AMIC KAU Commodity Report – 2

(Funded by ICAR-NAIP)

COMMODITY REPORT ON COCONUT

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December 2011

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CENTRE FOR AGRICULTURAL AND RURAL DEVELOPMENT STUDIES
TAMIL NADU AGRICULTURAL UNIVERSITY

Dr .N. Ajjan, Ph.D.
Director

Coimbatore-3
Date: 22.8.2011

Dear Sir,

Sub: NAIP Project. "**Establishing and Networking of Agricultural Market Intelligence Centres in India**"-Project Monitoring and Advisory Committee (PMAC- NAIP)Review meeting -performance -reg.

Ref: PMAC meeting held on 17.8.2011 at NCAP - New Delhi.

Greetings.

The PMAC meeting for the project entitled "**NAIP -Establishing and Networking of Agricultural Market Intelligence Centres in India**" was held at NCAP, New Delhi on 17th August, 2011 under the Chairmanship of Dr.S.S.Acharya, former Chairman, Commission for Agricultural Costs and Prices (CACP), Government of India along with Dr.R.C.Agrawal, National Coordinator, NAIP Component -1.

The presentation and discussion were very productive and interesting. The Chairman as well as National Coordinator very much appreciated the performance and progress of the project in all partner centres. The Chairman rated the performance of entire consortium as **Excellent**. A mail received from Dr. R.C. Agrawal is enclosed.

I congtatulate **Dr. K. Satheesh Babu, Professor &CCPI, Dr. K. Jesy Thomas, Professor & Head, Co PI and the team** to make the project excellent category.

I take this opportunity to profusely thank the Vice Chancellor, Director of Research, and Comptroller/ Finance Officer for the co-operation being rendered for the successful implementation of the project.

Let me have liberty of anticipating the same sort of excellent co-operation from all of you for the days to come.

With regards

Dr . N. Ajjan
Director, CARDS & CPI

To
The Vice Chancellor,
Kerala Agricultural University
Thrissur-680656, Kerala.

PREFACE

The agricultural market intelligence and the price forecasting initiatives under the National Agricultural Innovative Project (NAIP) of the Indian Council of Agricultural Research was a unique experiment in the history of research in agricultural economics. It was the first of its kind when farm economists were asked to take up the challenge of undertaking pro active research, having wide ramifications under the constraints imposed by State Agricultural University set up. Challenges were many, the major one being weak data base, inadequate facilities, low self belief levels in tracking the "invisible hand", and making it "visible", and inefficient marketing environments. The Agricultural Market Intelligence Centres (AMIC) of all collaborating centres stood up to the challenge, and the Project Monitoring and Advisory Committee (PMAC) of the Indian Council of the Agricultural Research in its annual evaluation of the project conducted at the National Centre for Agricultural Economics and Policy Research (NCAP) at New Delhi on 17 August 2011 rated the project as excellent.

As on date, the Consortium Network has published 357 price forecasts on 25 agricultural commodities, with an outstanding forecast reliability of more than 90 per cent. The KAU Centre has made 16 price forecasts (7 in pepper, 5 in coconut and 4 in cardamom), with more than 92 per cent accuracy. The KAU Centre has released 219 News Paper clippings, 66 TV telecasts and 27 Radio broadcasts, 17.34 lakh voice SMS for the benefit of farmers during its brief existence of two and half years. Seven info-series have been released by the Centre so far, besides conducting 11 Officers' training and 22 Farmers' training in different districts in Kerala, involving 564 Officers and 1342 farmers respectively as part of capacity building exercise.

The Centre published its first Commodity Report on Black Pepper in March 2011. It was well received not only by the research and extension communities, but also by the policy makers and students alike. It gives us immense satisfaction to note that when the agricultural market intelligence activities in coconut were started during February 2010, the commodity was reeling from depressed price for over a decade due to a host of factors. The market transparency created by our reports has helped in better price realizations by the coconut farmers. However, there are many more 'grey areas' to be tackled. This report is being published at a time when the coconut sector across the world is on a comeback trail. The report covers the national and global importance of the crop, production and marketing aspects, marketing channels, consumer and trade preferences, changing export and import situation, price behavior, a SWOC analysis of the sector, and major policy options.

We sincerely wish that this commodity report would also be accepted by the different stake holders of the coconut sector.

K. Satheesh Babu
Swapna Surendran
K. Jayasree
N. Ajjan
N. Raveendran

EXECUTIVE SUMMARY

Coconut is a traditional palm grown across the globe during the last 5000 years, and there is great antiquity attached to its cultivation. However, systematic efforts to cultivate coconut as a commercial crop can be traced back to the last seventy years or so. As a commercial crop, it had a chequered history of forming the raw material for the most premium vegetable oil in the world till the seventies, and a victim of malicious campaign by the soybean oil lobby in the latter period. India is a major coconut producing nation in the world, next to Indonesia and Philippines. However, India ranks 28 in respect of productivity among the coconut producing nations. This is a major constraint in achieving global competitiveness as compared to her competing nations. Being a huge captive market, almost entire domestic production is absorbed domestically and there is no trade surplus on a regular basis. The domestic market is oligopsonistic in nature, with a host of market inefficiencies like low level of on-farm processing, multiple level functionaries, seasonal and cyclical price pattern etc. in the three major markets considered, viz., Thrissur in Kerala, Tumkur in Karnataka and Pollachi in Tamil Nadu. Coconut prices had a tendency to remain low during the peak production months from March to August and high when production was low during the period from September to January. This amounted to denying the price advantages to the farmers. Being a small holder crop, in spite of the label of a plantation crop being attached to it, this has seriously eroded the farm income derived from the palm, leading to its widespread neglect. A price cycle of approximately five year was observed for all the three considered markets. Widespread irregular movements were found, that contributed to higher price fluctuations. The coconut-based industry in India revolves around the price of coconut oil, with the result that the fortune of coconut is closely interwoven with the fortune of coconut oil, which in turn depends on the price and overall availability of other competing vegetable oils. The co-integration study revealed that the domestic markets were well integrated with unidirectional influences. The domestic price of coconut was found to be higher than the international price, and the nominal protection coefficient worked out to more than one, indicating lack of global trade competitiveness. As a result, India has remained a marginal player in the international trade of coconut, copra or coconut oil. Technological, institutional and policy measures have been suggested to overcome these issues.

Introduction

Plantation crops occupy a unique place in India's agrarian economy not only in view of their domestic requirement and export potential, but also as a sector catering to the livelihood security of a vast number of small holders. Among the plantation crops cultivated in India, coconut (*Cocos nucifera* Linn.) ranks first as the most versatile palm. It is a commodity of strategic importance in the daily life of more than 10 million people in India in terms of its social, economic, cultural and religious utilities. The coconut palm is considered a truly multi purpose species across the world as every part of the tree is useful to human life for some purpose or the other. No wonder, it is aptly described as "*kalpavriksha*", or the "tree of life". Coconut plays a predominant role in India's plantation sector, contributing to more than 90 per cent of its production (Fig 1.).

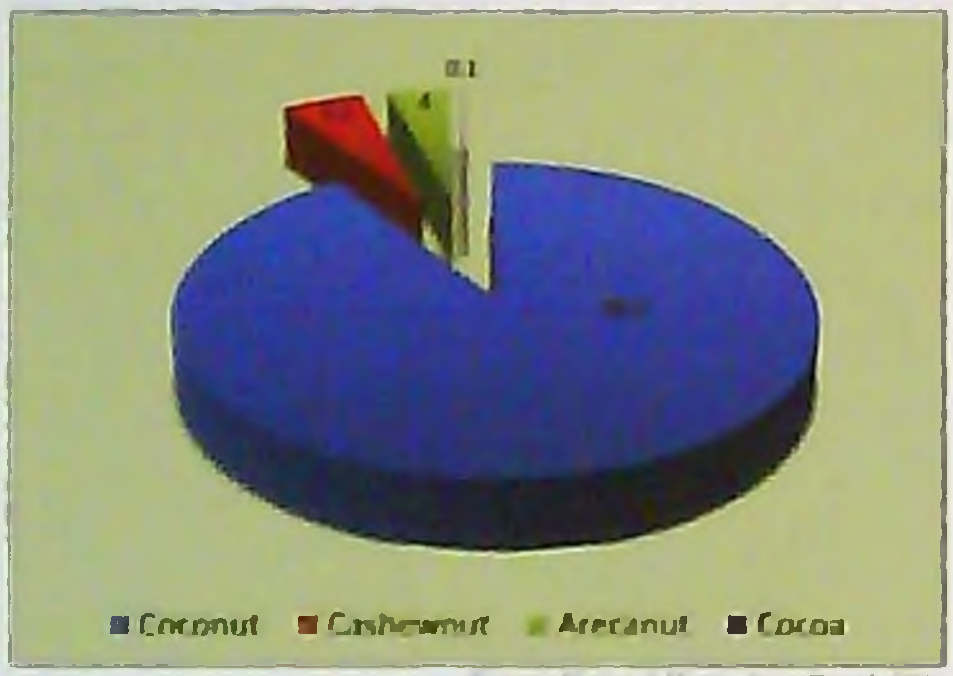


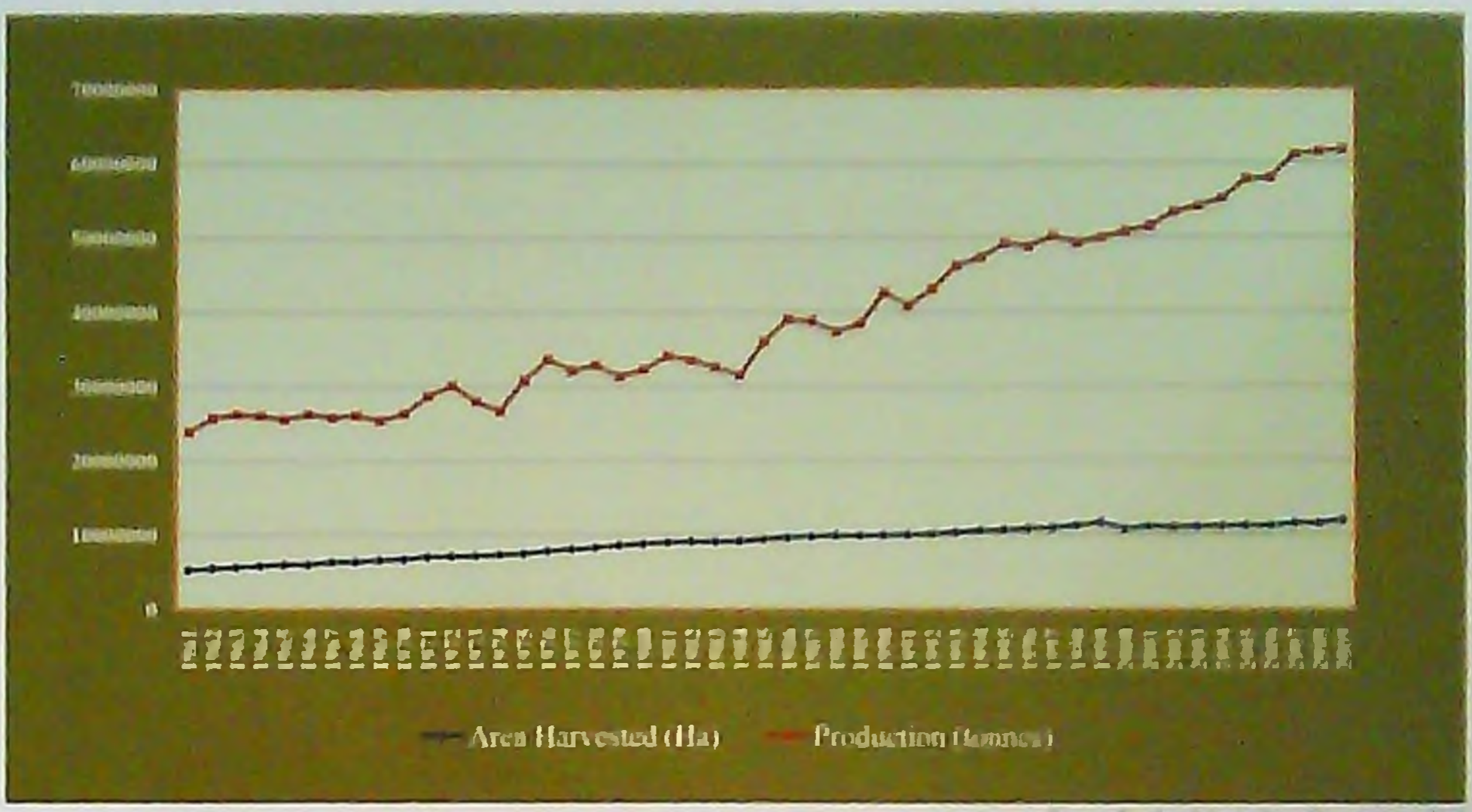
Figure 1. Production share under major plantation crops in India

