozhikode market is distinctly different from that in the other two markets. The farmers in northern Kerala harvest coconut less frequently than their southern counterparts. It has been noted that while the coconut farmers in southern Kerala take six to seven harvests a year, the farmers in Malabar part take only three to four harvest. It is mainly because of the climatic difference between the regions. It is an established fact that crops growth in the state is not inhibited by temperature, but governed by rainfall alone as the state as a whole experience mega thermal climate. The rainfall distribution in Kerala is bimodal. The distribution pattern of rainfall during the North East monsoon is quite different form the South West monsoon, as the northern part of Kerala receive less amount of rainfall compared to the south and northern part of the state experience prolonged dry spells July is the most rainy month in the northern district while the southern part extending from Ponnani to Thiruvananthapuram show two peaks in the months of June-July and October during the south West monsoon and North East monsoon respectively (Kerala Agricultural University, 1989). The differences in the harvest pattern in the north make seasonal variation in the production and market arrival distinctly different from each other. As

a result of this, the common pattern of prices coming down in the plentiful season and going up during slack production period is not applicable to Kozhikode market.

The coefficient of variations showed that during the pre WTO period, the seasonal variation in coconut price was less in Kozhikode followed by Alappuzha. The highest seasonal variation was seen in Kochi market (Table 4.18). But during the post WTO period, seasonal variations were less in Alappuzha and Kochi market, where as the Kozhikode market was found to be showing more variability (Table 4.19).

4.6.2 **Seasonal Variations in the Prices of Copra**

During the pre WTO period of the study, copra prices in all the main market centres showed distinct seasonality with the price showing buoyancy during the period from October to February and depression during April-September. Peak prices were observed in November in both Kochi and Alappuzha markets where as in Kozhikode market the price peaked up in December there by one month lag is observed with respect to Kochi and Alappuzha markets. Kochi approached trough price in May, where as it was lagging by one month in the other two markets (Fig 4.45 to 47). In the post WTO period, price peaks were observed in November in all the markets. It is interesting to note that in the post WTO period, the price peaking in Kozhikode market advanced by one month from December to November. Thus all the three markets are now more synchronized showing signs of better market integration during the post WTO period. The trough was found shifted to March in Kochi and Kozhikode market and to April in Alappuzha market. The depression phase and the buoyant phase were found to have advanced slightly in the post WTO period by one month (Fig.4.48 to 4.50).

4.6.3 Seasonal Variations in the Prices of Coconut oil

The seasonal variation in coconut oil prices was found to be moving in close association with that of copra in the three major markets considered. This is understandable as the prices of copra and coconut oil influence each other. Both during the pre WTO period and post WTO period, prices were found to peak up during November in the markets studied. October to February was observed as the buoyant phase during the former period where as during the latter period buoyant phase was found to commence early. The period from April to September was the depressed phase with trough price occurring in May in all the markets. But the post WTO period witnessed advance commencement of depressed phase with the prices approaching trough in March in all the markets.

It is interesting to note that inter market disparity in seasonal price variation tended to fade away with product development. Price peaks and trough differed widely among markets for coconut where as they started moving in closer association in the case of copra. In the case of copra and coconut oil, prices moved up and down in unison in the major markets in Kerala. During the pre WTO period, Kozhikode market showed maximum variability followed by Alappuzha. But in the latter period copra prices in Kozhikode and Alappuzha were found to stabilize where as the price variability increased in Kochi market. But for coconut oil, the coefficient of variation remained more or less the same in all the markets both during the pre WTO period and post WTO period.

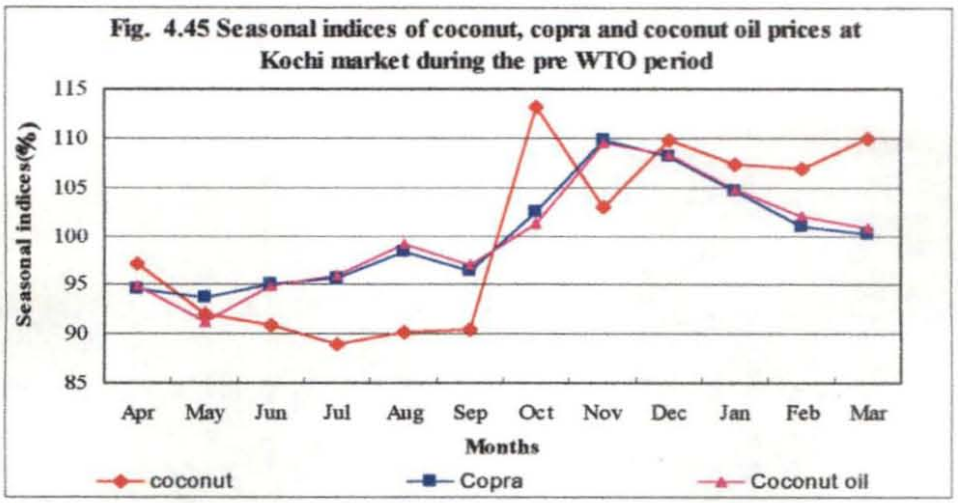


Fig. 4.45 Seasonal indices of coconut, copra and coconut oil prices at Kochi market during the pre WTO period
Seasonal indices(%)
115
110
105
100
95
90
85
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Months
coconut
Copra
Coconut oil

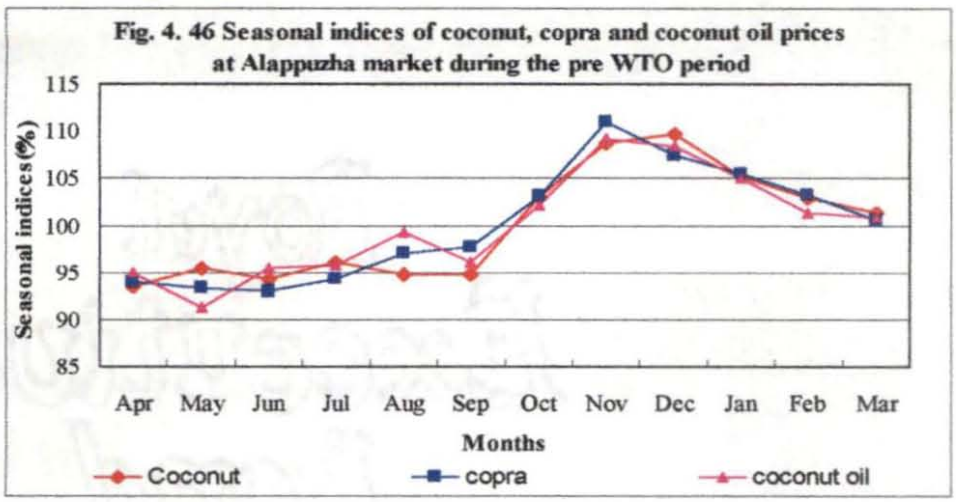


Fig. 4. 46 Seasonal indices of coconut, copra and coconut oil prices at Alappuzha market during the pre WTO period
Seasonal indices(%)
115
110
105
100
95
90
85
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Months
Coconut
copra
coconut oil

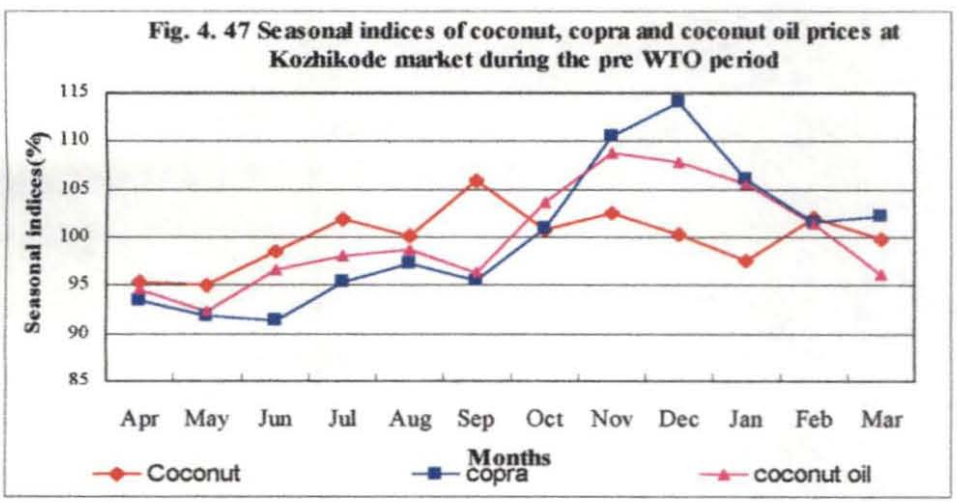


Fig. 4. 47 Seasonal indices of coconut, copra and coconut oil prices at Kozhikode market during the pre WTO period
Seasonal indices(%)
115
110
105
100
95
90
85
Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar
Months
Coconut
copra
coconut oil

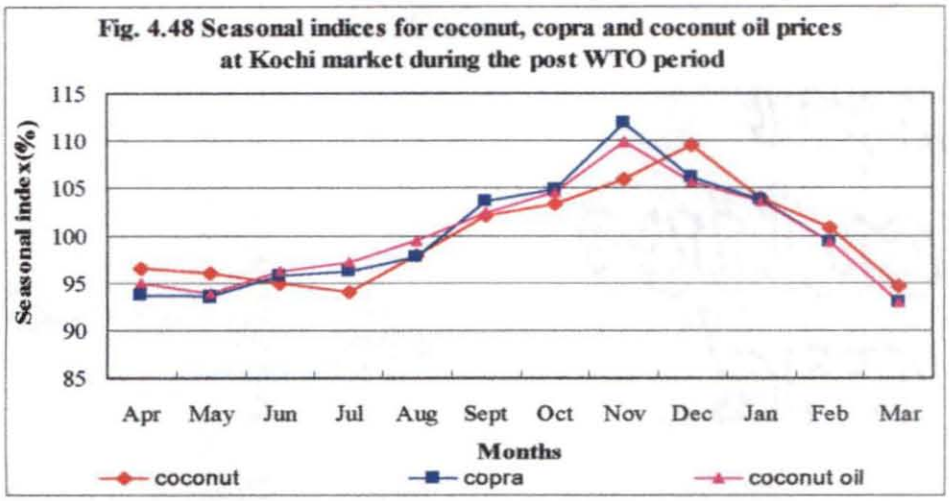


Fig. 4.48 Seasonal indices for coconut, copra and coconut oil prices at Kochi market during the post WTO period
Seasonal index(%)
115
110
105
100
95
90
85
Apr May Jun Jul Aug Sept Oct Nov Dec Jan Feb Mar
Months
coconut
copra
coconut oil

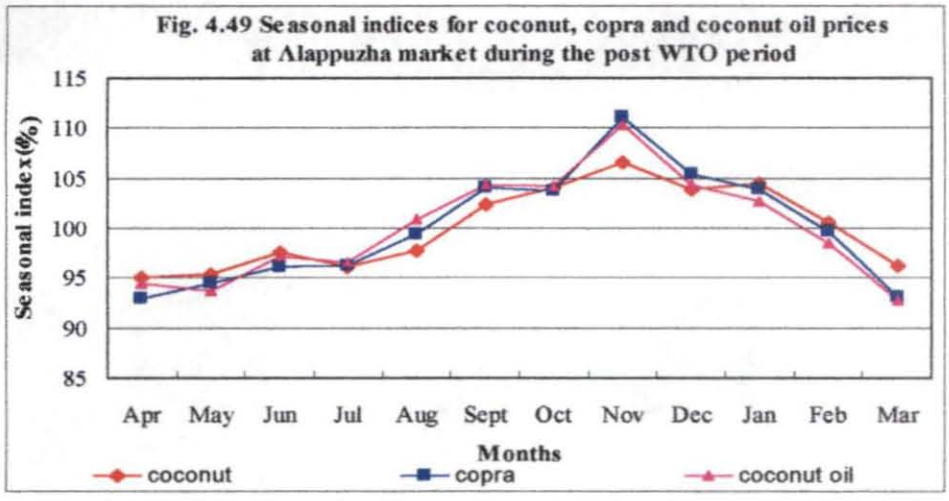


Fig. 4.49 Seasonal indices for coconut, copra and coconut oil prices at Alappuzha market during the post WTO period
Seasonal index(%)
115
110
105
100
95
90
85
Apr May Jun Jul Aug Sept Oct Nov Dec Jan Feb Mar
Months
coconut
copra
coconut oil