Coconut is a perennial palm, belonging to Family Arecaceae. The coconut palm is found to grow under varying climatic and soil conditions. It is essentially a tropical plant growing mostly between 20 N and 20 S latitudes. The ideal mean annual temperature is 27°C with 5-7° diurnal variation. The palm does not withstand prolonged spells of extreme variations. A well-distributed rainfall of 1300-2300 mm per annum is preferred (Kerala Agricultural University, 2007). Irrigation is essential in areas where prolonged dry spell occurs. Coconut performs well up to 600 m above mean sea level, though it is cultivated above 900 m also. The humidity should be ideally more than 60 per cent (CPCRI, 2011). The relative humidity below 50 per cent affects opening of stomata. The coconut palm will tolerate a wide variety of soil conditions provided they are free draining and allows unrestricted root development and aeration (Child, 1974). It is therefore, grown in different soil types such as laterite, coastal sandy, alluvial, and also in reclaimed soils of the marshy lowlands. It tolerates salinity and a wide range of pH from 5.0-8.0 (Kerala Agricultural University, 2007). The ideal soil conditions for better growth and performance of the palm are proper drainage, good water-holding capacity, and presence of water table within 3m and absence of rock or any hard substratum within 2m of the surface (Coconut Development Board, 2011).

Global Coconut Scenario

Presently, the palm is cultivated in more than 93 coconut producing countries in the world, in an area of 12.16 million hectares with an annual production of 61.08 billion nuts. Over the years, global acreage under coconut cultivation has been gradually increasing (Fig 2.). The global area has been continuously increasing from 1961 to 1999, reaching a maximum of 11.66 million hectares in 1999. It declined to 10.75 million hectares in 2000, but subsequently regained its position to 11.86 million hectares in 2009.

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 1.80 million ha in 1980 to 2.26 million ha in 1990 and to a figure of 3.23 million ha by 2009. Correspondingly, the acreage in Philippines declined from 3.24 million ha in 1980 to 3.11 million ha in 1990. Thereafter, it increased to 3.40 million ha by 2009. Philippines (28.67 per



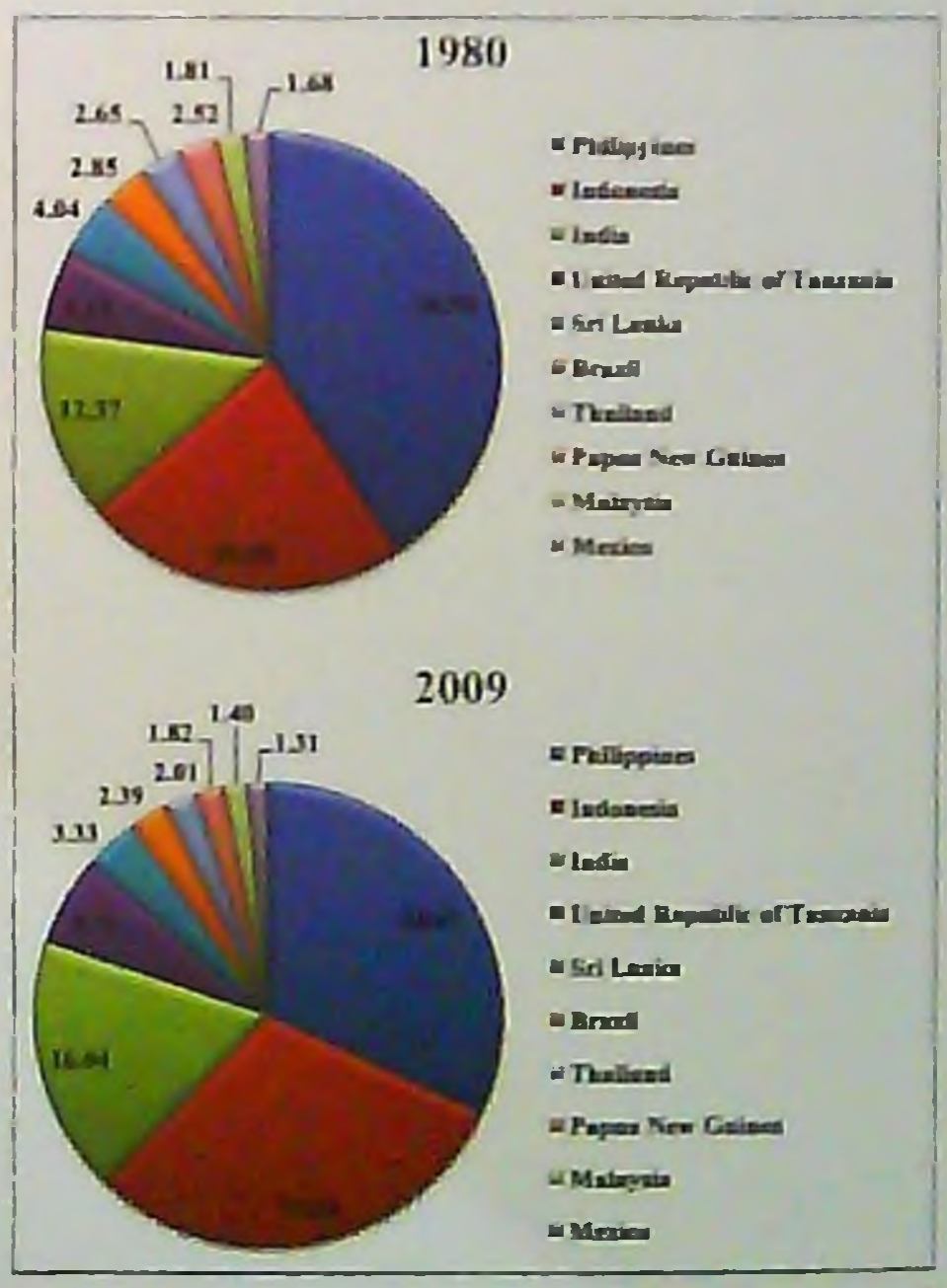
Source: Food and Agriculture Organization, 2011

Figure 2. Global acreage and production of coconut cultivation over years (1961-2009)

cent), Indonesia (27.24 per cent), India (16.04 per cent), United Republic of Tanzania (5.70 per cent) and Sri Lanka (3.33 per cent) accounts for 81 per cent of total global acreage under coconut cultivation (Fig 3.). It may be noted that currently, Indonesia along with Philippines account for 54 per cent of coconut area in the world and 55 per cent of its production.

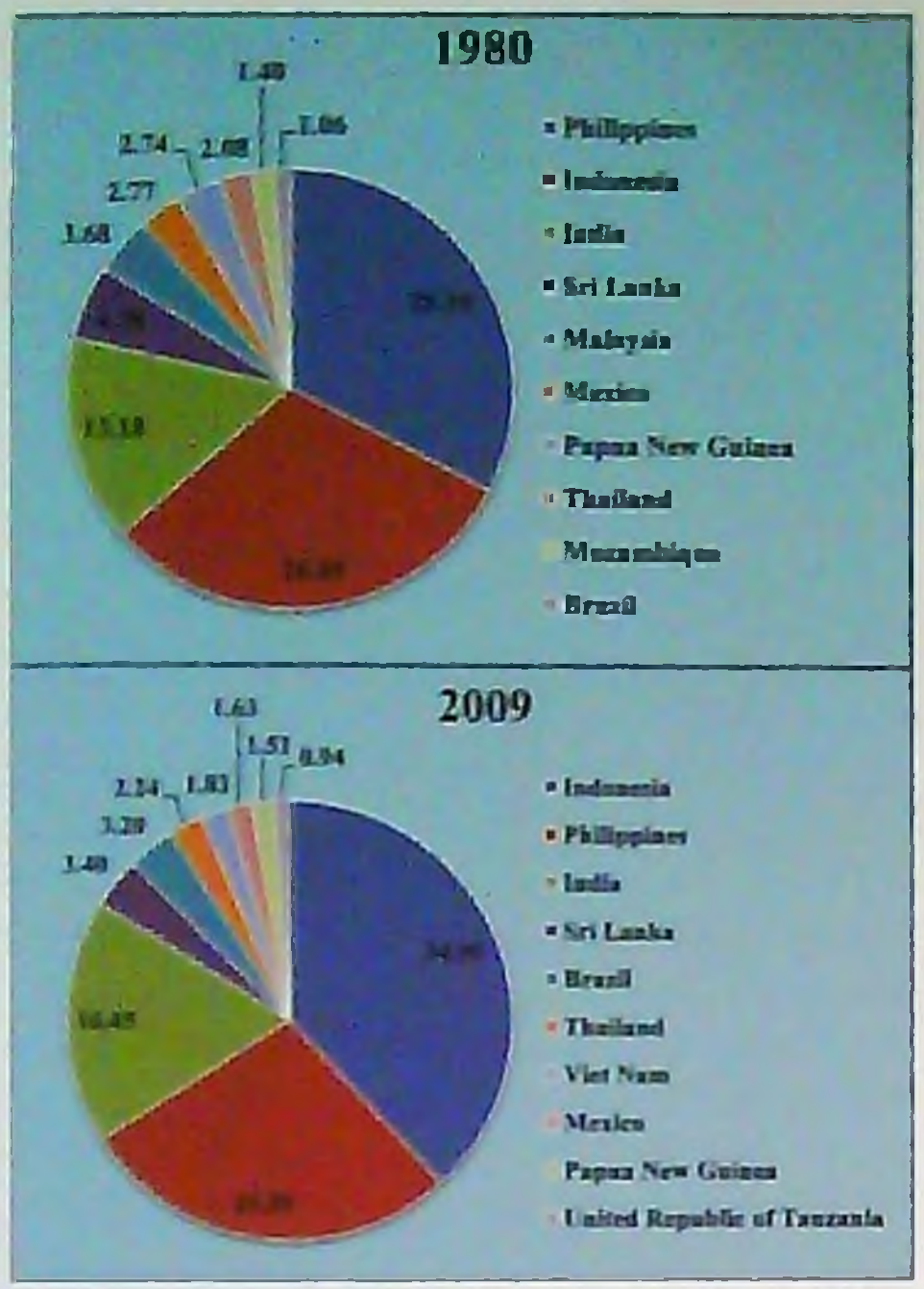
Philippines, Indonesia and India had occupied the first, second and third positions in the relative share of global acreage of coconut in the eighties. The share of Philippines in area declined from 36.94 per cent to 28.67 per cent by 2009. At the same time, the percentage share of total global area under coconut cultivation in Indonesia increased from 20.58 per cent to 27.24 per cent during the reference period (Fig 3.). India's share in the global coconut acreage increased from 12.37 per cent to 16.04 per cent during the corresponding period.

Globally, Indonesia and Philippines are the two major competitors in coconut production. It was in the year 1997 that Philippines had a superior



Source: Food and Agriculture Organization, 2011

Figure 3. Shifts in relative share of global area under coconut cultivation



Source: Food and Agriculture Organization, 2011

Figure 4. Shifts in the relative share of global production of coconut

position to Indonesia with a production of 13.71 million nuts while Indonesia was just behind Philippines with a production of 13.46 million nuts after which Indonesia is continuously occupying the first position in global coconut production.