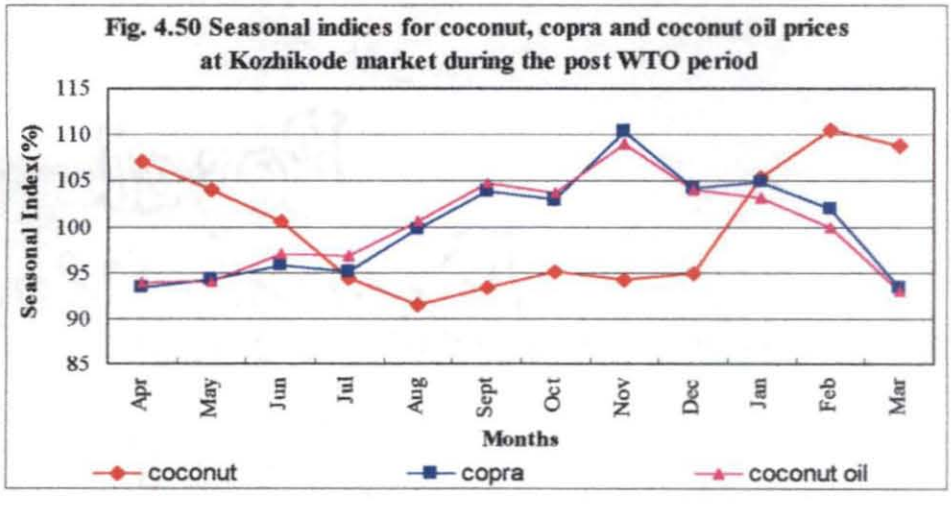


Fig. 4.50 Seasonal indices for coconut, copra and coconut oil prices at Kozhikode market during the post WTO period
Seasonal Index(%)
115
110
105
100
95
90
85
Apr May Jun Jul Aug Sept Oct Nov Dec Jan Feb Mar
Months
coconut
copra
coconut oil

4.6.4 Seasonal Variations in the International Prices

Analysis of the seasonal variation in copra and coconut oil prices in the international market showed that, the buoyant period from September to February is visible in the international market also, but with a time lag of two months from November to February. However, another price peak is also visible around June, which was absent in the domestic market. Depressed price was visible around August to October, both in the pre and post WTO period (Table 4.20 and Fig. 4.51 and 4.52). The domestic price in this period is characterised by a buoyant phase. Thus, it may be confirmed that, the level of integration between the domestic and international market is low as far as copra and coconut oil are concerned.

Table 4. 20. **Seasonal indices for copra and coconut oil prices in the international market**

	Copra		Coconut oil	
Months	Pre WTO	Post WTO	Pre WTO	Post WTO
April	96.64	98.17	95.57	102.76
May	98.99	99.85	100.52	96.48
June	102.40	108.07	102.33	101.16
July	102.47	99.13	102.82	98.75
August	96.58	98.64	98.29	96.01
September	96.00	94.97	95.95	97.41
October	98.98	95.41	101.36	95.61
November	101.28	101.21	101.00	103.59
December	101.17	103.95	100.66	103.02
January	104.90	100.49	103.29	102.06
February	101.18	103.29	98.65	104.47
March	99.42	96.82	99.58	98.67

Fig. 4. 51 Seasonal indices for copra and coconut oil price in international market during pre WTO period

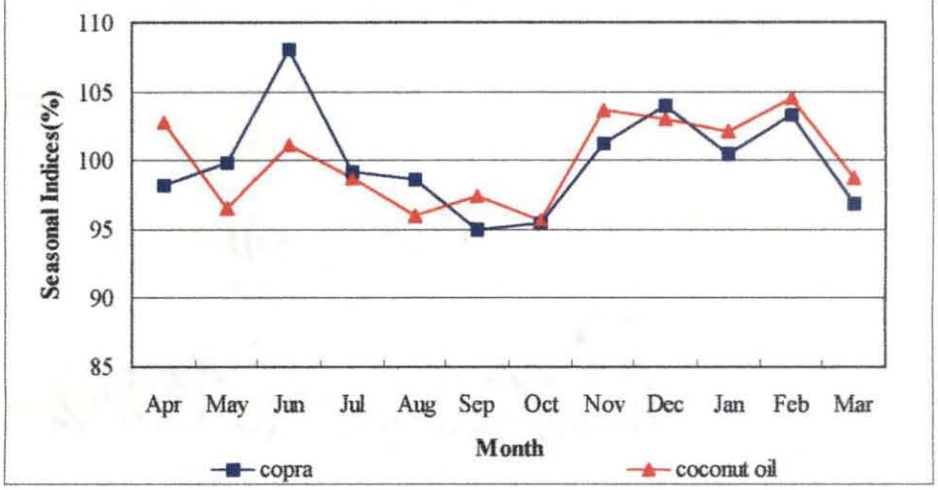
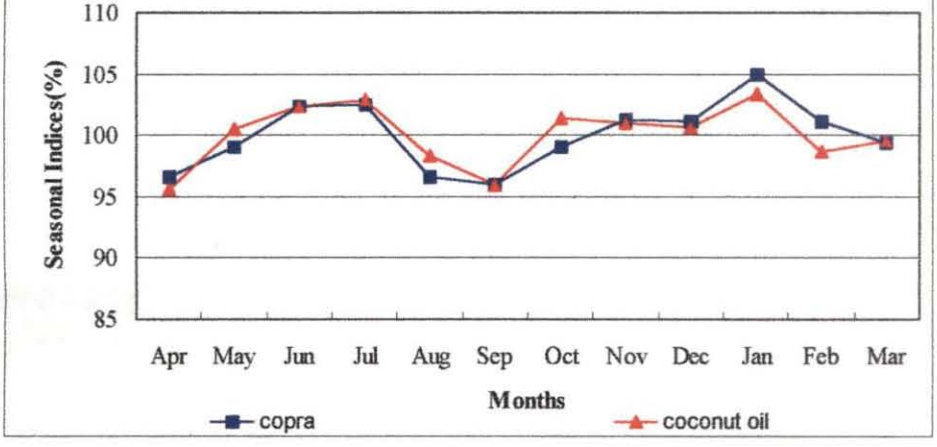


Fig. 4. 52 Seasonal indices for copra and coconut oil price in international market during post WTO period



4.7 CYCLICAL VARIATION

The indices for the cyclical price variations in coconut, copra and coconut oils were worked out by eliminating the trend and seasonal variations from the original data to obtain cyclical-irregular indices and irregular fluctuation were ironed out by averaging to give the cyclical indices. The cyclical indices computed are represented graphically in fig. 4.53 to 4.58. The estimated indices showed that both during the pre WTO period and post WTO period of the study, the prices of coconut and its products were subjected to highly pronounced cyclical variations. But it was interesting to note that there was marked similarity in the cyclical variation not only among the three commodities under consideration but also among the different market situation considered and the cycle which was visible in one market was visible in the other markets centres also. But among the different coconut products studied, the cyclical variation of coconut was found to be less coherent with that of the other two products viz., copra and coconut oil. And also there was less association among the cyclical variation of coconut in different market situations studied. It was observed that during the pre WTO period, there existed four complete cycles in the prices of all the three commodities, with the length of the cycle being three to four years. It depicts that barring the irregular variations; market high and low price can be expected once in three to four years. The price cycle fluctuated about 70 percent above and 25 percent below the average price. Prices of all the products were found to spiral to the peak during 1984-85 and a depression was noted there after with the prices approaching trough by 1986-87. Prices again approached peak by 1988, but got depressed by 1990-91.

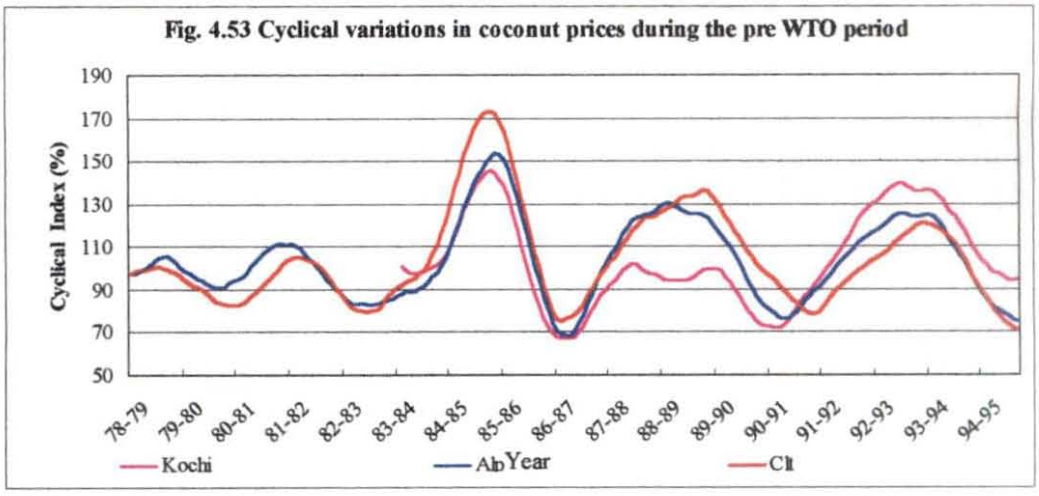


Fig. 4.53 Cyclical variations in coconut prices during the pre WTO period
Cyclical Index (%)
190
170
150
130
110
90
70
50
78-79
79-80
80-81
81-82
82-83
83-84
84-85
85-86
86-87
87-88
88-89
89-90
90-91
91-92
92-93
93-94
94-95
Kochi
Alp
Year
Clt

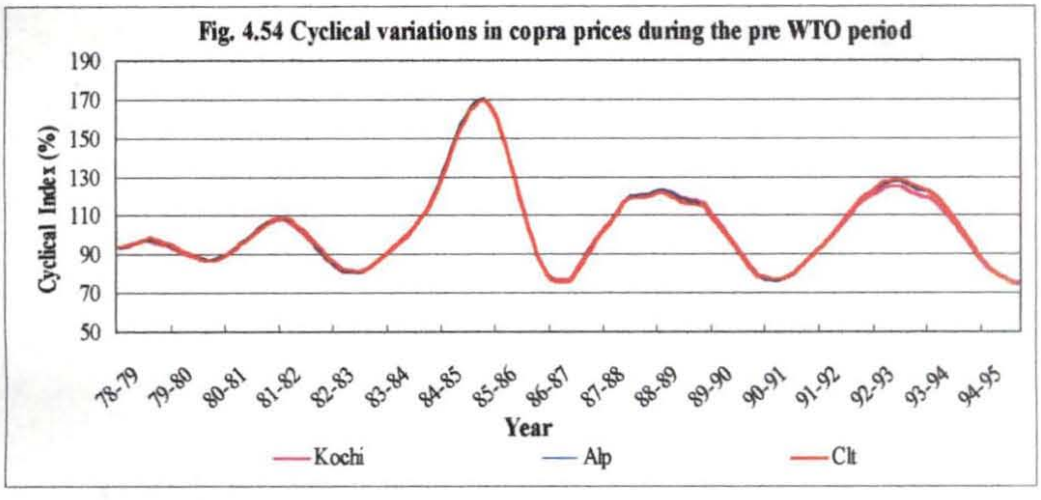


Fig. 4.54 Cyclical variations in copra prices during the pre WTO period
Cyclical Index (%)
190
170
150
130
110
90
70
50
78-79
79-80
80-81
81-82
82-83
83-84
84-85
85-86
86-87
87-88
88-89
89-90
90-91
91-92
92-93
93-94
94-95
Year
Kochi
Alp
Clt

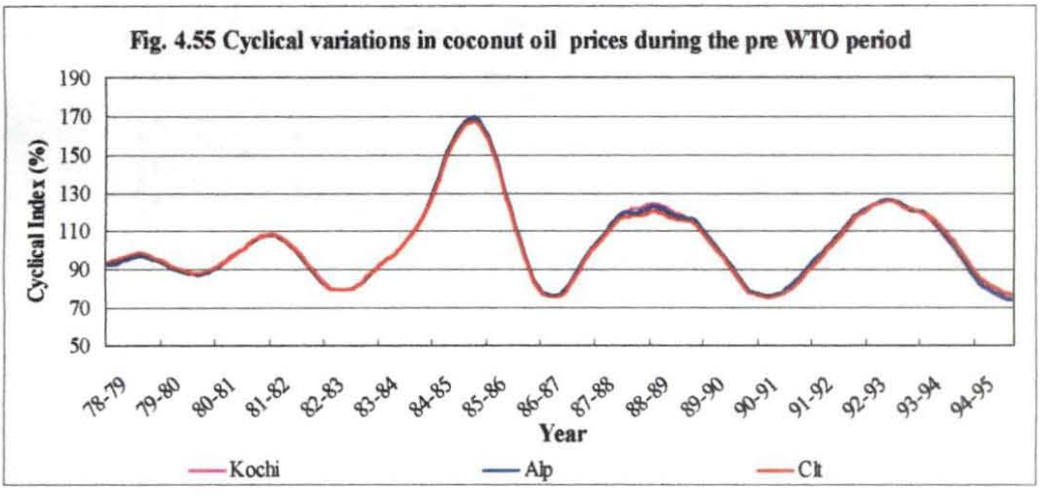


Fig. 4.55 Cyclical variations in coconut oil prices during the pre WTO period
Cyclical Index (%)
190
170
150
130
110
90
70
50
78-79
79-80
80-81
81-82
82-83
83-84
84-85
85-86
86-87
87-88
88-89
89-90
90-91
91-92
92-93
93-94
94-95
Year
Kochi
Alp
Clt

Fig. 4.56 Cyclical variations in coconut prices during the post WTO period

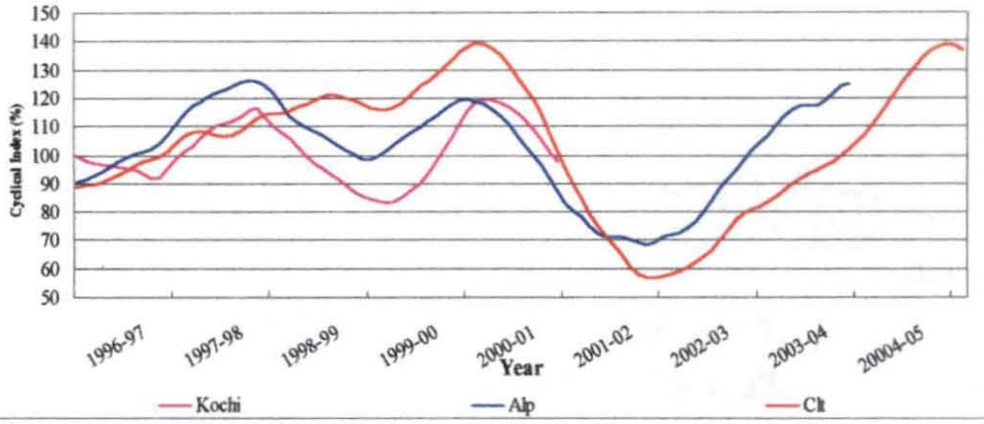


Fig. 4.57 Cyclical variations in copra prices during the post WTO period

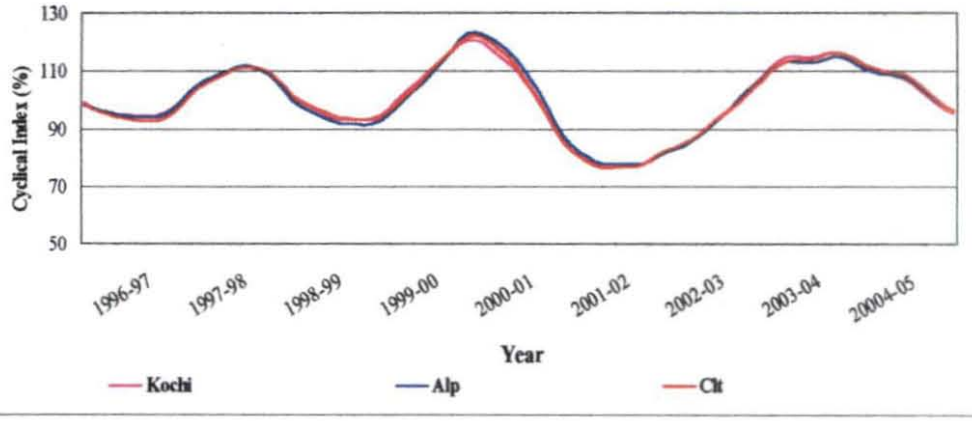
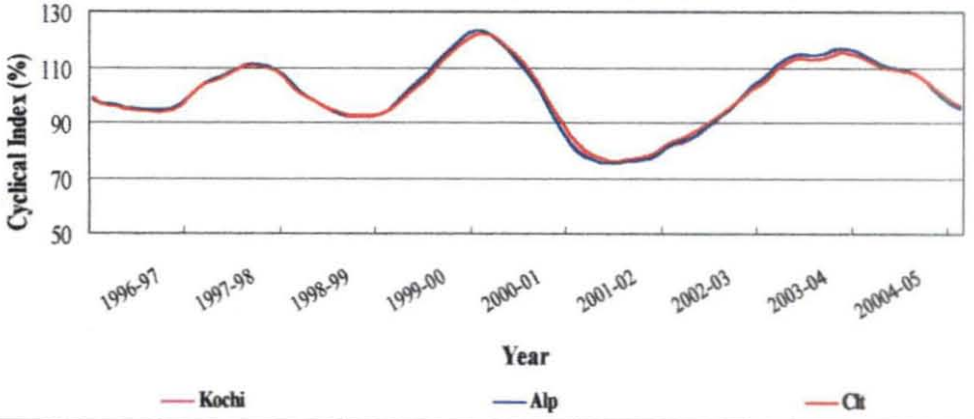


Fig. 4.58 Cyclical variations in coconut oil prices during the post WTO period



Copra and coconut oil prices exhibited closer association in the cyclical variation in the three major markets of Kerala in the post WTO period also. Though cyclical movement of coconut price was following the general pattern of copra and coconut oil, there was marked difference among its variations in different markets. During the post WTO part of the study, there were three complete cycles but the spread of the cycle was found to be increasing with years. The cycle length was two years during the initial years, where as it increased to more than four years by the latter period. The price cycles were found to fluctuate about 24 percent above and 44 percent below the average prices in the case of copra and coconut oil. This observation along with the increased spread of the cycle is suggestive of the fact that in the post WTO period, the amplitude of cyclical fluctuation has declined.

4.7.1 **Cyclical Price Variations in the International Market**

The cyclical indices were worked out for the international prices of copra and coconut oil in order to trace out possible interrelationships. The cyclical fluctuations for the pre WTO period and post WTO period are as depicted in fig. 4.59 and 4.60 respectively.

A perusal of the cyclical indices showed that international prices of copra and coconut oil are also showing well defined cyclical pattern. Cyclical fluctuation in copra and coconut oil prices were found to be moving in close association with each other as observed in the domestic market. The price cycle was found to fluctuate about 58 percent above and 43 percent below the average price during the pre WTO period and about 30 percent above 25 percent below during the post WTO period. It took two to four years to complete one cycle during the pre WTO period where as it became less frequent in the post WTO period suggesting that in the latter period, the amplitude of cyclical fluctuation has subdued considerably in the international

Fig. 4.59 Cyclical variations in the international prices of copra and coconut oil during the pre WTO period

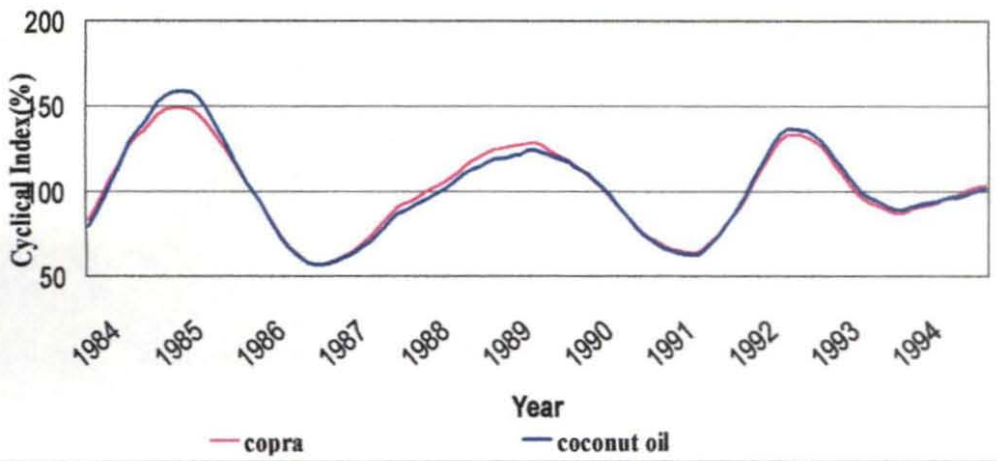
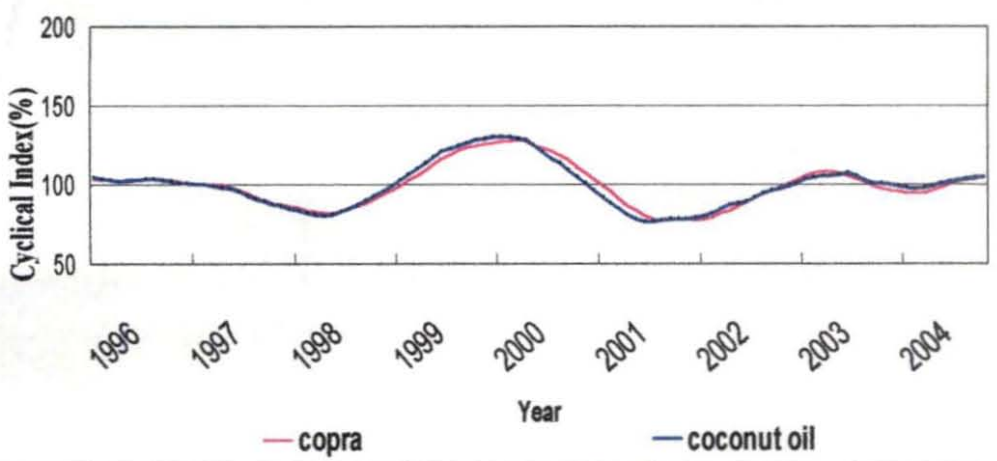


Fig. 4.60 Cyclical variations in the internationalprices of copra and coconut oil during the post WTO period



market. Thus, it is evident that the cyclical price behavior in the domestic market was similar to that observed in the international market. As the volume of domestic market is too small to influence the international market, it is obvious that the cyclical price behavior in the copra and coconut oil in the global markets are influencing the Indian market. Thus, the pulls and pushes in the international market in the bullish and bearish form are evident in the domestic market also.

4.8 IRREGULAR VARIATION

The indices of irregular variations were computed using the residual method by eliminating trend, seasonal and cyclical components from the original data. The indices are presented graphically in fig 4.61 to 4.78. The irregular indices showed that coconut, copra and coconut oil prices were highly unpredictable and did not maintain any uniform pattern over the period. However, there was marked similarity in the irregular price movements of copra and coconut oil. But the irregular variations in coconut price were found to behave differently from that of copra or coconut oil. Also there was marked dissimilarity in irregular variations among different markets trading in coconut. However, the episodic variations of larger proportion were similar in coconut, copra as well as coconut oil.

It was interesting to note that the extent of irregular variations was found to reduce with the level of product development. The intensity of irregular variation was more visible in the case of coconut than either in copra or coconut oil. This is expected also because coconut is a primary produce characterised by bulkiness and lesser storage life and also because of the reason that, coconut being a small holders crops, farmers do not retain the produce for long once harvested. But contrary to this, copra and coconut oil are handled by big traders who store it for comparatively longer

Fig 4.61.Irregular variations in coconut prices in Kochi market during the pre WTO period

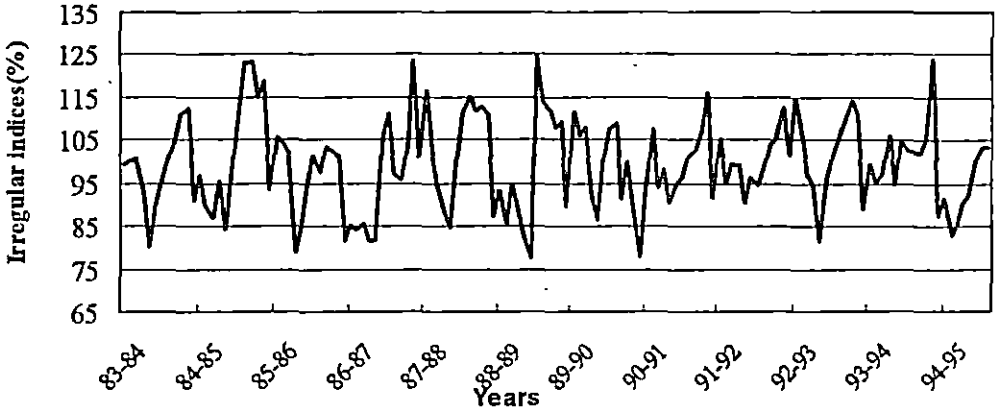


Fig. 4.62. Irregular variation in coconut prices in Alappuzha market during the pre WTO period