A comparison of the shifts in the relative share of global contribution of coconut production throws some interesting features. It is interesting to note that Philippines, Indonesia, India and Sri Lanka were occupying the first four positions in 1980. Philippines, which occupied first position with 28.35 per cent contribution to the world coconut production in the eighties slipped to the second position with a relative share of 25.39 per cent during 2009. On the other hand, Indonesia, which was second major producer of coconut in the eighties, emerged as the leading producer of coconut now (Fig 4). The percentage contribution of India remained at the third, but her relative contribution has increased from 13.18 per cent to 16.45 per cent during the corresponding period.

As far as global productivity is concerned, the major producers are down in the order. El Salvador stands first with a productivity of 12513 Kg/ha, followed by Peru, Puerto Rico and Singapore occupying second, third and fourth positions with a productivity of 12008 Kg/ha, 11957 Kg/ha and 11133 Kg/ha respectively (Fig 5.). Even though Indonesia stands first in global production of coconuts, in terms of productivity, she is ranked eighteenth. Philippines and India

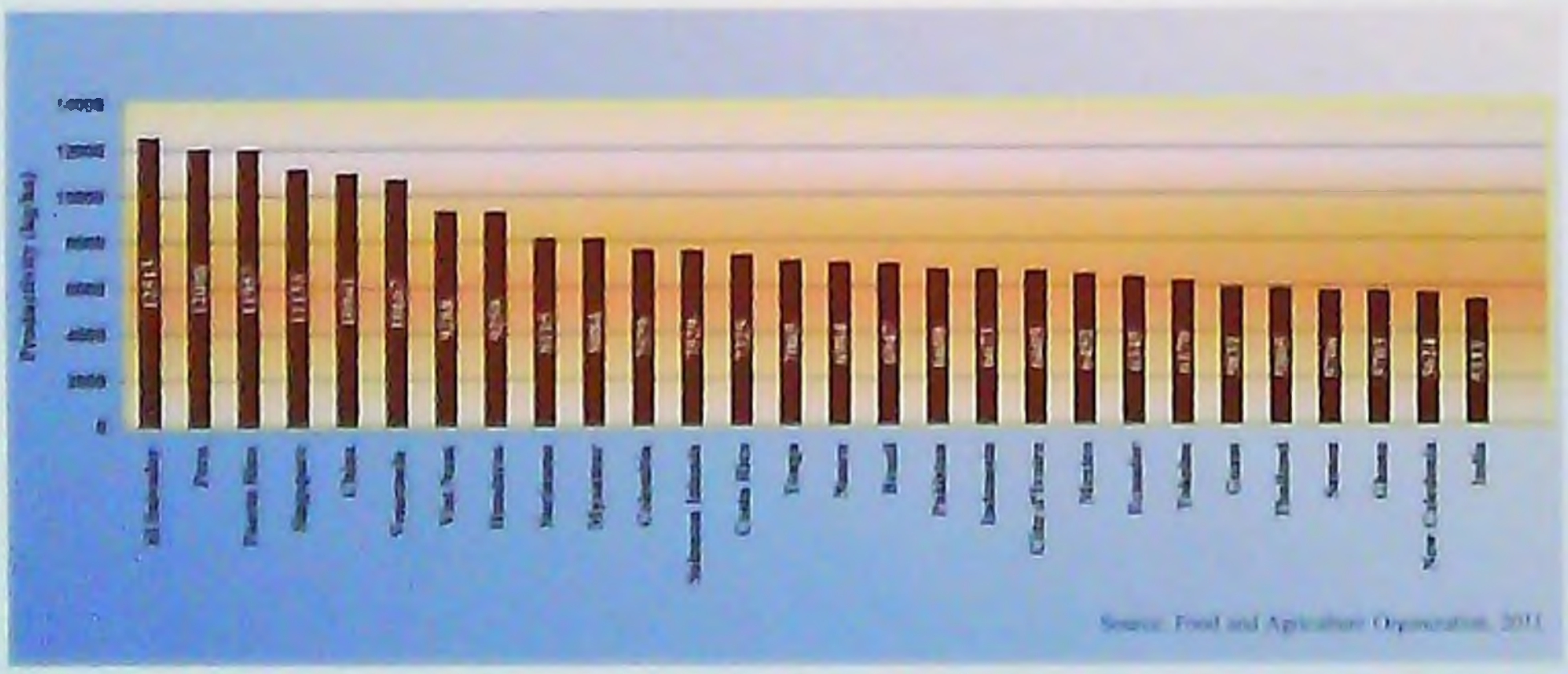
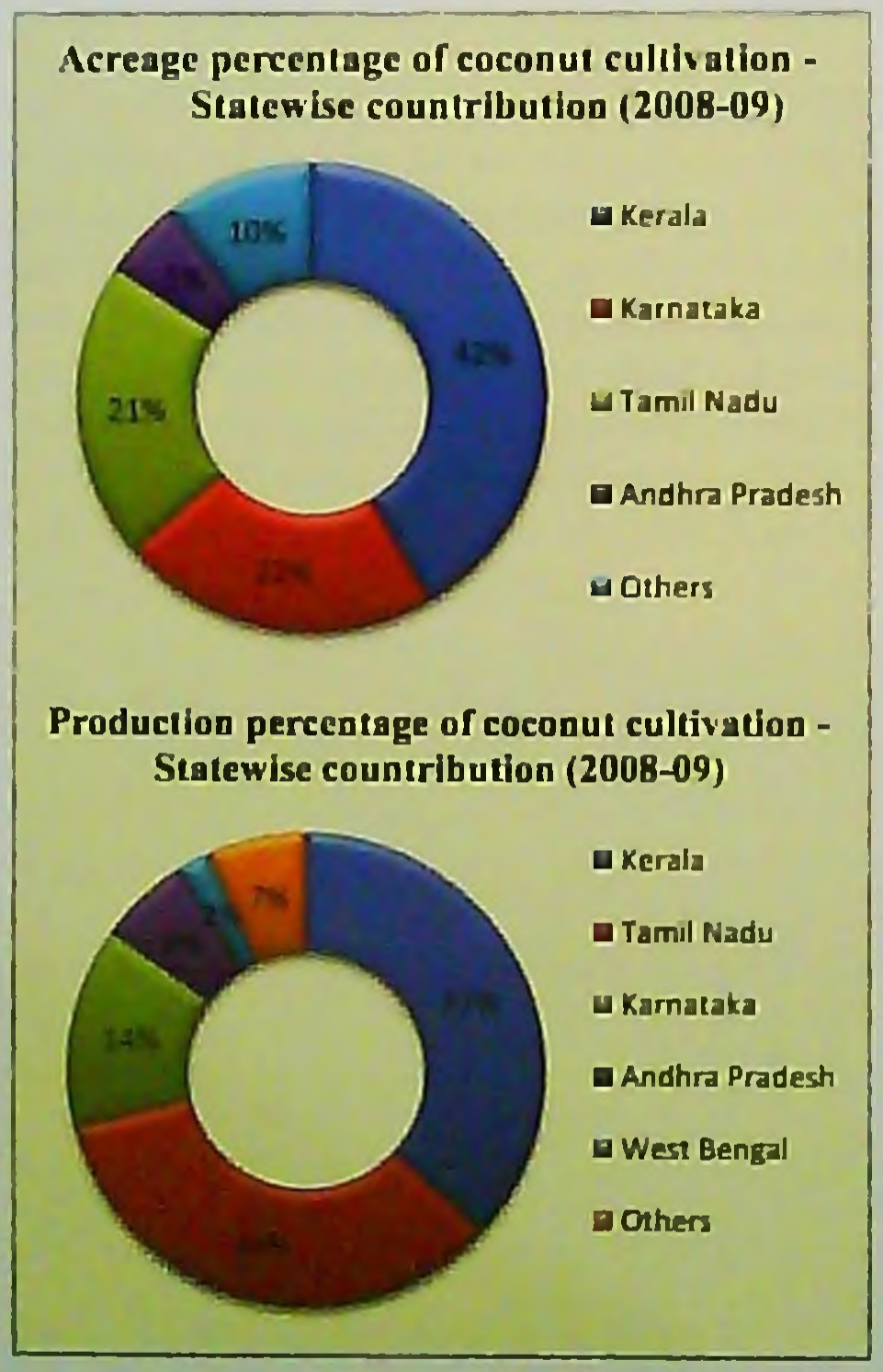


Figure 5. Global Productivity of Coconut - Countrywise Status

are ranked 37th and 28th respectively, while Sri Lanka is ranked 29th next to India.

Indian Coconut Scenario

Coconut is a palm traditionally cultivated in India for more than 5000 years. Hence, there is a great antiquity attached to its cultivation. However, systematic efforts to grow coconut as a commercial crop begun in the 1940s (Directorate of Marketing and Inspection, 2008). The coconut pockets in India is concentrated on the West Coast region of Kerala, Karnataka, Goa, Maharashtra, Gujarat, and the East Coast regions of Tamil Nadu, Andhra Pradesh, Pondicherry, Orissa, West Bengal, Assam, and the Islands of Andaman & Nicobar and Lakshadweep. The main producers are the States of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh. It may be noted that three States viz., Kerala, Tamil Nadu and Karnataka together account for almost 84 per cent of area and production of coconut in the country (Fig 6.).



Source: Coconut Development Board

Figure 6. Indian coconut scenario: A Glance

The total production of coconuts in India is 15,730 million nuts from a total coconut cultivated area of 1.89 million hectares (Coconut Development Board, 2011). Among the various states, Kerala constitue 42 percent of area under coconut cultivation in the country followed by Karnataka (22 per cent), Tamil Nadu (21 per cent) and Andhra Pradesh (5 per cent) in that order. In Kerala, coconut is cultivated in all the fourteen districts. Coimbatore, Thiruppur, Thanjavur, Dindigul, Kanyakumari, Vellore, Erode, Theni, Tirunelveli, Krishnagiri, Salem and Madurai districts are the major coconut growing areas, accounting for 80 per cent of the total area in Tamil Nadu. The major coconut growing districts of Andhra Pradesh are East Godavari, West Godavari, Srikakulam and Vishakhapatnam having 90 per cent of the area. Coconut cultivation is also found in Vizianagaram, Chittoor and Krishna districts. Major coconut growing districts in Karnataka are Tumkur, Hassan, Dakshina Kannada, Chikmagalur and Chitradurga which together account for more than 85 percent of coconut area in the State. Tumkur district has the largest area under coconut followed by Hassan. The non traditional areas where coconut cultivation gains prominence of late are Orissa, Maharashtra, Gujarat, Manipur, Mizoram and Nagaland. Production wise statistics also shows that Kerala occupied the first position with a share of 36.89 per cent followed by Tamil Nadu (34.11 per cent) and Karnataka (13.83 per cent).

The overall productivity of coconut in India is 8303 nuts/ha. Lakshadweep has the highest productivity of 19,630 nuts/ha (Fig 7). The second and third positions in productivity are enjoyed by Pondicherry (14,619 nuts/ha) and Tamil Nadu (13,771 nuts/ha). Andhra Pradesh is ranked sixth (9327 nuts/ha). Kerala is ranked ninth (7365 nuts/ha) in terms of productivity.

Source: Coconut Development Board

Figure 7. Productivity status of major coconut growing states of India (2008 -09)

Karnataka occupies the tenth rank (5193 nuts/ ha). Tamil Nadu and Andhra Pradesh are having productivity above the national average, while Kerala and Karnataka are having productivity below the national average (Table 1).

The compound annual growth rates (CARGs) of area, production and productivity of coconut in India was worked out and presented in Table 2. It may be noted that highest growth in production was registered in the fifties and eighties. However, the growth in production in the fifties was contributed by growth in productivity, where as it was contributed by growth in area in the eighties. The seventies are marked by a negative growth in area, production and productivity. It is

Table 1. Area, Production and Productivity of Coconut in India (2008-09)

Sl. No	State	Area ('000 ha)	Production (Million nuts)	Productivity (Nuts/ha)
1	Kerala	787.77	5802	7365
2	Karnataka	419.00	2176	5193
3	Tamil Nadu	389.60	5365	13771
4	Others	298.20	2387	8005
5	All India	1894.57	15730	8303

Source: Coconut Development Board

Table 2. CGR (%) of Area, Production and Productivity of Coconut in India

YEARS	AREA	PRODUCTION	PRODUCTIVITY
1950 to '59	1.29	4.02	2.69
1960 to '69	4.10	2.59	-1.44
1970 to '79	-0.17	-1.02	-0.85
1980 to '89	3.47	4.69	1.18
1991 to '99	2.34	2.70	0.35
2000 to '08	0.21	3.24	3.02

heartening to note that there is a substantial growth in production of late, fuelled by growth in productivity.

The Kerala Context

The area under coconut cultivation in Kerala recorded substantial reduction in the late seventies and early eighties. However, the late eighties and early nineties witnessed an expansion phase of acreage under coconut cultivation. Presently, the area under coconut cultivation is showing a declining phase (Fig 8). The area under coconut has been drastically shrinking in Kerala continuously from 2000-01 onwards due to a host of factors like depressed price for nuts, high wage rates, shortage of labour especially for the timely harvest and plant protection operations, high incidence of diseases and pests, declining crop productivity, coupled with less relative profitability vis- a vis competing crops like rubber and higher level of urbanization, which encroaches more coconut areas.

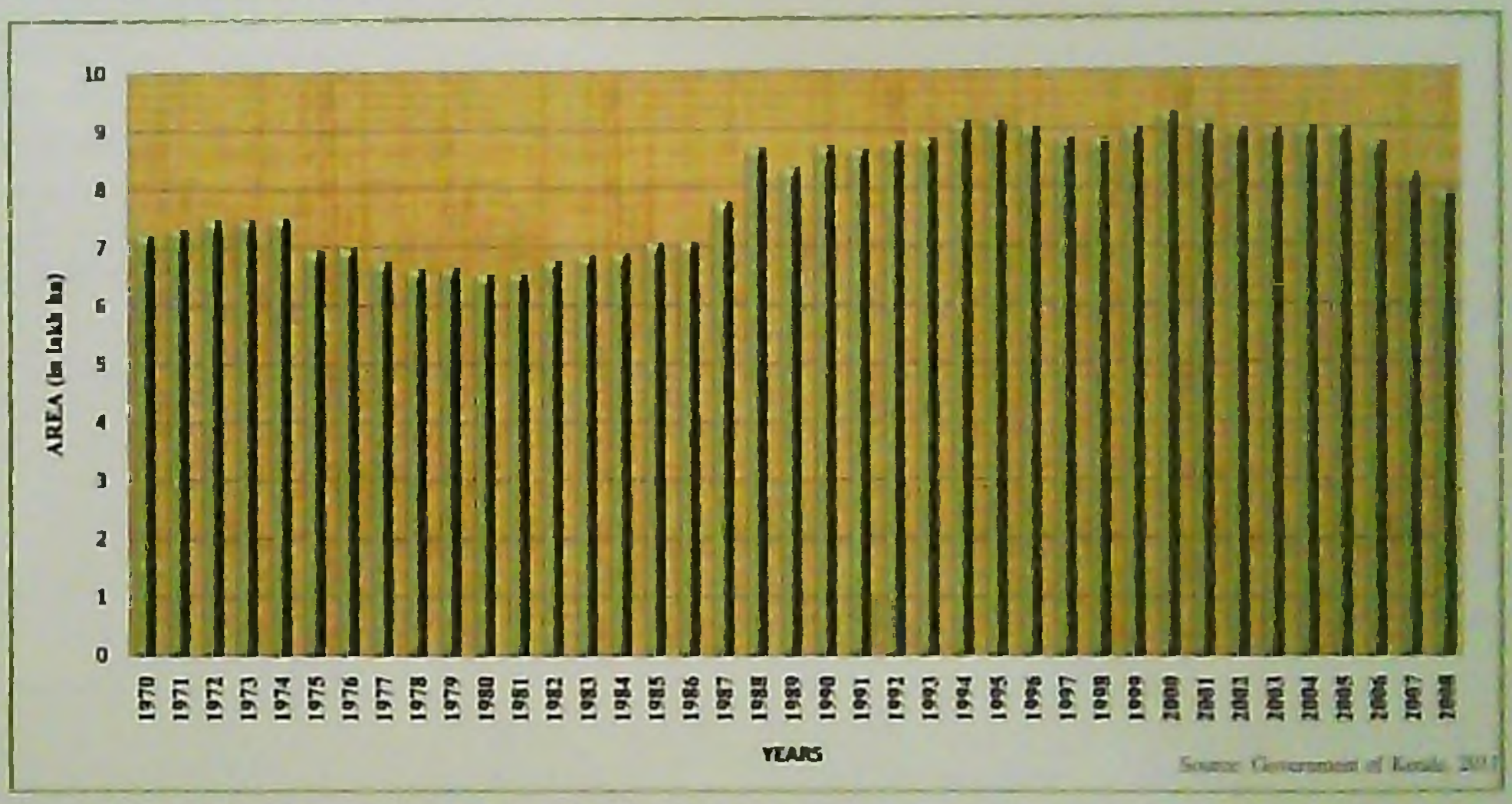


Figure 8. Area under coconut cultivation in Kerala

The area under cultivation reduced from 9.26 lakh hectares in 2000-01 to 7.79 lakh hectares in 2009-10, a reduction by 1.47 lakh hectares (ie. 15.87 per cent reduction). The production during the corresponding period has increased marginally from 5536 million nuts to 5667 million nuts (2.37 per cent increase), thanks to productivity enhancements acheived during the period.

Cultivars

Two distinct cultivars of coconut are *typica* or the Tall and *nana* or the Dwarf. Tall is a cross pollinated palm population, while the dwarf varieties are not only shorter in stature, having a shorter lifespan, but also are comparatively having more homogeneous population with varying degrees of self fertilization (Ramadasan *et al.* 1993). The West Coast Tall (WCT) is the cultivar extensively cultivated in the West Coast region, where as the East Coast Tall (ECT) is the cultivar extensively cultivated in the East Coast region. Lakshadweep Ordinary (LO) is a cultivar indigenous to the islands of Lakshdweep. It resembles WCT except smaller nut size, but higher oil content. It is therefore recommended for commercial cultivation in Kerala, Karnataka and Andhra Pradesh. Andaman Ordinary is the cultivar grown extensively in the islands of Andaman & Nicobar. It is tall, massive and more vigorous than WCT in vegetative growth. Philippines Ordinary is an exotic cultivar found

suitable for cultivation in the west coast region, Konkan region of Andhra Pradesh, Maharashtra and West Bengal. Tipton Tall is a popular tall cultivar of Karnataka.

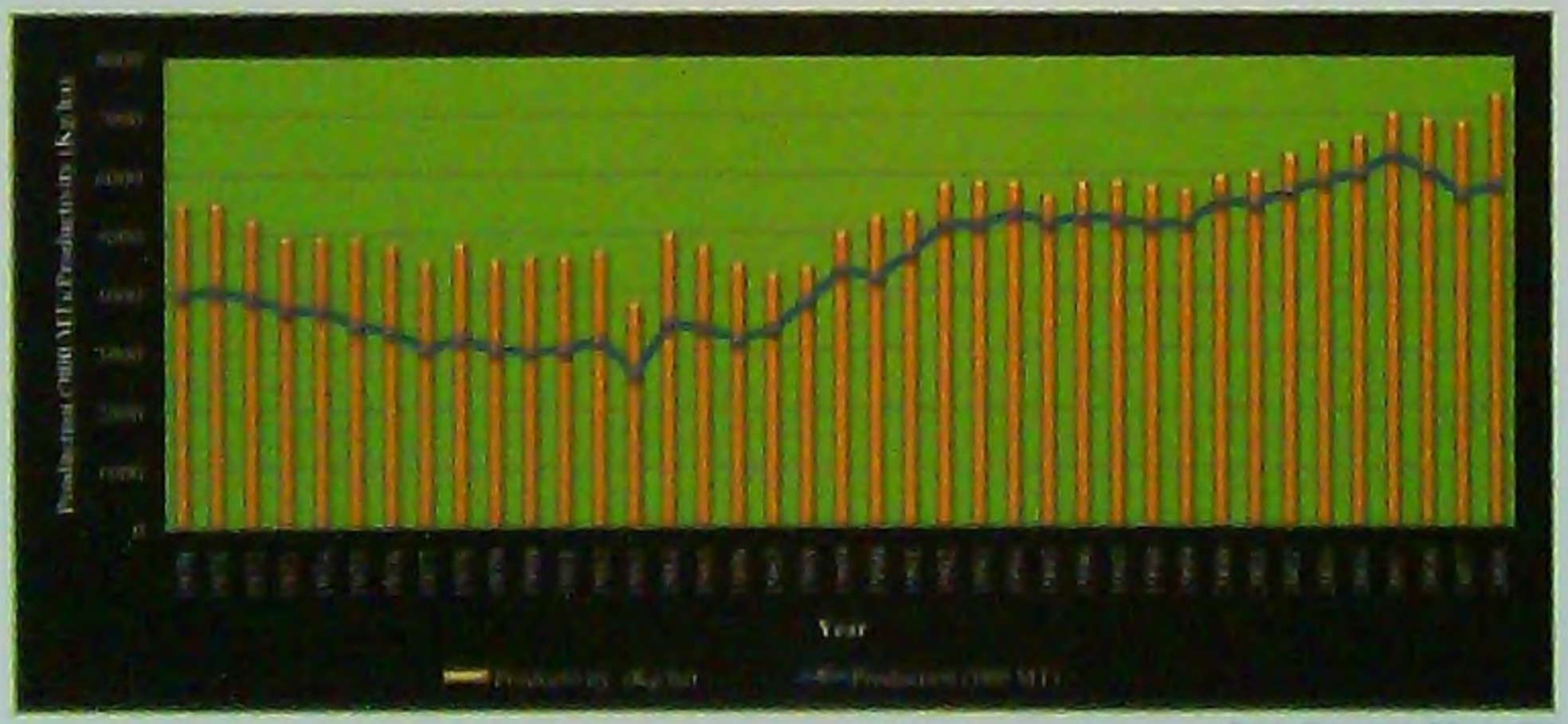
Chowghat Orange Dwarf (COD), Chowghat Green Dwarf (CGD), Malayan Yellow Dwarf (MYD), Malayan Orange Dwarf (MOD), Malayan Green Dwarf (MGD) are important indigenous dwarf cultivars in India. COD is an indigenous dwarf cultivar ideally suited for tender coconuts. CGD, MYD, MOD and MGD are also dwarf cultivars, grown for tender nuts. Gangabondam is a semi tall cultivar grown in certain tracts of Andhra Pradesh mainly for tender nuts.

Hybrids are evolved by artificial inter varietal crosses of two morphological forms of coconut and they exhibit improved inherited characteristics for which their parents were crossed such as early flowering, high yielding, higher quantity and better quality of copra and oil when compared to the parents. Hybrid vigor in coconut was reported for the first time in India by Patel in 1932 from artificial crossing. West Coast Tall (WCT) as mother palms and Chowghat Green Dwarf (CGD) as male parent (Rao *et al.* 1993). Laksha Ganga, Ananda Ganga, Kera Ganga, Kera Sree, Kera Sowbhagya released by Kerala Agricultural University; Chandra Sankara, Kera Sankara, Chandra Laksha, Kalpa Samridhi, Kalpa Sankara, released by Central Plantation Crops Research Institute, Kasargode and VHC1, VHC2 and VHC3 released by Coconut Research Station; Veppankulam under Tamil Nadu Agricultural University are major coconut hybrids in India. Godavari Ganga is a hybrid coconut variety released by Acharya N G Ranga Agricultural University. Kahikuchi Coconut Hybrid-I (KCH-I) is a newly developed high yielding coconut hybrid developed by Horticultural Research Station, Kahikuchi (Guwahati) suitable for the North-Eastern region.