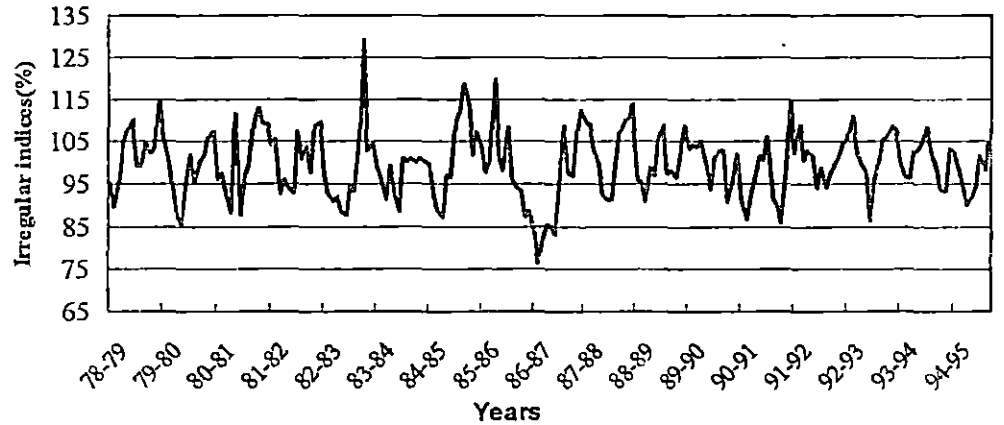


Fig. 4.63 Irregular variation in coconut prices in Kozhikode market during the pre WTO period

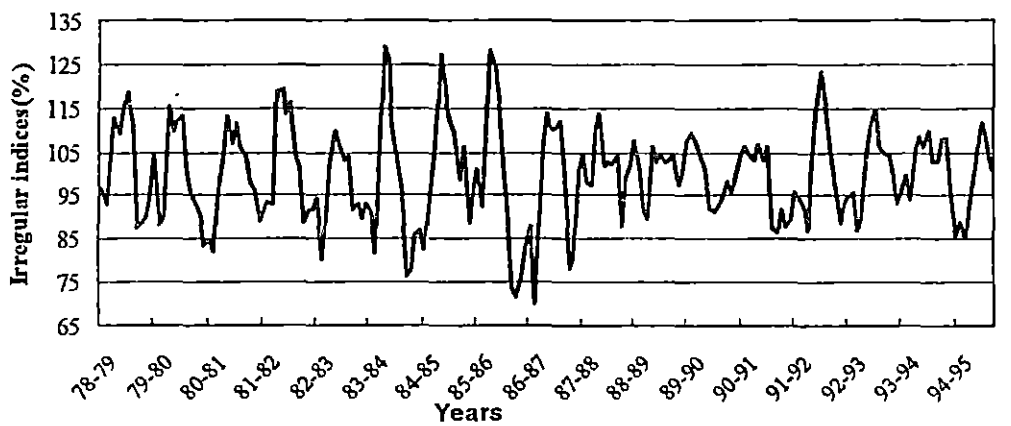


Fig 4.64.Irregular variations in copra prices in Kochi market during the pre WTO period

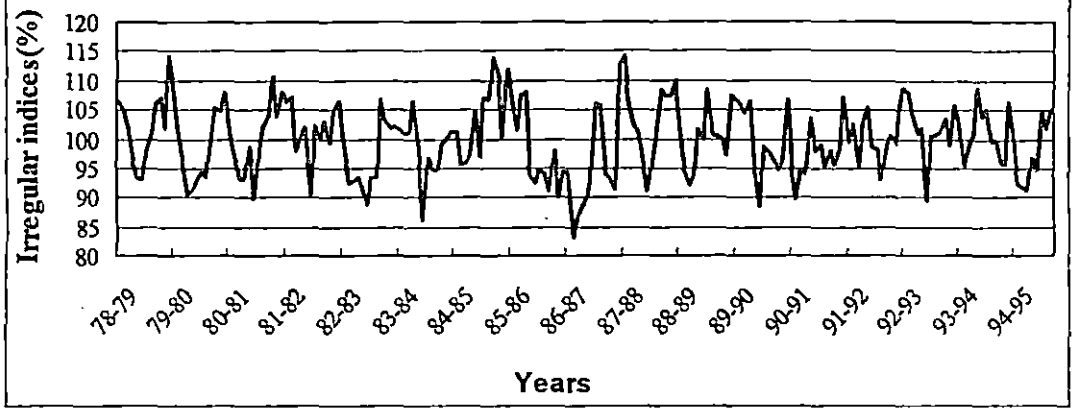


Fig 4.65 Irregular variations in copra prices in Alappuzha market during the pre WTO period

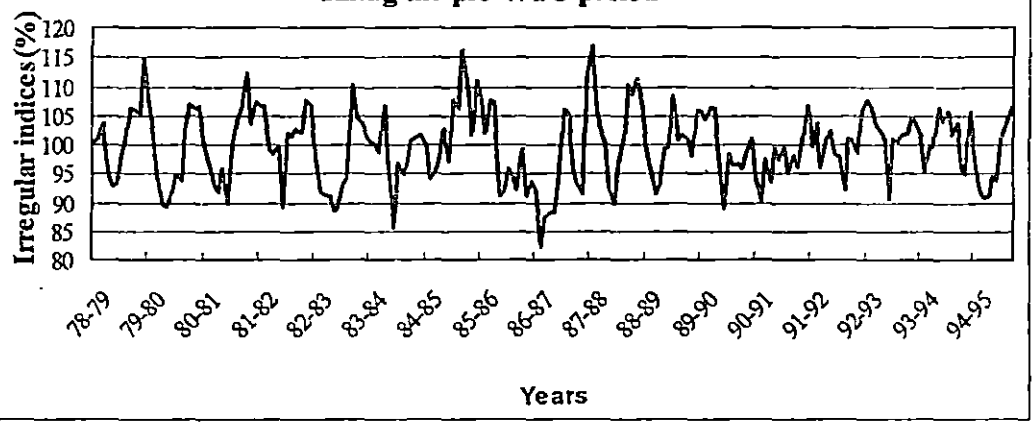


Fig 4.66 Irregular variations in copra prices in Kozhikode market during the pre WTO period

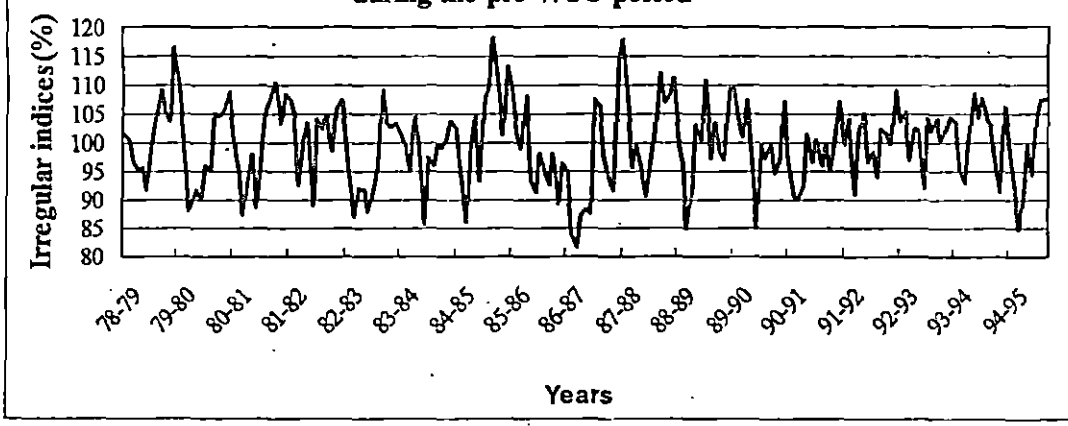


Fig 4.67 Irregular variations in coconut oil price in Kochi market during the pre WTO period

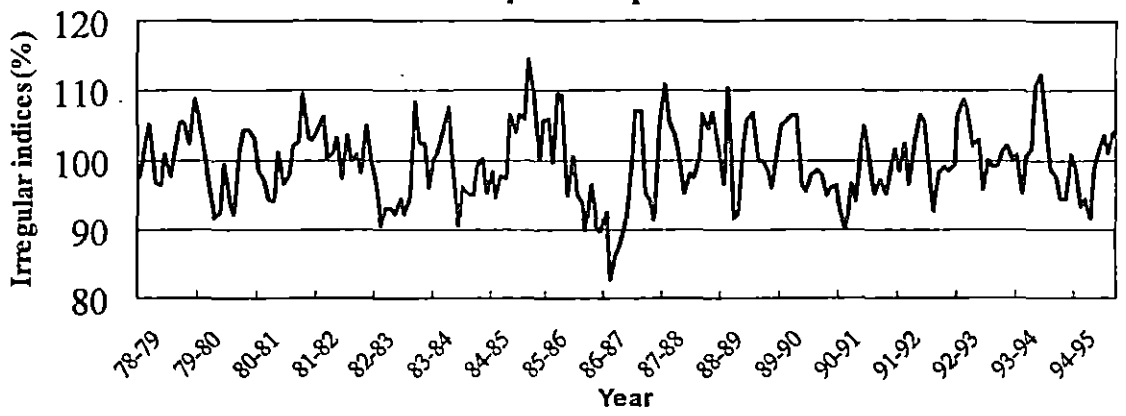


Fig 4.68 Irregular variations in coconut oil price in Alappuzha market during the pre WTO period

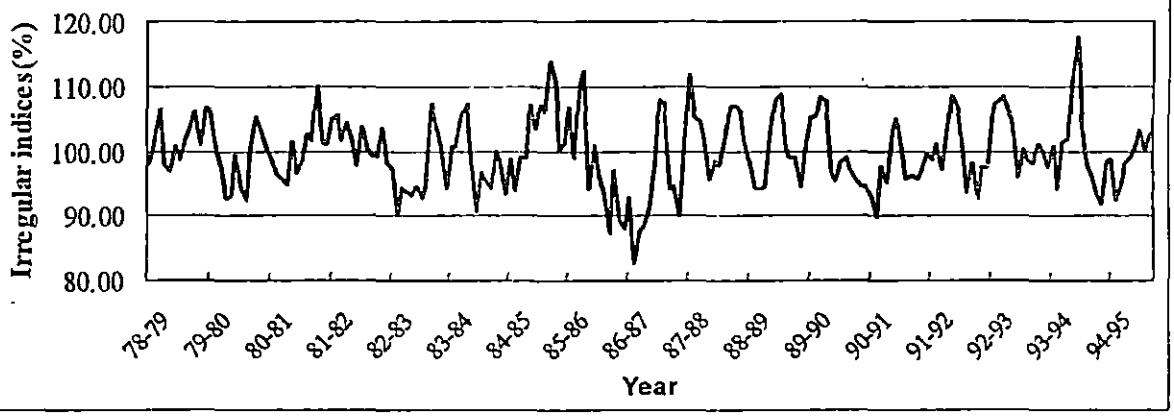


Fig 4.69 Irregular variations in coconut oil price in Kozhikode market during the pre WTO period

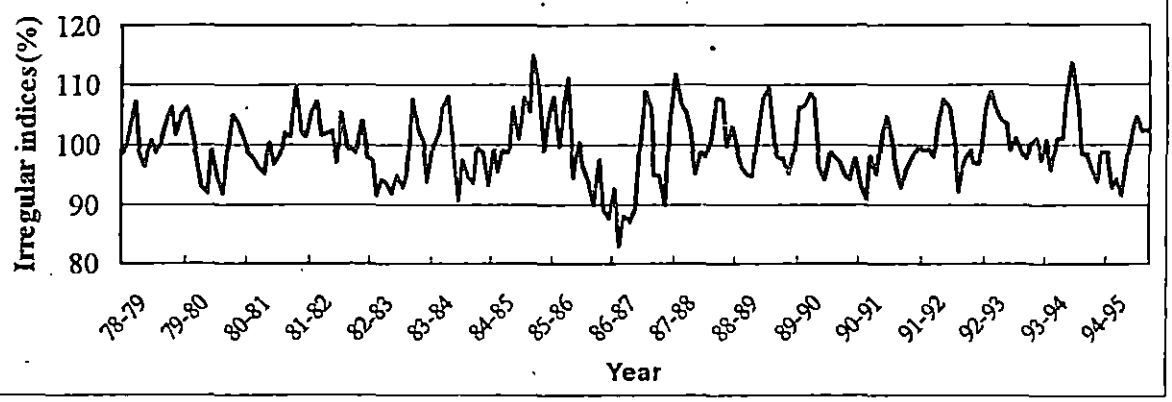


Fig. 4.70 Irregular variations in coconut prices in Kochi market during the post WTO period