Harvesting and Post Harvest Operations

Typical tall palms, growing under good conditions may start to flower in the sixth year of growth (Child, 1974). Dwarf and tall-dwarf hybrids flower earlier, and may bear fruits in 4-5 years (CPCRI, 2011). The palm attains a stable yield phase by 12-15 years. The fruit is a fibrous drupe. The kernel (endosperm) is embedded in a stony shell (endocarp), which in turn is covered by a fibrous mass, the husk.

Coconuts are harvested at different stages of development, depending upon their consumption and commercial needs. Usually, 11-12 month old



Source: Government of Kerala, 2011

Figure 8. Production and Productivity status of coconut - Kerala Scenario

nuts are harvested at varying intervals of 45-60 days in about 6-7 times in a year. The nuts must be harvested when fully ripe in order to have maximum recovery of quality copra. In States where husk is utilized for the manufacture of coir fibres, 11 month old nuts with green husk are harvested because the best quality coir fibre is obtained from the green husks of coconut. The nuts are allowed to fall natural for making ball copra. When the nuts are used as tender coconuts, 5-7 month old nuts are harvested. Skilful climbers only can climb the coconut palm, and determine which bunches are ready for picking. These climbers visit the plantations in regular frequency

West Coast Tall (WCT) coconut palms exhibit wide variability in the annual yield, ranging from 30 to 400 nuts per palm per year (Ramadasan *et al*, 1993). The only on farm processing done in coconut plantations is the conversion of nuts to copra, that too by a limited number of farmers. Even though there is considerable range of size within a population (a coefficient of variation of 17.8 per cent for nut weight is reported), around 5000 nuts produced by typical tall palms are required for a tonne of copra (Child, 1974). Small holders do not convert coconut into copra for two main reasons. Firstly, the marketable surplus after meeting the home demand is not sizeable enough

Figure 9. Skilled climber undertaking harvest operations

(Fig. 9). These frequencies have come down due to the non availability of workers. It is even common in certain areas in Kerala that nuts are not harvested, instead allowed to fall natural due to acute shortage of climbers.

to warrant on farm processing. Secondly, the labour intensive nature of copra making acts as a deterrent, and most of them dispose off the harvested nuts at the farm gate itself. Maximum arrivals of coconut and copra in the markets in Kerala are during the

Table 3. Seasonal pattern in coconut yield in India

Sl. No.	Quarter	% of annual yield
1	March - May	35.6
2	June – August	25.7
3	September – November	18.6
4	December – February	20.1

Source: Thampan. 1993

period from January to June. This creates downward pressure on coconut and copra prices during this period. The period from September to December marks a period of low arrivals of coconut and copra in the domestic market, which creates upward pressure on the prices in the Kerala markets. However, higher market arrivals are reported in Tamil Nadu, Karnataka and Andhra Pradesh during the period from May to August and the lean arrival period is from November to February. The seasonal pattern in nut yield in India is depicted in Table 3.

Solar drying is the most common method of drying nuts into copra by the small farmers and small scale copra makers (Fig. 10). Copra kilns, using the hot gases generated by burning fuel wood, especially coconut shells are used for large scale conversion into copra by upcountry traders. Coconut Development Board is subsidizing copra dryers (solar as well as electric) so that copra making is unhindered in the rainy seasons also.

Figure 10. Copra making by solar drying

Table 4. Main secondary coconut markets in the major growing states

States	Markets
Kerala	Adoor, Alleppey, Chengannur, Kannur, Kasargode, Kollam, Kochi, Kozhikkode, Moovattupuzha, Nedumangad, Neyyattinkara, Parassala, Ranni, Thodupuzha, Taliparambu, Thrissur, Vamanapuram and Vadakara
Tamil Nadu	Ambur, Annamalai, Annur, Avalpundhurai, Avinashi, Coimbatore, Cumbum, Arichalur, Avalpoondurai, Gobichettipalayam, Kangayam, Kulasekharam Kunnathur, Kaveripattinam, Krishnagiri, Madurai, Nagercoil, Negamum, Pochampalli, Palani, Paravai, Periyakulam, Perundurai, Pollachi, Rajapalayam, Ramnad, Sathyamangalam, Sivagiri, Sulur, Thoduvatty, Thalavadi, Thanjavur, Udumalpet, Uthamapalayam, Vellakovil, Veppuli, and Vaniyambadi
Andhra Pradesh	Ambajipet, Palakole, Narasapuram, Rajolu, Sakhenetipalli Bhimavaram and Vuyyur
Karnataka	Arasikere, Bantwala, Channapatna, Gubbi, Gundlupet, Hassan, Honnavar, Maddur, Mangalore, Shimoga, Tharikere, Tumkur and Udupi

This method is more efficient than the traditional solar drying. The keeping quality of copra depends mainly upon its moisture content. Copra, if dried to 6-7 per cent moisture and stored in well ventilated dry godowns at an even temperature is not subjected to any serious deterioration (Child, 1974). Deterioration of the quality of copra during transportation, storage and shipment is always due to careless preparation coupled with inefficient drying. Reabsorption of moisture by well dried copra is not likely to be serious except under the most extreme conditions.

Coconuts are generally marketed as mature nuts and fresh tender nuts. The mature nuts are sold in two grades, viz., the edible nuts and the milling grade nuts. Being an extensively grown crop through out the length and breadth of Kerala, all primary agricultural markets in the State transacts coconuts in the various forms. Coconut is disposed as green husked nuts, partially dehusked nuts or fully dehusked nuts for culinary purpose, and as dry nuts for copra making. Usually, green husked nuts are sold in numbers, size forming the basis for pricing. Partially dehusked and fully dehusked nuts are sold on weight basis. The marketing practices differ too widely across the four southern states. The major referral markets in Kerala were Alleppey and Kozhikode. Alleppey lost its prominence to Kochi in the eighties. Now, Thrissur and Kozhikode acts as major referral markets in Kerala for coconut, copra and coconut oil. The major market centres of coconut in Tamil Nadu, Karnataka and Andhra Pradesh are listed in Table 4.

Consumer and Trade Preferences

As coconut is a crop with diverse uses, consumption pattern varies widely from state to state. According to the Directorate of Marketing and Inspection, on an average around 9 per cent of the total nuts produced in India are retained at the farm level, leaving 91 per cent as marketable surplus (Table 5). Spatial variations are possible across different producing states.

Coconuts have three basic colour forms, viz., green, yellow and orange (Fig.11), or its variants - but it has nothing to do with consumer preference or market price. The size, shape and maturity of the nuts have more considerations of consumer preference than colour. The trade preferences are for well developed, matured and husked coconuts with or without water. These shall be free from bad smell, damage and blemish due to fungus and insect infestation and dark brown colour at the top. When struck at the shell with finger or metal, it shall give the characteristic metallic sound without any dull note. Though

Table 5. On farm retention of coconuts by farmers in India

Sl. No.	Particulars	Percentage
1	Total Production	100.00
2	Retention for seed	2.13
3	Direct Consumption	5.31
4	Oil Milling	0.00
5	Kind Wages	1.23
6	Total Retention	8.67
7	Marketable surplus	91.33

Source: Directorate of Marketing and Inspection, 2008

Figure 11. Coconut with (a) green, (b) yellow and (c) orange husk

Agmark grade standards are developed for coconut in shell (Table 6), coconut trade between farmers and traders in the primary markets is by and largely not carried out based on any established grades. In the secondary markets, the traders follow a grade of their own in some parts of the country. They treat big sized nuts as Grade I, medium sized nuts as Grade II, while small sized nuts are treated as Grade III.

Edible copra and milling copra are the two grades of copra made in India. Dried kernel of coconut having less than 6 per cent moisture content, and used for obtaining coconut oil is termed 'milling copra'. Milling copra is used to extract oil while edible grade of copra is consumed as a dry fruit and used for religious purposes. The AGMARK grade specifications for coconut in shell and copra are detailed in Table 7. Accordingly, 'milling cup copra shall be kernels obtained from the fruits of *Cocos nucifera* Linn., Family. Palmae,which have been cut approximately into two equal pieces, forming a cup shape. They shall be well dried, reasonably firm and in sound merchantable condition'.

It may be fumigated by sulphur or other fumigants permissible under P.F.A. Rules, 1955, and shall be free from rancid taste and objectionable odour. The testa shall be whitish to dark brown in colour and the meat shall be pearly white to ash white in colour.

Copra normally has an oil content varying from 65 to 72 per cent (Coconut Development Board, 2011). The extraction of oil from copra is one of the oldest vegetable oil industries in the world, next only to the olive oil industry. Traditionally, coconut oil is extracted by crushing copra in rotary mills or expellers. In solvent extraction method, hexane is used for higher oil recovery. No by product is currently processed commercially, except the husk, into coir fibres.

Marketing Channel

Marketing channels are sets of interdependent organizations involved in the process of making a product or service available for use or consumption (Kotler and Keller, 2007). It is the sequence of intermediaries through which a commodity passes from the primary producer before it reaches the ultimate consumer. Channels are necessary to transfer the ownership of goods from the site of production to the site of consumption. The channel selection strategy depends upon a variety of factors like nature of the produce, location and type of the markets, price of the produce etc. Though coconut is a versatile crop, the nuts are traded in the traditional route of copra making for coconut oil production, which hinders more efficiency in coconut marketing. The main marketing channels prevalent in the major coconut producing states are shown in Fig 12 (A and B).

There are no regulated markets in Kerala, and the private market functionaries dominate the coconut marketing scenario. The coconut growers sell their produce through the village merchants, commission agents or wholesalers. Usually, the village merchants are the first buyers of coconut in the production areas. The merchant middlemen or the copra makers or the millers convert nuts into copra. No grading is done at the primary level. Wholesale traders resort to grading. The cooperative marketing agencies involve in the marketing of coconut only when the prices fall excessively, and the National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED) or Kerala Kerakarshaka Sahakarna Federation Ltd. (KERAFED) are appointed as the procurement agencies during market support operations. Though Agricultural Produce Market Committees (APMCs) operate in Tamil Nadu, Andhra Pradesh and Karnataka, major market share is handled by private traders only. Producer markets like *Sashraya Markets* in Kerala and *Uzhavar Chanda* in Tamil Nadu are getting strengthened at the grass roots level.

Narayanan and Bastine (2004) studied the

Table 6. AGMARK Grade Designation of Coconut in shell

Grade Designation	Colour	Size / Diameter (in mms)
Extra Special Grade	Brown	110 and above
Special Grade	Brown white or Brown & White	100 and above
Standard Grade	Brown WhiteorBrown and White	90 and above
General Grade	Mixed	Below 90

Table 7. AGMARK Grade Designation of quality of cup copra for oil milling

Characters	Grade Designations		
	Grade I	Grade II	Grade III
Foreign matter (Max % by wt.)	0.5	1.0	2.0
Mouldy & Black kernels (Max % by count)	5.0	10.0	15.0
Wrinkled kernels (Max % by count)	10.0	10.0	15.0
Chips (Max % by wt)	5.0	10.0	15.0
Moisture (Max % by wt.)	6.0	6.0	6.0
Oil content (Min % by wt on moisture free basis)	70.0	68.0	66.0
Acid value of extracted oil (Max.)	2	4	10

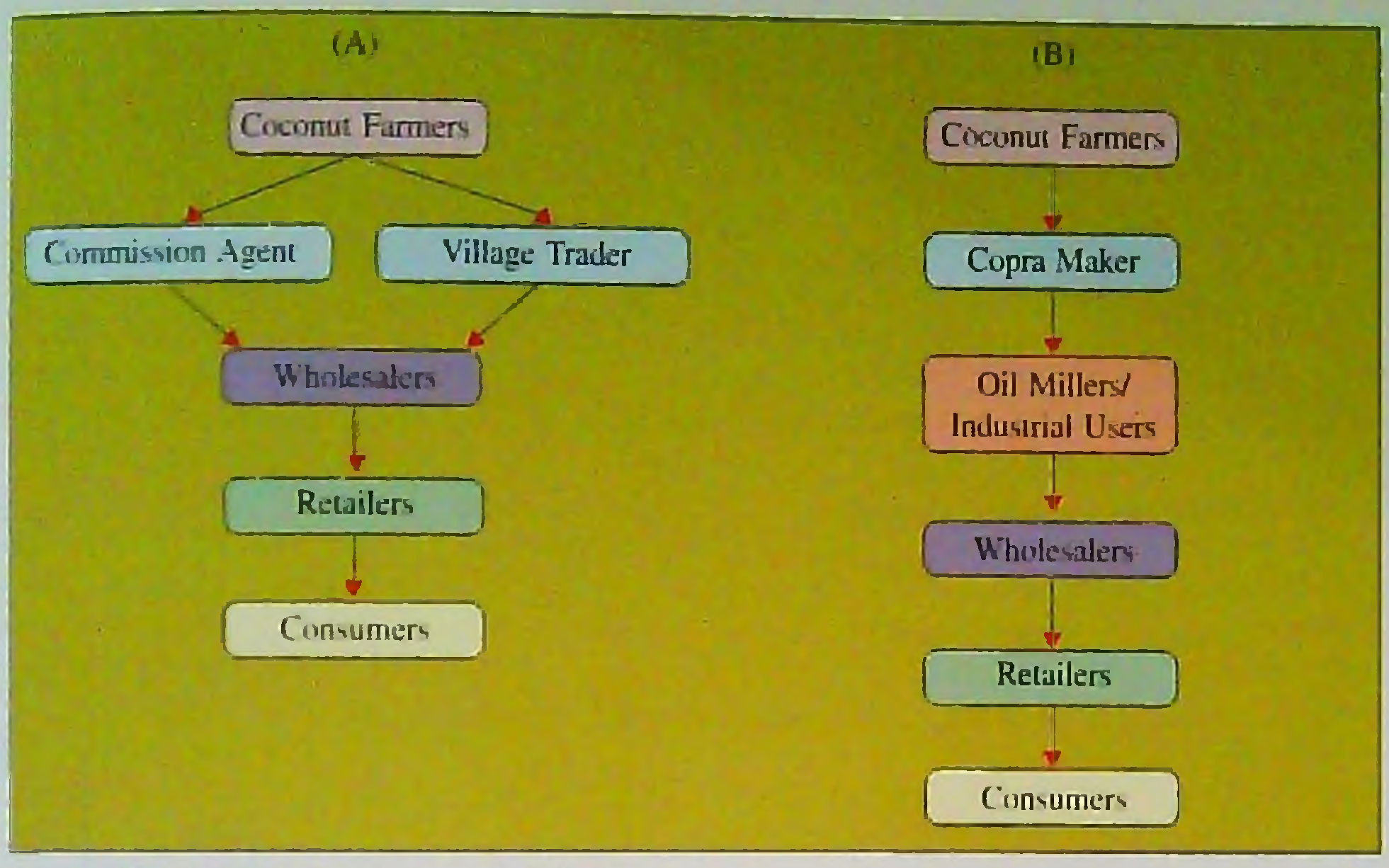


Figure 12. Major Marketing channels in India

Source: Radhakrishnan *et al*, 1988; Yasodha and Padmanaban, 1996; DMI, 2008)

marketing efficiency of the marketing channel: farmer ⇨copra maker ⇨oil miller ⇨wholesaler ⇨retailer ⇨consumer in Kerala (Table 8), and found that the farmer's share was around 61 per cent (in other words, a price spread of 39.42 per cent). Keeping the temporal differences apart, this is higher than the price spread of 19 per cent estimated by Haridoss and Chandran (1996) for Tamil Nadu.

The main forms in which coconut are exported from India are coconut, grated coconut, desiccated coconut powder, coconut milk powder, tender coconut, coconut water, copra, coconut oil, virgin coconut oil, hair oil, baby oil, coconut oil cake, coconut shell based products like shell charcoal, steam activated carbon, ice cream cups, coconut shell powder, and coir products. The channel for the export of coconut is depicted in Fig.13. The export houses procure their inventory through the pre harvest contractors and wholesalers, depending on the market situation, who in turn procure the commodity directly from the producers or through the village traders.

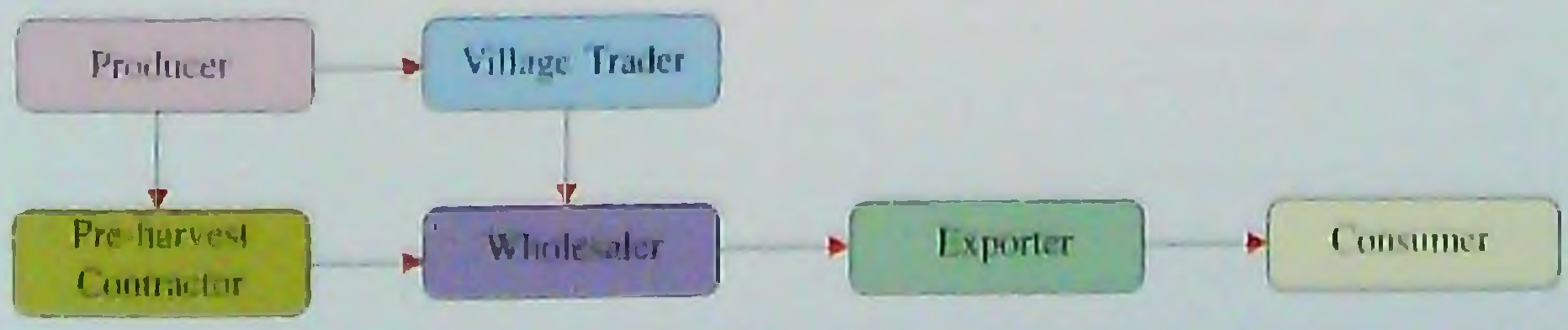


Figure 13. Marketing Channel for Export of Coconut

Table 8. Farmer's share and price spread in coconut marketing in Kerala

Sl. No.	Particulars	Percentage share per 100 nuts
1	Price received by farmers	60.58
2	Price received by the copra maker (or Price paid by the oil miller)	81.06
3	Marketing cost of the copra maker	6.56
4	Realization by the copra maker from the by product	1.86
5	Net margin of the copra maker	15.78
6	Price received by the oil miller (or Price paid by the wholesaler)	84.14
7	Realization by the oil miller from the by product	4.93
8	Net margin of the oil miller	4.88
9	Marketing cost of the wholesaler	0.10
10	Price received by the wholesaler (or Price paid by the retailer)	89.60
11	Net margin of the wholesaler	5.37
12	Marketing cost of the retailer	0.41
13	Net margin of the retailer	9.98
14	Price paid by the consumer (Price received by the retailer)	100.00
15	Price Spread	39.42

Source: Narayanan and Bastine, 2004

Trade Status and Export Competitiveness

There are references to coconut in many Arab and European writings. The Arab Merchant Soleyman who visited China in the first half of the ninth century refers to the use of coir fibre and coconut toddy. To the medieval writers such as Marco Polo, the coconut was known as *Nux Indica*, the Indian Nut. The name *coco* or its variants do not appear in European literature until the end of the sixteenth century (Child, 1974). The earliest reference was given by the Oxford New English Dictionary in 1893, which again is attributed to *Roteiro deVasco da Gama*.

Valuable properties of coconut oil for soap making were understood in the eighteenth century. It was understood that the lathering quality of soap is enhanced by the use of 'lauric oils'. This led many Europeans to set up coconut plantations in Sri Lanka as early as in 1833 (Child, 1974). The emergence of coconut based economy in the world can be traced to the expansion of European Soap and Edible Oil Company, coinciding with the industrial revolution in the Europe. Emerging export opportunities triggered an unprecedented expansion in area and production in the present coconut growing areas. This period saw India emerging as a major exporter of copra and coconut oil nation, and the annual exports exceeded 30,000 and 10,000 tons respectively (Markose, 1993).The economic crises during the World Wars saw a prolonged industrial depression in world economies. During this period, the price of coconut oil and copra also crashed in the international market, resulting in nose diving exports. Sensing the need to rehabilitate the coconut industry, the Indian Central Coconut Committee was set up in 1945 under the Indian Coconut Committee Act, 1944. The Committee was given statutory powers for the systematic development and research in coconut. The Committee did yeoman service for the growth of coconut industry in India during the period from 1945 to 1966. In 1966, the Coconut Committee was dissolved, and the Directorate of Coconut Development was formed and entrusted with the task of developing coconut industry in the country. The Directorate of Coconut Development ceased to exist when the Coconut Development Board was constituted under the Coconut Development Board Act, 1979 for the integrated development of the coconut industry in India.

With the introduction of hydrogenated oils in the early twentieth century, coconut oil lost its prominence as a source of lauric acid. With the American Soybean Association waging a vigorous and vicious campaign against "tropical oils" to reduce their imports to the USA, coconut oil suffered heavily in the market in terms of drastic reduction in demand for human consumption (Etherington, 1993; Directorate of Marketing and Inspection, 2008). Since then, coconut oil has been susceptible to the pressures from increased availability of cheaper oils like palm oil, soybean oil, and sunflower oil. As the price of coconut depended heavily on the price of copra and coconut oil, the Government of India decided to declare minimum support price (MSP) for copra from the year 1988. Declaration of MSPs was done on regular basis from 1991 onwards. The MSP is intended to provide a guarantee to purchase copra at a pre-announced price when the market prices crashed beyond a point. This way, the government wanted to provide a minimum price guarantee to the producers. The details of MSP declared for milling and ball copra are furnished in Table 9.

It may be observed that MSP of both milling and ball copra have been continuously increasing over the period. By the year 2009-10, MSP of milling copra has increased 2.78 times the MSP in1990-91, while the same for ball copra has doubled during the corresponding period. This could have benefitted vast majority of functionaries related to coconut industry. Another major development in the sector was when import of oilseeds was put under open general licence (OGL) in 1998, futures trading was permitted in major oils. However, futures trading was permitted in coconut oil w.e.f. 29 October 2001, after a gap of 3 years.

Table 9. Minimum Support Price of Milling copra and Average Annual Market Prices: A Comparison

Year	Milling Copra (Rs/Ql)	Ball Copra (Rs/Ql)
1990-91	1600	N.D.
1991-92	1700	N.D.
1992-93	N.D.	N.D.
1993-94	2150	2350
1994-95	2360	2575
1995-96	2500	2725
1996-97	2500	2725
1997-98	2700	2925
1998-99	2900	3125
1999-00	3100	3325
2000-01	3250	3500
2001-02	3300	3550
2002-03	3300	3550
2003-04	3320	3570
2004-05	3500	3750
2005-06	3570	3820
2006-07	3590	3840
2007-08	3620	3870
2008-09	3660	3910
2009-10	4450	4700

Source: Economic Survey, various issues

Table 10. International Prices and Nominal Protection Coefficients for Coconut

Year	Domestic price of Trichur market (Rs/Qlt)	Domestic price of Pollachi market (Rs/Qlt)	International price of Philippines (Rs/Qlt)	NPC with respect to Trichur market	NPC with respect to Pollachi market
2003-04	645.83	511.67	352.45	1.83	1.45
2004-05	704.17	470.83	433.17	1.63	1.09
2005-06	589.58	453.33	376.15	1.57	1.21
2006-07	537.50	590.61	465.27	1.16	1.27
2007-08	600.00	578.98	580.80	1.03	1.00
2008-09	1275.00	641.70	684.82	1.86	0.94
2009-10	1145.83	649.50	431.96	2.65	1.50
Mean	**785.42**	**556.66**	**474.95**	**1.68**	**1.21**

Indian agriculture faced both opportunities and challenges with liberalization of domestic and global markets. There was a need to develop a new strategy for the agricultural sector to become globally more competitive. Appropriate measures were 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 raw coconuts of Trichur market and Pollachi market with that of Philippines market. The idea of export competitiveness is more comprehensive as it involves segmented markets, differential products, technology and difference in economies of scale. The export competitiveness of coconut has been calculated using the nominal protection coefficient (NPC) under an exportable hypothesis (Appleyard,1987; Gulati *et al*,1994; Datta, 2001). The respective nominal protection coefficients are worked out and presented in Table 10. A perusal of NPCs show that the domestic prices of coconut in Trichur and Pollachi markets have been consistently higher than the international prices, indicating that the Indian coconuts are not globally competitive under the exportable hypothesis.