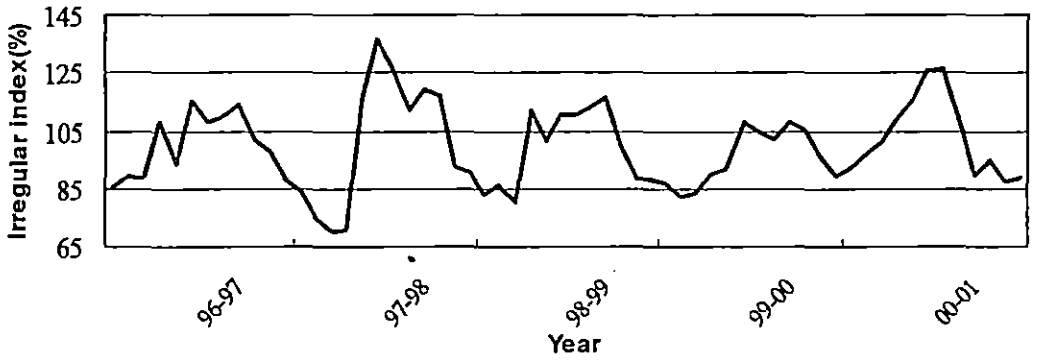


Fig. 4.71 Irregular variations in coconut prices in Alappuzha market during the post WTO period

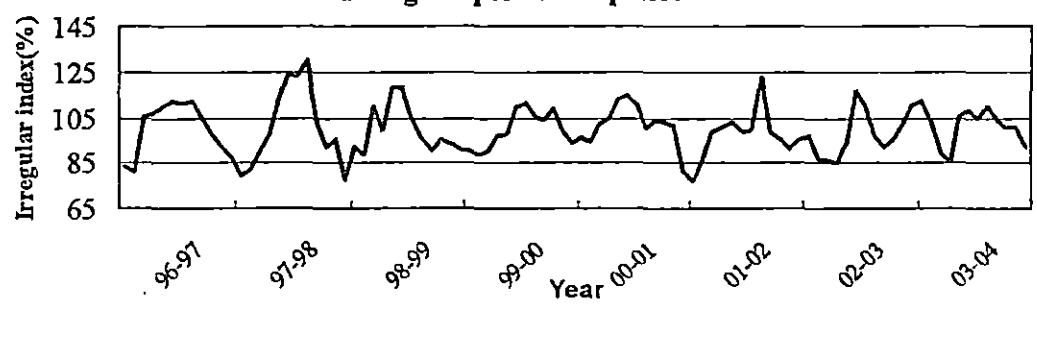


Fig. 4.72 Irregular variations in coconut prices in Kozhikode market during the post WTO period

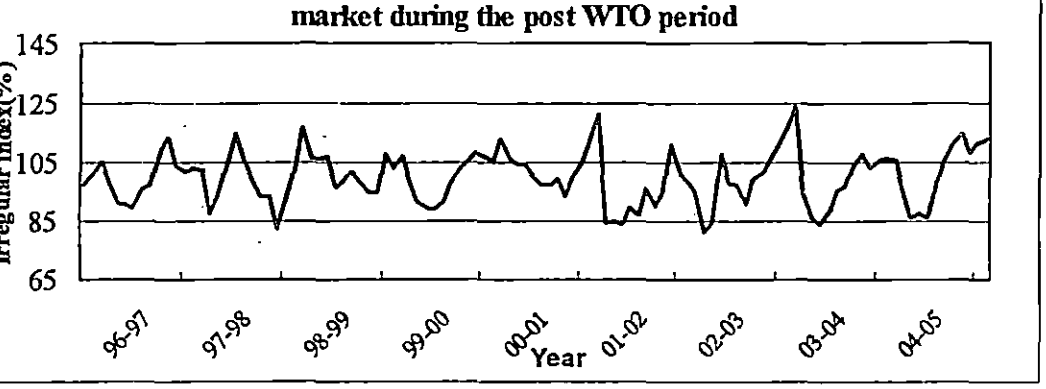


Fig. 4.73 Irregular variations in copra prices in Kochi market during the post WTO period

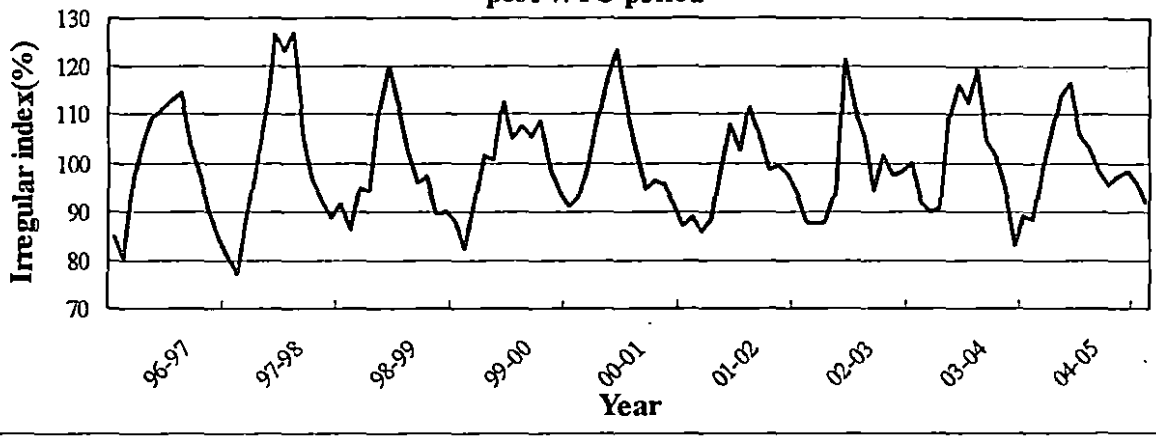


Fig. 4.74 Irregular variations in copra prices in Alappuzha market during the post WTO period

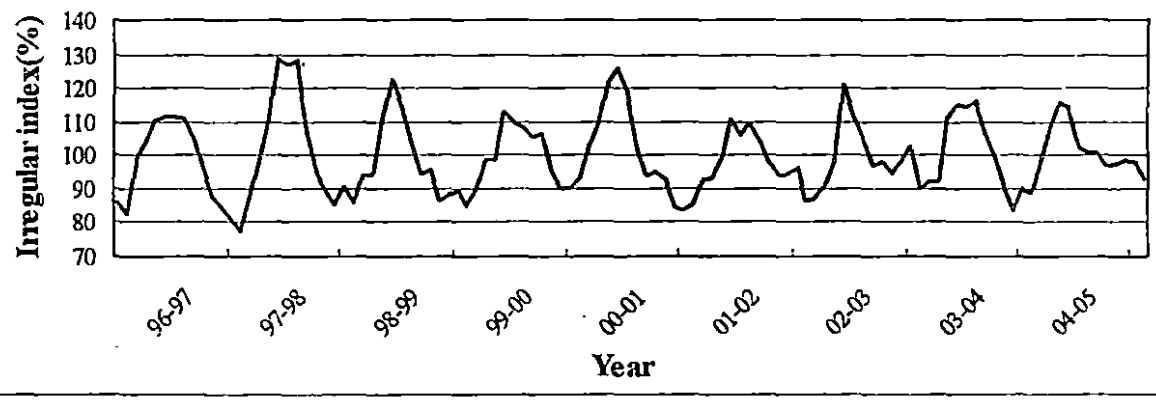
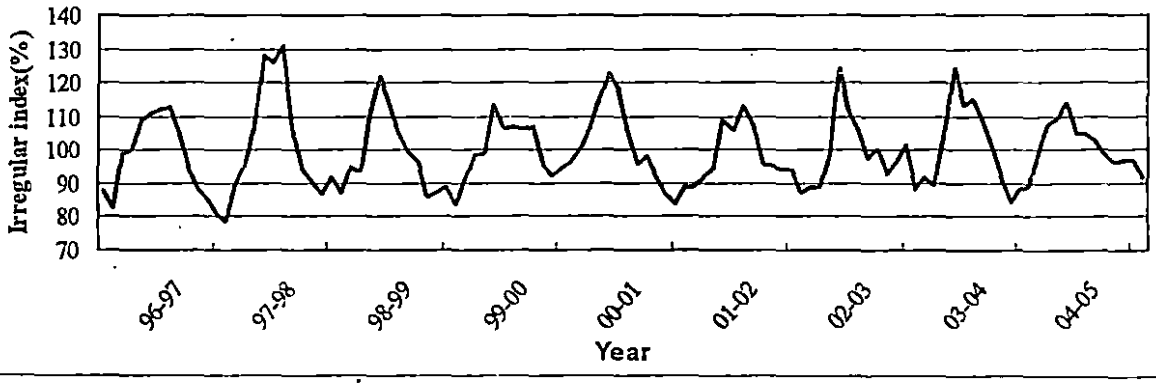


Fig. 4.74 Irregular variations in copra prices in Kozhikode market during the post WTO period



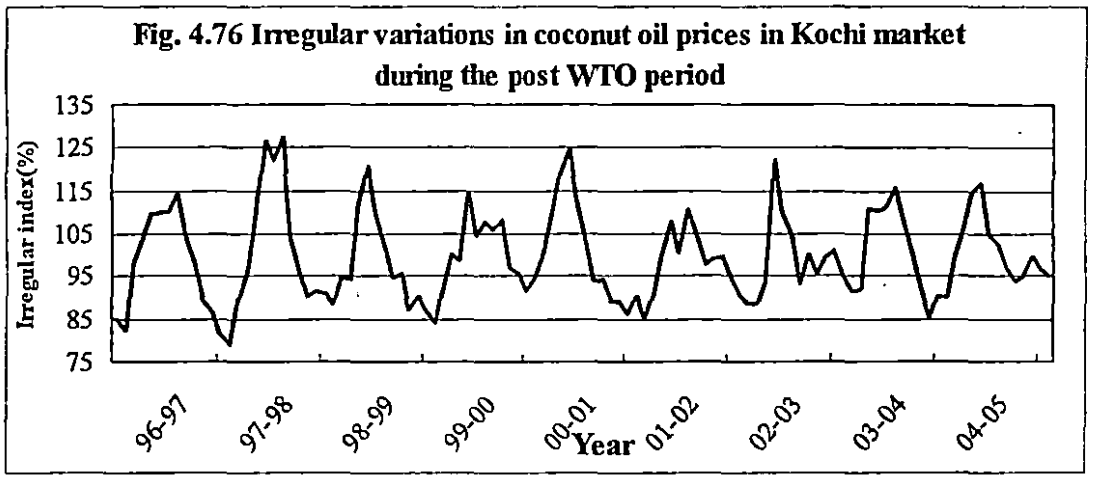


Fig. 4.76 Irregular variations in coconut oil prices in Kochi market during the post WTO period
Irregular index(%)
135
125
115
105
95
85
75
96-97
97-98
98-99
99-00
00-01
01-02
02-03
03-04
04-05
Year

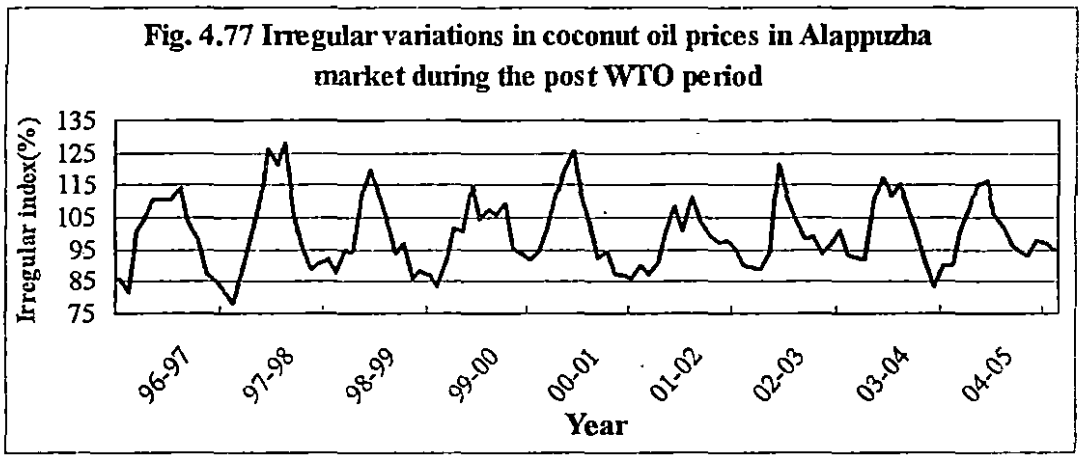


Fig. 4.77 Irregular variations in coconut oil prices in Alappuzha market during the post WTO period
Irregular index(%)
135
125
115
105
95
85
75
96-97
97-98
98-99
99-00
00-01
01-02
02-03
03-04
04-05
Year