Export Status

That may be the reason as regards to why export of coconut and other coconut products did not find a prominent place in India's agricultural export basket although India is one of the largest producers of coconut (Babu, 2011). Another reason was that our production were by and largely utilized for domestic consumption and therefore exportable surplus did not exist on a regular basis (Singh and Remany, 2004). During the sixties, 295 MT coconuts were exported from India for US $ 21,000. It remained more or less at this level till the eighties. However, the export of raw coconuts from India witnessed considerable reduction during the early nineties. Export of coir and coconut oil gained momentum in nineties. Latest figures indicate that coconut (29.15 per cent), coir (25.55 per cent), copra (23.83 per cent) and coconut oil (17.30 per cent) form the main items of export from India (Table 11) The shift in the export basket will be clear from Fig .13. In the eighties, coir contributed the major share (62.05 per cent) of coconut exports, which has declined to 25.55 per cent by 2008-09. During the same period, export of raw coconuts has increased from 3.33 per cent to 25.55 per cent, and the export of copra which was absolutely nil in the eighties has increased to 23.83 per cent. The coconut oil cake exports which occupied a percentage share of 18.06 per cent of total coconut exports in the eighties has come down to negligible per cent in 2008-09. Of late, the export of desiccated coconut is picking up.

Import Status

In sixties and seventies, copra was the major item of import with a share of 99.98 per cent and 100

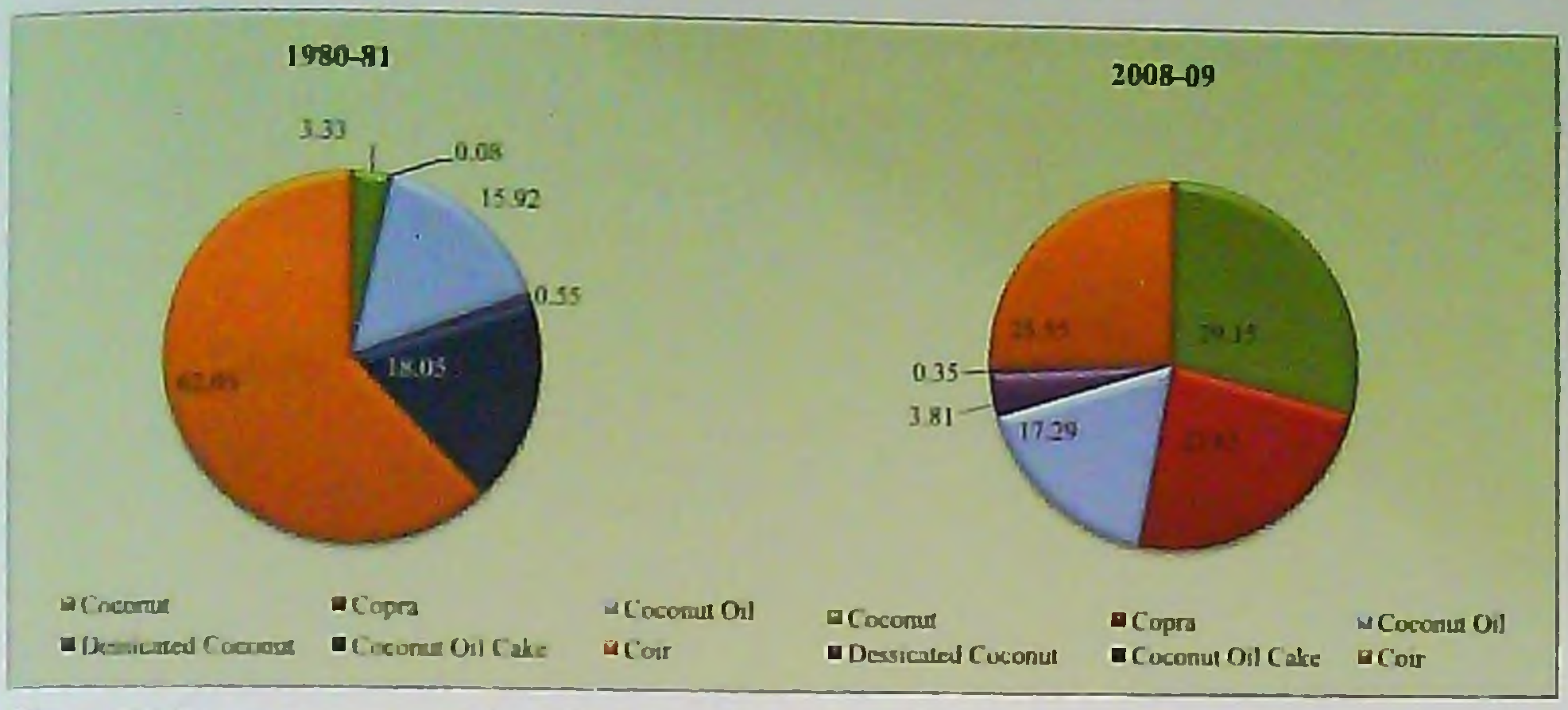


Figure 14. Percentage composition of exports of coconut and coconut products from India

Table 11. Export of Coconut and Coconut Products from India (Quantity in MT)

Year	Coconut	Copra	Coconut Oil	Desiccated Coconut	Coconut Oil Cake	Coir	Total
1961	295	0	1	0	10357	0	10653
	(2.77)	(0)	(0.009)	(0)	(97.22)	(0)	(100)
1971	232	0	9	0	3813	0	4054
	(5.72)	(0)	(0.22)	(0)	(94.06)	(0)	(100)
1981	118	485	1	0	1975	160	2739
	(4.31)	(17.71)	(0.037)	(0)	(72.11)	(5.84)	(100)
1991	4	0	70	0	0	64	138
	(2.89)	(0)	(50.72)	(0)	(0)	(46.38)	(100)
2001	439	12	3134	144	12	11538	15279
	(2.87)	(0.08)	(20.51)	(0.94)	(0.08)	(75.52)	(100)
2002	1188	31	5676	197	6435	22114	35641
	(3.33)	(0.09)	(15.93)	(0.55)	(18.06)	(62.05)	(100)
2003	1402	95	6014	482	482	27191	35666
	(3.93)	(0.27)	(16.86)	(1.35)	(1.35)	(76.24)	(100)
2004	2316	761	5954	432	4279	35764	49506
	(4.68)	(1.54)	(12.03)	(0.87)	(8.64)	(72.24)	(100)
2005	2690	1283	5378	652	272	62816	73091
	(3.68)	(1.76)	(7.36)	(0.89)	(0.37)	(85.94)	(100)
2006	2424	1357	3677	312	65	96051	103886
	(2.33)	(1.31)	(3.54)	(0.30)	(0.63)	(92.46)	(100)
2007	6932	1671	6817	1455	218	107996	125089
	(5.54)	(1.34)	(5.45)	(1.16)	(0.17)	(86.34)	(100)
2008	16609	13578	9855	2173	200	14558	56973
	(29.15)	(23.83)	(17.30)	(3.81)	(0.35)	(25.55)	(100)

Source: FAO, 2011

*Figures in parentheses indicate percentage to the total

per cent respectively Coconut oil entered the picture and remained the major item of import with a share of 87.69 per cent, 94.11 per cent, 70.30 per cent and 53.12 per cent of the total coconut product imports of India in 1981, 1991, 2001 and 2002 respectively. India had started importing coconut oil cake from 2002 onwards. From 2003 onwards, coconut oil cake was the major item of import and has continued the status till 2008 (Table 12). Coconut and coir have been imported in negligible quantities. A shift in import status is presented in Fig.15. Analysis of import statistics shows that copra and coconut oil contributed the major share of coconut imports in the eighties with a percentage share of 93.75 per cent and 6.25 per cent respectively. Raw

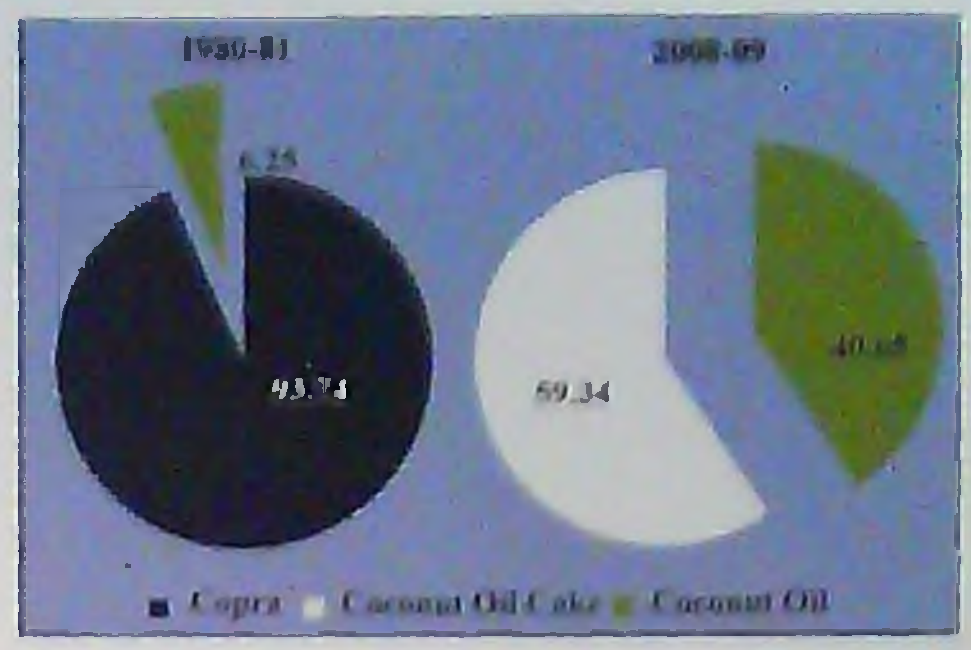


Figure 15. Percentage composition of imports of coconut and coconut products into India

(Source: FAO, 2011)

Table 12. Import of Coconut and Coconut Products into India (Quantity in MT)

Year	Coconut	Copra	Coconut Oil	Desiccated Coconut	Coconut Oil Cake	Coir	Total
1961	9	89716	0	5	0	0	89730
	(0.01)	(99.98)	(0)	(0.01)	(0)	(0)	
1971	0	8134	0	0	0	0	8134
	(0)	(100)	(0)	(0)	(0)	(0)	
1981	0	6063	43718	0	0	73	49854
	(0)	(12.16)	(87.69)	(0)	(0)	(0.15)	
1991	0	83	1325	0	0	0	1408
	(0)	(5.89)	(94.11)	(0)	(0)	(0)	
2001	0	371	23609	3	9501	99	33583
	(0)	(1.10)	(70.30)	(0.01)	(28.29)	(0.29)	
2002	15	227	30416	24	26181	392	57255
	(0.03)	(0.40)	(53.12)	(0.04)	(45.73)	(0.68)	
2003	19	1144	13760	3049	70588	148	88708
	(0.02)	(1.29)	(15.51)	(3.44)	(79.57)	(0.17)	
2004	1085	1136	12712	8208	53184	438	76763
	(1.41)	(1.48)	(16.56)	(10.69)	(69.28)	(0.57)	
2005	58	1790	4069	716	94350	803	101786
	(0.06)	(1.76)	(4)	(0.70)	(92.69)	(0.79)	
2006	0	0	14096	0	42432	192	56720
	(0)	(0)	(24.85)	(0)	(74.81)	(0.34)	
2007	2	0	8119	2	30849	394	39366
	(0.01)	(0)	(20.62)	(0.01)	(78.36)	(1)	
2008	4	0	15229	0	22231	0	37464
	(0.01)	(0)	(40.65)	(0)	(59.34)	(0)	