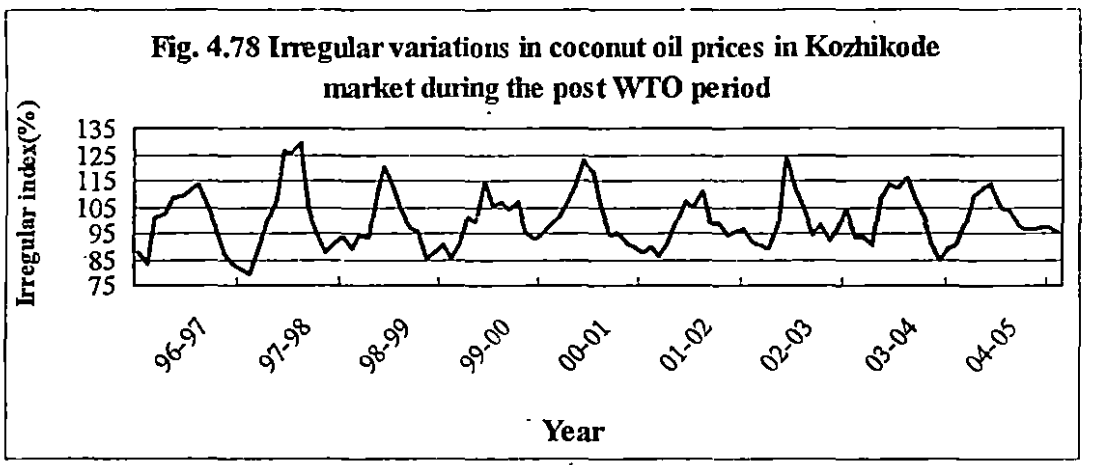


Fig. 4.78 Irregular variations in coconut oil prices in Kozhikode market during the post WTO period
Irregular index(%)
135
125
115
105
95
85
75
96-97
97-98
98-99
99-00
00-01
01-02
02-03
03-04
04-05
Year

period with an eye on profit. Consequently, in the case of copra and coconut oil prices are determining the supply rather than supply determining the price.

4.9 EXPORT COMPETITIVENESS

Indian agriculture faces both opportunities and challenges with liberalization of domestic and global markets. There is a need to develop a new strategy for the agriculture sector. Appropriate measures are required to move away from the subsidised and protected regime to an internationally competitive market structure. Therefore, an attempt was made to analyse the global competitiveness of coconut oil. The idea of export competitiveness is more comprehensive as it involves segmented markets, differential products, technology and difference in economics of scale. The export competitiveness of coconut has been calculated using the nominal protection coefficient (NPC) under an exportable hypothesis. The respective nominal protection coefficients are given in table 4.18. A perusal of figure shows that the domestic prices of copra and coconut oil have been consistently higher than the international prices, indicating lack of global competitiveness. The NPC ranged well over two in most years except during the second half of the nineties. This indicated that Indian copra and coconut oil were not competitive internationally under the exportable hypothesis.

The minimum support price (MSP) is intended to provide a guarantee to purchase copra at a pre-announced price for years when the market prices crashed beyond a point. This way, the government wanted to provide a minimum price guarantee to the producers. The Government of India started declaring minimum support price for copra from 1986 onwards. It could be observed that the MSP always remained higher than the international price. The domestic price was found to fall below the MSP level in five years out of the 13 years for which minimum support

4.21. **International prices and Nominal Protection Coefficients for copra and coconut oil**

(Price in Rs/Ql)

	Copra				Coconut oil		
Year	Domestic price	International price	MSP	NPC	Domestic price	International price	NPC
1983	1374	503	ND	2.73	2074	741	2.80
1984	2198	803	ND	2.74	3319	1308	2.54
1985	1300	479	ND	2.71	1977	733	2.70
1986	1422	249	ND	5.70	2149	374	5.74
1987	1991	397	ND	5.02	3054	573	5.33
1988	2104	554	ND	3.80	3160	787	4.02
1989	1605	562	ND	2.85	2415	836	2.89
1990	1802	403	1600.00	4.47	2727	588	4.64
1991	2660	667	N.D.	3.99	4060	1012	4.01
1992	2985	1066	N.D.	2.80	4543	1620	2.81
1993	2580	924	2150.00	2.79	3915	1407	2.78
1994	2165	1310	2360.00	1.65	3234	1907	1.70
1995	2316	1425	2500.00	1.63	3460	2177	1.59
1996	2967	1736	2500.00	1.71	4456	2669	1.67
1997	3484	1573	2700.00	2.21	5258	2386	2.20
1998	2928	1702	2900.00	1.72	4404	2726	1.62
1999	3506	1991	3100.00	1.76	5446	3181	1.71
2000	2324	1404	3250.00	1.66	3430	2014	1.70
2001	2046	950	3300.00	2.15	3101	1500	2.07
2002	2871	1294	3300.00	2.22	4328	1937	2.23
2003	3861	1397	3320.00	2.76	5867	2176	2.70
2004	4267	2045	3500.00	2.09	6479	3015	2.15

ND- Not Declared

Fig. 4.79 International and domestic price of copra along with Minimum Support Price

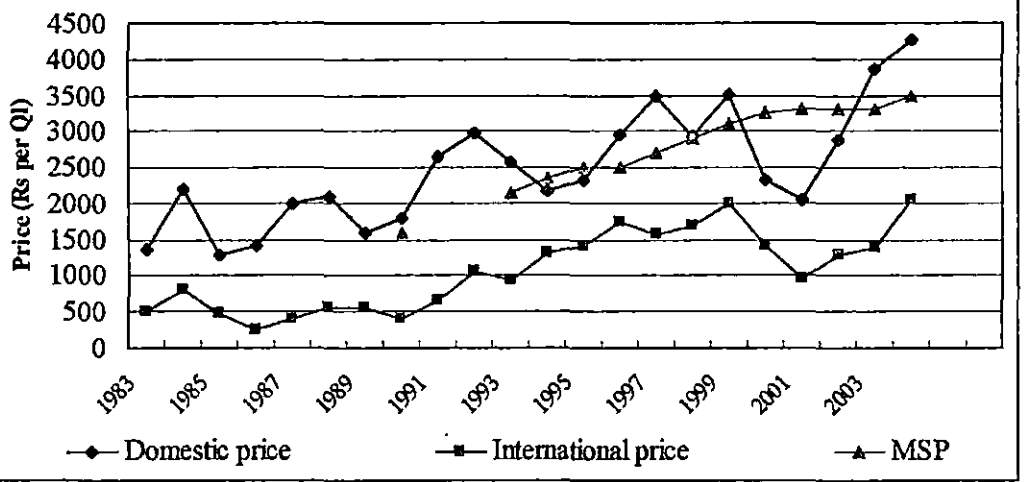
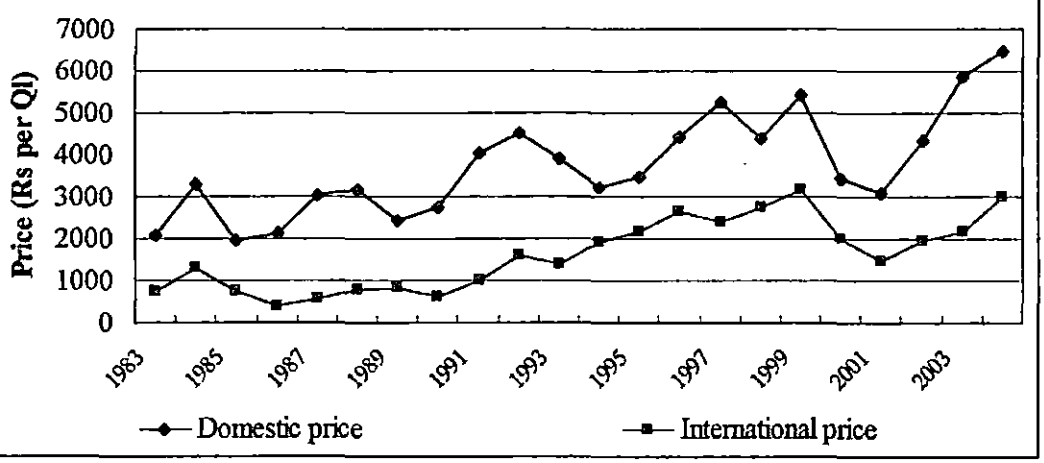


Fig. 7.80 International and domestic prices of coconut oil



price was declared. Even then, the MSP as well as the domestic prices were higher than the international price. It indicates that price stabilization measures initiated by the government were an effective subsidisation by providing a cushion to coconut growers.

4.10 POLICY ANALYSIS

With a population of over one billon, India is the second most populous country in the world. Vegetable oil is an essential culinary item in India. We are consuming 12.75 million tonnes of edible oil annually. But we are producing only 7.5 million tonnes annually and this is grossly inadequate to meet our demand (Government of India, 2005b). Since there has been a continuous excess of demand over domestic supply, import of edible oils has been resorted to for more than two decade to make the item of mass consumption easily available to the consumers at reasonable prices. Presently, we are meeting nearly 50 percent of our requirement from imported sources and the edible oil import alone occupies almost 50 percent of the agricultural import value of the country. This is not a healthy practice not only because it is affecting the oilseed growers badly but also cause undue burden to the state exchequer by way of foreign exchange commitments. Therefore, it goes with out saying that a viable policy harmonizing the interest of the growers, consumers and processors shall constitute the basis of a sound edible oil policy. With this objective in mind the Government of India has enacted a host of measures in the edible oil sector over a period of time since independence. The present chapter is an attempt to review these policy changes and to suggest policy fine tunings especially in the light of new WTO provisions to which India is also a signatory.

India was self sufficient in vegetable oils in the 1950s. However, by the 1960s the domestic demand-supply equilibrium almost vanished. The turning point

came in 1988, when the country faced shortfall of two million tonnes of oil, necessitating imports worth one billion US dollars. Alarmed at this situation, government made a concerted effort to make oilseeds more attractive to growers, through a combination of specialized extension campaigns. The high-profile Technology Mission on Oilseeds (TMO) was launched in the country during March 1986. This was a turning point transforming the Indian oil seed sector. As a result, the country became almost self-sufficient in edible oil by the year 1992-93 (Kumar and Jha, 2005). There is no doubt that the remarkable progress made by India during the early phase of TMO was possible with appropriate policy and institutional support from the Government. The MSP was deliberately used by the Government to create a favourable atmosphere for the oilseeds sector.

Till 1993-94, the oilseed sector was highly protected through various types of control and interventions. In order to protect the domestic oilseed sector, imports were slashed to 0.37 million tonnes in 1988-99. Imports were further reduced to a mere 0.10 million tonnes in 1991-92. The reduced imports resulted in price hike in the domestic market for edible oils due to the demand supply imbalances. All the imports prior to 1994 were canalised directly by India's State Trading Corporation (STC) and subject to state-imposed import quotas. Imported oils were passed on to state government for sale in Public Distribution System (PDS) at administered prices. Similarly, export of oilseeds and edible oils were also banned in view of the gaps in production and consumption till 1994. Restrictions were imposed on storage and movement of oilseeds and edible oils. Futures' trading was also banned for oilseeds and edible oils. Working capital availability was restricted for trade and processing of oilseeds and oils under the Selective Credit Control programme. Expelling of rapeseed-mustard, groundnut and sesame were reserved for the small-scale industries. Under the circumstances a rebate in excise was admitted to promote non-conventional oils.

However, the liberalization of Indian economy at this point of time fundamentally changed the import regime of India's edible oil particularly in 1994. With the commitments under Uruguay round Agreement on Agriculture, India had to remove all quantitative restrictions (QR) of imports of edible oil. Under the new WTO rules, imports are to be regulated through tariffication. Uruguay round agreement provided option to member countries to convert QRs to equivalent tariffs and provided a mechanism to declare maximum level of tariff for each commodity. As per this provision, India could impose a tariff up to 45 percent for crude or refined soybean oil imports. Tariffs on all other edible oil imports were bound at 300 percent, except refined rapeseed oil and crude sunflower-safflower oils, which were subject to tariffs of 75 and 85 percent respectively. As part of its obligations under WTO rules, India eliminated the state monopoly on imports and placed the imports under a privatised Open General License (OGL) system at 45-85 percent import duty. The maximum tariff ceiling bindings established by India for the oilseed sector was much below the bound tariff for the refined oils like Refined Bleached Deodorised (RBD) Palmolin, which is a close substitute for coconut oil, perhaps keeping in mind the interest of consumers with low purchasing power.

The subsequent years witnessed further liberalization measures and the government abolished or repealed the controls and restrictions imposed in the oilseed sector. The calendar of shifts in edible oil policies of the Government of India is presented in table 4.20 In February 1995, soyabean import was permitted to private processors under conditions of export of oil meal. Exports of sunflower, rapeseed-mustard were also allowed in May 1995.Working capital restriction on trade and processing of oilseeds and oils under selective control were lifted in 1996. In 1997, storage restriction on oilseeds was removed and in 1998, import of oilseeds was put

under OGL. Futures' trading was permitted in major oils from 1999 onwards. However, futures' trading was permitted in coconut oil w.e.f. 29 October 2001.

When edible oil imports were placed under the OGL system in 1994, private traders were permitted to import any quantity of vegetable oils, subject only to a tariff. The tariff was initially set at 65 percent on all edible oils—still relatively high, but significantly below the implied tariff when imports were under quantitative controls In 1995-98, India's tariff structure was relatively simple and increasingly liberal—with a common applied *ad valorem* (percentage) tariff for all oils progressively lowered to a uniform rate of 16.5 percent by the middle of 1998 (Government of India, 2005). Importers responded to the lower tariffs and declining international prices by importing 4.6 million tonnes of vegetable oil in 1998-99, up sharply from earlier levels, and more than double the level of imports in 1997-98.

Table 4.22 Calendar of policy shift in Indian edible oil sector

1991	Licensing of solvent extraction units removed
1992	Blending of two oils permitted
April, 1994	Import of RBD Palmolein placed on OGL with 65% import duty.
February, 1995	Import of soyabean oil permitted to private traders
March, 1995	Import of all edible oils (except coconut oil, palm kernel oil, RBD palm oil, RBD palm stearin) placed on OGL with 30% import duty.
May, 1995	Export of sunflower, rapeseed-mustard oil permitted
1996-97 (in regular Budget)	Further reduction in import duty to 20% +2%(special duty of customs) bringing total import duty to 22%. Another special duty of custom @ 3% was later imposed bringing the total import duty to 25%.
1997	Storage restriction on oilseeds removed
July, 1998	Import duty further reduced to 15%.
1999-2000 (Budget)	Import duty raised to 15% (basic) + 10%(surcharge)=16.5%.

December, 1999	Import duty on refined oils raised to 25% (basic) + 10% (surcharge) = 27.5%. In addition, 4% SAD levied on refined oils.
June, 2000	Import duty on crude oils raised to 25% (basic) + 10% (surcharge)=27.5% and on refined oils raised to 35%(basic)+10%(surcharge)+4%(SAD)=44.04%. Import duty on Crude Palm Oil (CPO) for manufacture of vanaspati retained at 15% (basic) + 10%(surcharge)=16.5%.
November, 2000	Import duty on CPO for manufacture of vanaspati raised to 25% and on crude vegetable oils raised to 35%. Import duty on CPO for other than vanaspati manufacture raised to 55%. Import duty on refined vegetable oils raised to 45%(basic)+4%(SAD)=50.8%. Import duty on refined palm oil and RBD palmolein raised to 65%(basic)+4%(SAD)=71.6%.
March, 2001 (As amended on 26.4.2001)	Import duty on crude oils for manufacture of vanaspati/refined oils by the importers registered with Directorate of VVO&F raised to 75% (for others import duty levied at 85%) except soyabean oil, rapeseed oil and CPO at 45%, 75% and 75% respectively. The duty on refined oils including RBD Palmolein raised to 85% (basic) except in the cases of Soyabean Oil and Mustard oil where the duty is placed at 45%(basic) and 75%(basic) respectively due to WTO binding. In addition, 4% SAD levied on refined oils.
October, 2001	Import duty on Crude Palm Oil and its fractions, of edible grade, in loose or bulk form reduced from 75% to 65%. Futures trading permitted in coconut oil
November,2001	Import duty on crude sunflower oil or safflower oil reduced to 50% up o an aggregate of 1,50,000 MTs **(Tariff Rate Quota)** of total imports of such goods in a financial year **subject to certain condition.** Import duty on refined rape, colza or mustard oil reduced to 45% up to an aggregate of 1,50,000 MTs **(Tariff Rate Quota)** of total imports of such goods in a financial year **subject to certain condition.**
March, 2002	Statusquo on import duty structure of vegetable oils/edible oils maintained. Import of vanaspati from Nepal be levied SAD @ 4%.
August,2002	SAD is not applicable on vanaspati imported from Nepal under TRQ.
March, 2003	Statusquo on import duty structure of vegetable oils/edible oils maintained.
April,2003	Import duty on Refined Palm Oil and RBD Palmolein reduced from 85% to 70% and SAD not applicable on edible oils.

July, 2004	Import duty on Refined Palm Oil and RBD Palmolein raised from 70% to 75%
February,2005	Import duty on Crude Palm Oil and Crude Palmolein raised from 65% to 80% Import duty on Refined Palm Oil and RBD Palmolein raised from 75% to 90%

(Source: Government of India, 2005)

India being the largest importer of edible oil in the world, the Government of India began making frequent tariff adjustments to safeguard the interest of the domestic oilseed producers and processors from imports and to smooth the effect of fluctuating world prices on domestic consumers w.e.f 1998. Although applied tariffs fell in 1999 after an initial hike in June 1998, the trend after April 2000 was incremental increases to applied rates for all oils, with adjustments being made to the relative rates on different types of oil—e.g., palm versus soyabean oil and crude versus refined oil—creating a more complicated tariff structure. Thus, it can be seen that, India has used the flexibility within its WTO commitments to make frequent policy adjustments in response to evolving domestic and international market conditions. These adjustments made the overall import demand and the market shares of different imported oils uncertain.

In addition to adjusting tariffs, the government established a Tariff Rate Value (TRV) system for palm oil in August 2001 and for soyabean oil in September 2002. The TRV system is intended to prevent under invoicing by importers and establishes a government reference price for tariff calculations. The reference prices are supposed to be periodically revised to reflect actual market prices, but in practice, delays in making these adjustments have resulted in tariff assessments different from what would have occurred had tariff rates been applied to actual market prices.

The dramatic decrease in self-sufficiency in the last 5 years is a clean indication that globalization has already made an impact of far reaching

consequences in this sector. The country was almost self-sufficient in edible oils during 1991-92 to 1994-95 when the sufficiency level was in the range of 95 to 98 percent. However, gradually it has declined to about 53 percent by 2002-03. Trade policy reforms in the mid-1990's, coupled with declining domestic oilseed production, fuelled the resurgence of imports and India's descendance from a near self-sufficient in the mid-1990's to the world's leading net importer since 1998.

As far as the policy on coconut oil and Refined Bleached (RBD) palmolin as well as crude palm oil (CPO)-both close substitutes for coconut oil- are concerned, the policy options have remained a class apart from the rest of the edible oils. This is due to the reason that around 30 percent of coconut oil is used as edible oil that too in the state of Kerala and in pockets outside where non-resident Keralites dominate. It means that the bulk of coconut oil is having industrial uses in soap, toiletry and cosmetic industries. It is also finding new uses in the paint industry, pharmaceuticals, automobiles lubricants etc.

Table 4.23 Present custom duty structure of crude and refined edible oils

Item Description	WTO	Current rates of	Current rates of
Soyabean Oil	45	45	45
Palmolein	300	80	90
Palm Oil	300	80	90
Groundnut Oil	300	75	85
Sunflower/Safflower Oil	300	75	85
Coconut Oil	300	75	85
Rapeseed/Mustard Oil	75	75	75
Other Oils	120/300	75	85
Oilseeds	45	-	-

(Source: Government of India, 2005b)

It is a fact that the Indian coconut industry was subjected to international competition prior to the liberalization regime. Imports of close substitutes like crude palmolein and palm oil for industrial uses were diverted to the edible sector. Even when the imports of all edible oils were placed on OGL with 30 percent import duty w.e.f. April 1994, coconut oil, palm oil and RBD palm stearin were exempted. However, the country witnessed a surge of import of palm oil and its variants during the period from 1994 onwards; the duty on CPO was raised to 75 percent while that of RBD palm oil was raised to 85 percent with effect from April 2001 in order to protect the domestic industry from possible injury. This represents a period of temporary reduction in palm oil import. However, the import duty on CPO was reduced to 65 percent during October 2001. The import duty on refined palm oil and RBD were raised to 75 percent on crude palm oil and RBD palmolin were raised from 65 percent to 80 percent and that of RBD palmolin and refined palm oil were raised from 75 percent to 90 percent with effect from February 2005. The present edible import duty and WTO binding duty are as furnished in the table 4.23. While bound tariff of palm oil is 300 percent, the current applied rate is kept at a much lower rate of 90 percent. This gap in bound rate and applied rate is noticeable for all and applied rate is noticeable for all edible oils except soyabean oil and rapeseed mustard oil. Coconut oil was one of the four major edible oils that were listed for forward trading in the country. The Government of India banned futures trading in coconut oil in October 1971. On 29 October 2001, Government of India permitted futures trading in coconut oil after a gap of 30 years. It can be noted from table 4.24 that the volume of futures trading in coconut oil is increasing steadily now. It is an evidence of increasing stakeholders in making use of the price discovery and risk management aspects of futures trading in order to avoid the spot price volatility.

Table 4.24 Volume of coconut oil transacted under futures trading

(in million tonnes)

Month	Year			
	2001-02	2002-03	2003-04	2004-05
April	-	1012	1842	3366
May	-	808	2416	3854
June	-	1254	3464	6540
July	-	1474	2936	6054
August	-	1758	2940	5978
September	-	1628	2990	7246
October	32	2366	3612	7690
November	528	3286	3688	6080
December	474	3638	3544	7010
January	464	2886	3172	7778
February	442	3062	4704	8312
March	404	3624	6524	NA
Total	2344	25806	41832	69908

(Source: Coconut Development Board, 2005)

The policy analysis brings to fore the fact that, there was no sound long-term policy on the coconut oil and palm oil segment of edible oil economy of India. There have been short-term measures, which are more of *ad hoc* and of fire fighting nature than long term systematic policy fine-tuning. This may be due to the diverse interest represented by oil crushers, who have got under utilized capacity and face shortage of

Summary and conclusion

5. SUMMARY AND CONCLUSION

The oilseed sector in India is a crucial segment of out farm economy. The coconut-based industry in India revolves around the price behaviour of coconut oil, which in turn depends on the price and overall availability of other vegetable oils. It is against this background that the study entitled "Price behaviour of coconut and coconut products in India" was undertaken with the specific objective to study the secular trend, seasonality and irregular movements in the price of coconut and major coconut products in India, and to assess the implications of liberalized exim policies. The study was conducted during the year 2004-05.

The study was based on the secondary data published from various institutions and organization. Secondary data were collected from the head quarters of the Coconut Development Board, Kochi; State Planning Board, Thiruvananthapuram; Directorate of Economics and Statistics, Government of India and from the official websites of Food and Agricultural Organization, Rome, Ministry of Finance and Ministry of Consumer Affairs and Public Distribution.

The trend in area, production and yield of coconut at world, national and state level over a period of 45 years from 1960-61 to 2004 –05 were fitted using different trend lines for the data in hand. The best fit was selected based on the adjusted R^2 values, outlier values and standard error of the estimate. Out of the different functional forms like linear, quadratic, cubic, exponential, power, logistic and compound functions tried, cubic model was found to give the best fit for area, production and yield of coconut. Decade wise compound growth rate (CGR), of area, yield and production of coconut in the state, national and world level were also estimated.

The analysis showed that the global area under coconut has witnessed a sharp expansion during the sixties and seventies. However, there was a negative growth rate in the acreage in the new millennium. Among the major coconut cultivating countries, Philippines showed the highest annual growth of more than five percent during the sixties and seventies. Coconut plantations in India underwent significant improvement in area during the sixties, eighties and nineties. Growth rate, however, shows deceleration of late. Coconut acreage in Kerala expanded significantly during the fifties, sixties and during early seventies. However, a negative growth rate in area is recorded for the period 2000-05 while states likes Tamil Nadu and Karnataka have made tremendous strides in coconut cultivation during the last two and a half decades.

The productivity of coconut at the world, national and state level was observed to be a highly fluctuating one. World coconut productivity was found to decline drastically during the sixties and seventies. However, the situation was found to improve of late. Even though the yield of coconut in the country has increased in the long run, the tendency during the sixties, seventies and early part of eighties was to decline with a sharp recovery notable during the nineties. All the major producing states are facing yield decline in the recent past with the notable exception of Andhra Pradesh.

The global coconut production experienced consistent improvement during the seventies, eighties and nineties. However, the production decelerated towards the end of the millennium. Coconut production in India recorded a positive growth during the sixties, eighties and nineties only; where as negative growth can be observed during the new millennium. The major coconut producing states in India like Kerala, Tamil Nadu and Karnataka are showing negative growth in production during new millennium.

There is a clear shift in the export basket of coconut products. In the sixties, coconut oil cake was the major item exported, contributing to about 97 percent of export earning. By the eighties, copra became the major export earner as far as export of coconut products were concerned, forming 43 percent of export earnings. In the nineties, coconut oil became the major export earner, accounting for 79 percent of the export earnings. By 2003-04, coconut oil and coir products became major export earners, contributing to 45 and 44 percent of export earnings from coconut products. Similarly, copra was the major item of import in the sixties. In the eighties, import of coconut oil became substantial, accounting for nearly 90 percent of the import value of coconut products, relegating copra to 10 percent. Coconut oil continues to be a major item of import as far as import of coconut products are concerned.

The price behaviour of coconut and its products were studied by subjecting the monthly average prices of coconut, copra and coconut oil from three main market centres viz., Kochi, Alappuzha and Kozhikode to the techniques of classical time series analysis. The total period of the study from 1977-78 to 2004-05 was divided into two sub periods; one before 1995(pre WTO) and after 1995(post WTO), in order to get insights into the possible implications of WTO led market regime on Indian coconut economy.

Secular trend was estimated by fitting various functional forms and the model of best fit was selected by taking R^2 values, standard errors and outliers as the criteria. The R^2 values were comparatively lower indicating the highly fluctuating nature of the prices. It was evident that a host of external factors are influencing the price behaviour in coconut and historical trend alone cannot explain the variations fully. However, compound growth function was found to be able to explain the pre WTO period price variations where as cubic models gave satisfactory fit for the post WTO

period price trend. The prices of coconut, copra and coconut oil a general tendency to increase over a period of time in all the markets situations. The domestic price of copra and coconut oil was higher than the international price through out the period under study.

Inter-correlation matrix of the price in the major market centres in India as well as with international market was carried out to understand the level of market integration. The study showed that Kochi, Alappuzha and Kozhikode markets were well integrated for coconut, copra and coconut oil. It was also found that the domestic markets were integrated with the international market, but the level of integration was relatively low.

There was marked seasonal variations in the prices of coconut and its products in all the major market centres. It was found that coconut prices tended to be low during the months of peak production and prices ruled high when production was low thus denying the farmers the advantage. Price movement for coconut, copra and coconut oil were more or less similar. There was marked similarity in the price movement of coconut in all the market except Kozhikode where a different pattern was found to follow owing to the difference in arrival pattern. For copra and coconut oil months from September to January was found to be the buoyant phase with the peak falling in November- December. The depressed phase was observed in May to August. The peaking and depression were found to have advanced by one or two months in the post WTO period compared to pre WTO period. In the international market also the period from September to January was observed as the time of price buoyancy but a second peak was witnessed during June-July, which was a depressed phase in the domestic market.

Price cycles were observed in all the three domestic markets studied for coconut, copra and coconut oil. The cycle length varied from three to four years suggesting that market buoyancy and depression could be observed in the coconut markets once in three or four years. A comparison of the cyclical pattern in the international market with that of the domestic prices showed that the cyclical fluctuations in the international market and the domestic markets were similar. It was suggestive that the cyclical fluctuations in the international market might have been transmitted to the domestic market. It was also interesting to note that the amplitude of cycle was found to wane in the post WTO period of the study.

The study also revealed that there was wide spread irregular movements in the price of coconut and its products under reference. The irregularity in the copra and coconut oil prices in all the domestic markets were more or less similar. There were indications than the irregular movements contributed to higher price fluctuations.

The export competitiveness of copra and coconut oil were also studied using the nominal protection coefficient. It revealed that both copra and coconut oil are not trade competitive in the international market at the existing price levels. As already indicated, the domestic price of copra and coconut oil were consistently higher than their international prices.

A review of the policy of Government of India with regard to edible oil sector was also carried out in order to identify areas of policy fine-tuning required. It was found that the general policy measures and options of Government of India with regard to the edible oil sector in general and that of coconut oil and palm oil on the other hand were different. Instead of having a systematic and long-term policy framework *ad hoc* short term policy interventions were evident, which were of a fire fighting nature in the face of crises. The import duty structure was found to be

inadequate to regulate the surge of imports of palm oil and its variants from 1994 to 2003.

The following policy interventions are suggested based on the above findings:

1. At present the coconut productivity in the country is very low when compared to the productivity in the competing countries like Philippines and Indonesia. To add to the woes, the domestic prices of copra and coconut oil have been consistently higher than that of the international prices. This renders the Indian coconut economy non competitive at the global level. In order to provide more trade competitiveness to coconut products from India, productivity enhancement measures such as adopting scientific package of practices for nutrient supply, soil and water management measures, timely plant protection operations etc are needed.

2. A sizeable portion of bearing coconut palms in the traditional belts like Kerala have reached the stage of senility, and every year the percentage of senile palms are increasing substantially. As the production potential of these plants are low, it requires a concerted effort aimed at replanting the senile palms with higher yield potential.

3. The coconut economy in India is linked with the demand for and price of coconut oil. This also encourages the speculative activities of wholesale traders, oil millers and extractors, affecting the future of millions of small and marginal farmers who are cultivating coconut for their livelihood. This calls for the need to de-link coconut prices from coconut oil driven market by more product development and product diversification. This will reduce the seasonal, cyclical as well as irregular fluctuations in the prices of copra and coconut oil. There are value added coconut products like packed tender coconut water, desiccated coconut, defatted coconut powder, spray dried coconut milk, coconut chips and biscuits, coconut burfi, yoghurt,

paneer, coconut vinegar etc. However, large-scale commercial production of these non-traditional products and its innovating marketing in quality packaging at easily accessible locations is conspicuously absent. Finding new uses for coconut oil like automobile lubricant and large-scale industrial uses will also reduce the seasonal price fluctuations in prices.

4. At present coconut is mostly disposed off as green, un-husked raw nut with out any processing or value addition at the producers level. As coconut is essentially a small holders crop in the traditional pockets, individual processing and value addition may not be feasible. Hence efforts are needed to encourage group processing at farm level by Coconut Development Board along the lines of group latex processing encouraged by the Rubber Board. This shall enable more gross returns per unit area cultivated.

5. Futures trading is known to have a sombering effect on volatile intra as well as inter seasonal price fluctuations. The commodity exchanges in the country will have to play an increasing role the coming years to provide price discovery and risk management to not only the traders and manufacturers but also to the farming communities. At present, the number of farmers accessing commodity exchanges in coconut oil and copra is very low.

6. The Government has used the import duty structure as a policy instrument to safeguard the interest of domestic consumers as well as producers with an objective of ensuring adequate supplies of edible oils at steady prices. However, the lack of fine adjustments in the tariff rate structure in response to change in world supply and price has resulted in a surge of imports, especially palmolein and soyabean oil into the country. This is known to have a wide ramification for the

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coconut growers. A more rationalization of the import duty structure by accommodating the interest of coconut farmers is therefore called for.

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Appendices

APPENDIX I

Area of coconut in major producing countries of the world

Year	Indonesia		Philippines		India		World
	M ha	%	M ha	%	M ha	%	Mha
1970	1.26	18.80	1.88	28.15	1.04	15.63	6.69
1975	1.53	20.72	2.28	30.85	1.07	14.45	7.40
1980	1.80	20.56	3.24	36.90	1.08	12.35	8.77
1985	1.98	20.99	3.27	34.76	1.23	13.03	9.41
1990	2.26	22.53	3.11	31.01	1.51	14.70	10.04
1995	2.58	24.33	3.06	28.84	1.83	17.25	10.62
1996	2.54	23.71	3.15	29.35	1.89	17.63	10.73
1997	2.55	23.54	3.31	30.62	1.86	17.20	10.82
1998	2.55	22.95	3.73	33.55	1.75	15.78	11.12
1999	2.54	22.10	4.09	35.64	1.77	15.41	11.48
2000	2.59	24.50	3.12	29.48	1.82	17.20	10.58
2001	2.84	26.19	3.12	28.80	1.89	17.45	10.83
2002	2.63	24.77	3.14	29.51	1.89	17.77	10.64
2003	2.68	24.98	3.14	29.33	1.90	17.74	10.71
2004	2.66	24.86	3.14	29.34	1.92	17.75	10.80

Source: Food and Agricultural Organization, 2005a

APPENDIX II

Production of copra in major producing countries of the world

	Indonesia			Philippines			India			World	
	Production		Yield	Production		Yield	Production		Yield	Production	Yield
Year	Lakh Mt	%	Mt/Ha	Lakh Mt	%	Mt/Ha	Lakh Mt	%	Mt/Ha	Lakh Mt	Mt/Ha
1970	63	23.8	4.98	57	21.6	3.02	45	17.2	4.32	263	3.93
1975	72	23.5	4.71	92	30.0	4.04	43	14.1	4.05	307	4.15
1980	87	26.9	4.80	91	28.4	2.82	43	13.2	3.92	322	3.68
1985	100	27.8	5.06	86	23.9	2.63	50	14.0	4.10	359	3.82
1990	121	28.5	5.36	110	25.9	3.54	72	17.0	4.90	425	4.24
1995	143	29.3	5.54	122	24.9	3.98	96	19.7	5.25	490	4.61
1996	138	28.4	5.43	119	24.5	3.79	97	19.9	5.13	486	4.53
1997	135	26.7	5.28	137	27.1	4.14	95	18.7	5.08	505	4.67
1998	139	28.0	5.44	128	25.8	3.43	93	18.8	5.31	496	4.46
1999	150	29.8	5.90	121	24.2	2.97	90	17.9	5.10	503	4.38
2000	151	29.3	5.83	130	25.2	4.17	94	18.2	5.18	516	4.88
2001	152	29.4	5.34	132	25.6	4.23	95	18.5	5.04	515	4.76
2002	161	30.0	6.11	137	25.5	4.36	97	18.1	5.13	537	5.05
2003	156	29.4	5.84	137	25.8	4.36	97	18.3	5.11	531	4.96
2004	157	29.3	5.88	137	25.6	4.36	97	18.1	5.11	535	5.00

Source: Food and Agricultural Organization, 2005a.

PRICE BEHAVIOUR OF COCONUT AND COCONUT PRODUCTS IN INDIA

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ABSTRACT OF THE THESIS

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ABSTRACT

The coconut-based industry in India revolves around the price behaviour of coconut oil, which in turn depends on the price and overall availability of other vegetable oils. It is against this background that the study entitled "Price behaviour of coconut and coconut products in India" was undertaken with the specific objective to study the secular trend, seasonality and irregular movements in the price of coconut and major coconut products in India, and to assess the implications of liberalized exim policies. The study was conducted during the year 2004-05, using secondary data.

It was found that an exponential growth model gave the best fit for area and production of coconut where as a quadratic form turned out to be the best fit for yield. The analysis showed that the area and production in the long run exhibited an increasing trend, while the productivity was highly fluctuating.

There was a clear shift in the export basket of coconut products, with coconut oil cake being the major item exported in the sixties, which is now occupied by coconut oil and coir products. Similarly, copra was the major item of import in the sixties, which is now occupied by coconut oil.

The price behaviour of coconut and its products were studied using the classical time series analysis. The prices of coconut, copra and coconut oil had a tendency to increase in the long run. The domestic price of copra and coconut oil was higher than the international price during the period under study. The domestic markets were well integrated for coconut products under consideration on the one hand, with the international market on the other hand.

There were marked seasonal variations in the prices of coconut and its products, with coconut prices remaining low during the months of peak production and high when production was low. The peaking and depression were found to have advanced by one or two months in the post WTO period.

Price cycles of three to four years were observed in all the three domestic markets studied for coconut, copra and coconut oil. It was also interesting to note that the amplitude of cycle was found to wane in the post WTO period of the study.

There was wide spread irregular movements in the price of coconut and its products under reference. There were indications than the irregular movements contributed to higher price fluctuations.

The study of export competitiveness of copra and coconut oil using the nominal protection coefficient revealed that both copra and coconut oil are not trade competitive in the international market at the existing price levels.

The policy analysis with regard to edible oil sector in general and the coconut sector in particular showed that the general policy regimes and instruments of Government of India were distinctly different with regard to the edible oil sector in general and that of coconut oil and palm oil in particular. The import duty structure was found to be inadequate to regulate the surge of imports of palm oil and its variants from 1994 to 2003, calling for rationalization of the import duty structure.