Source: FAO, 2011

*Figures in parentheses indicate percentage to the total

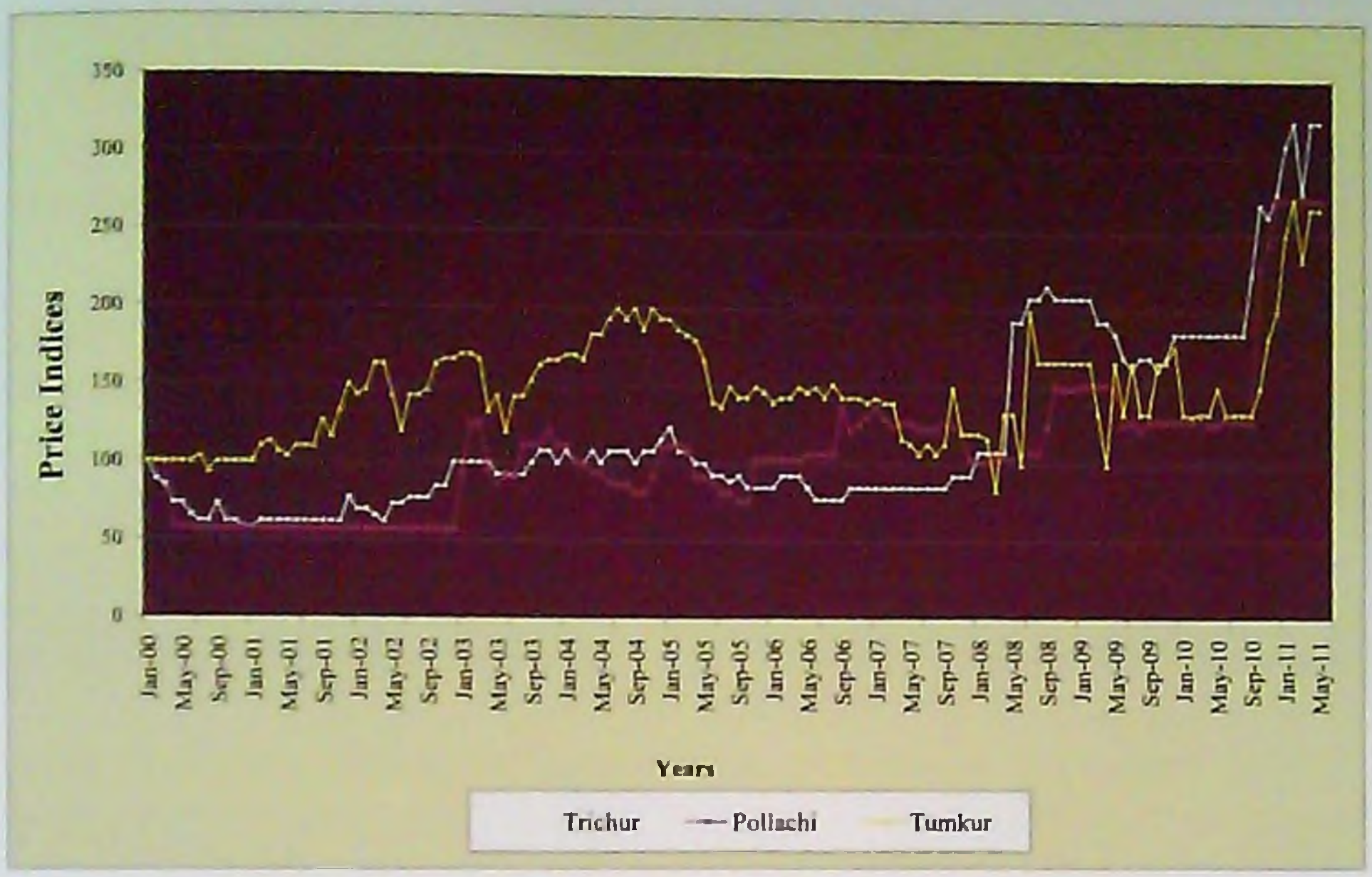


Figure. 16 Price Index of Coconut at Trichur, Pollachi and Tumkur markets

coconuts were not imported to India during the respective period. By 2008-09, the import of coconut oil has increased considerably to 40.65 per cent. The major share of coconut imports in 2008-09 is contributed by coconut oil cake with a percentage share of 59.34 per cent which was nil during the eighties.

Price Behaviour of Coconut

Agricultural commodity prices are determined by a combination of demand and supply related factors. The present section examines the behaviour of coconut prices scientifically in the major markets of Kerala, Tamil Nadu and Karnataka. The reference markets selected for the analysis are Trichur market for Kerala, Pollachi market for Tamil Nadu and Tumkur market for Karnataka. The monthly time series price data for 12 years extending from January 2000 to May 2011 were selected for the study. A multiplicative model of the following form was used to study the components of the time series:

$$Y(P) = T * C * S * I$$

where, Y (P) = Monthly average price of coconut
T = Secular trend
C = Cyclical movement
S = Seasonal index, and
I = Irregular movement

Trends

In the long run a time series may show a tendency to increase, decrease or remain stagnant. 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). The long-term trend in price of any commodity or group of commodities is the net result of forces affecting either demand or supply over a long span of time.

The price indices of three markets were worked out for easy comparison and depicted in Fig. 16. It may be noted that coconut prices in the three markets moved in close association. The prices remained stagnant for a long period from 2000 to 2009, and an upward trend is visible thereafter.

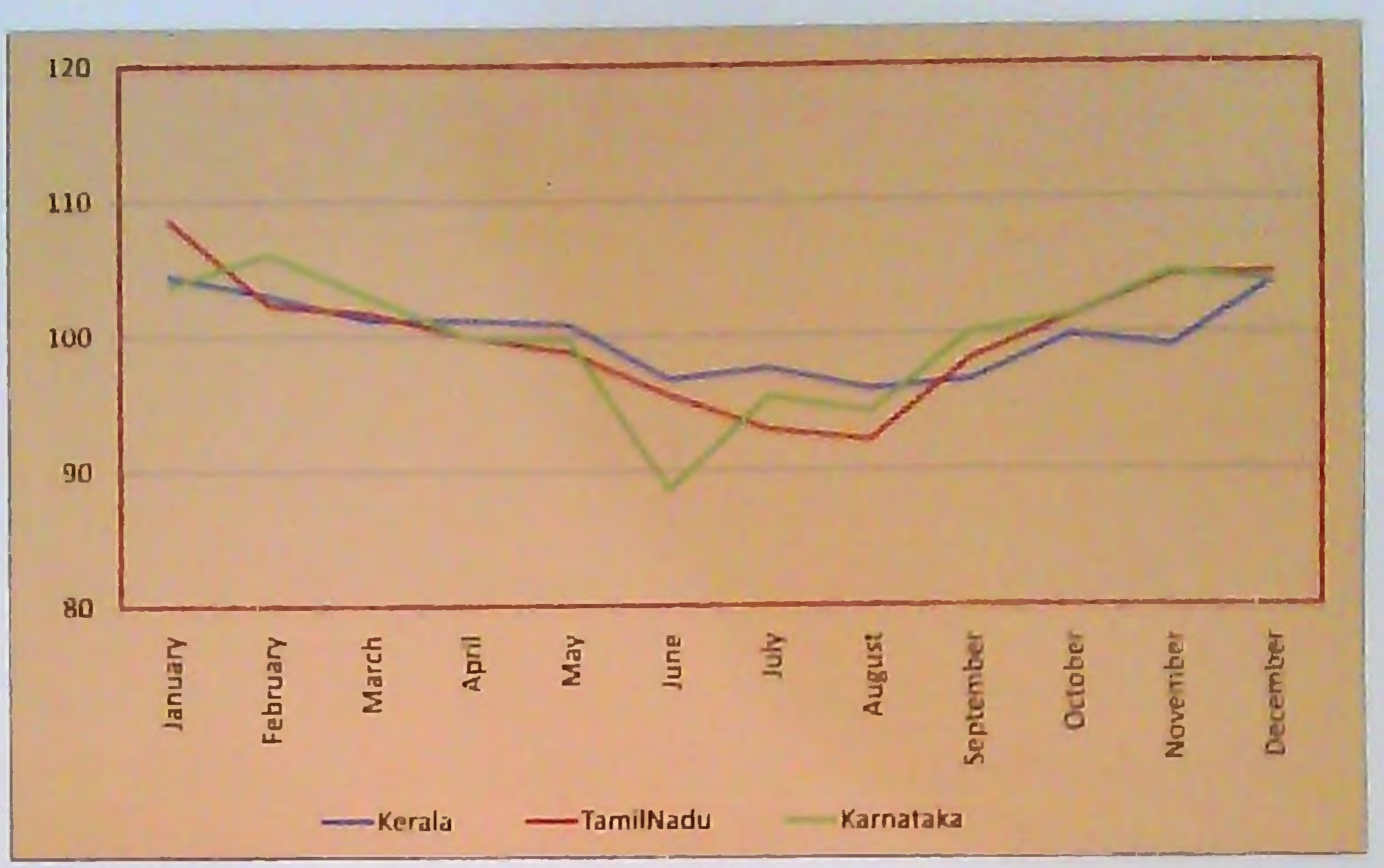


Figure 17. Seasonal variations in coconut price at Trichur, Polachi and Tumkur markets

The period from 2009 to 2010 corresponds to a global demand – supply mismatch caused by the global shortfalls in production due to the El Nino and the La Nina effect in the major coconut producing nations.

Seasonal Variation

Seasonal movements refer to the identical patterns of movement followed by a time series during corresponding months of successive years. Those movements recur with some degree of regularity within a year. The seasonal variation in prices is mainly due to the seasonality in supply and demand factors affecting the stocking decisions and availability of the commodity. Seasonality in a time series can be identified by regularly spaced peaks and troughs, which have a consistent direction and approximately the same magnitude every year relative to the trend.

Seasonality in coconut price could be identified in all the markets under reference. The seasonal behaviour identified (Fig 17) exhibited a similar pattern except for minor differences in magnitude for the peak and troughs. The prices of coconut in Kerala and Tamil Nadu are showing an upward trend from November to January as it is the off season for coconuts characterised by low arrivals. The period from May to August exhibits a trough phase in coconut prices in the three States as it is the peak production season for coconuts. The price is at its lowest during June in Karnataka. The price of nuts peaks in Karnataka during February.

Cyclical Variation

Price cycles represent deviations in price levels from the average trend due to business sequences of boom and recession that appear in the economy. Cyclical variations for the three markets in Kerala, Tamil Nadu and Karnataka were worked out and presented in Fig.18. The markets of Kerala and Karnataka behaved almost similarly with respect to the price cycles in duration and period. Even though the price cycles for Tamil Nadu behaved slightly differently, the

Figure 18. Cyclical variations in coconut price at Trichur, Polachi and Tumkur markets

present cycle for the three states is moving in same magnitude. The price cycle worked out to approximately five years' duration.

Irregular Variation

The irregular variations represent the "residues" left in the time series after the trend and calendar effects have been removed. Hence, it is referred to as the "residual effect' also. These are due to random factors such as supply shocks on account of climatic deviations, or market shocks on account of demand shocks or due to high speculative undercurrents. In internationally traded commodities, where diverse production, consumption and trade interests come into picture, such push and pulls are common and expected.

The irregular indices were worked out for the markets of Kerala, Tamil Nadu and Karnataka and graphically presented in Figure 19. There

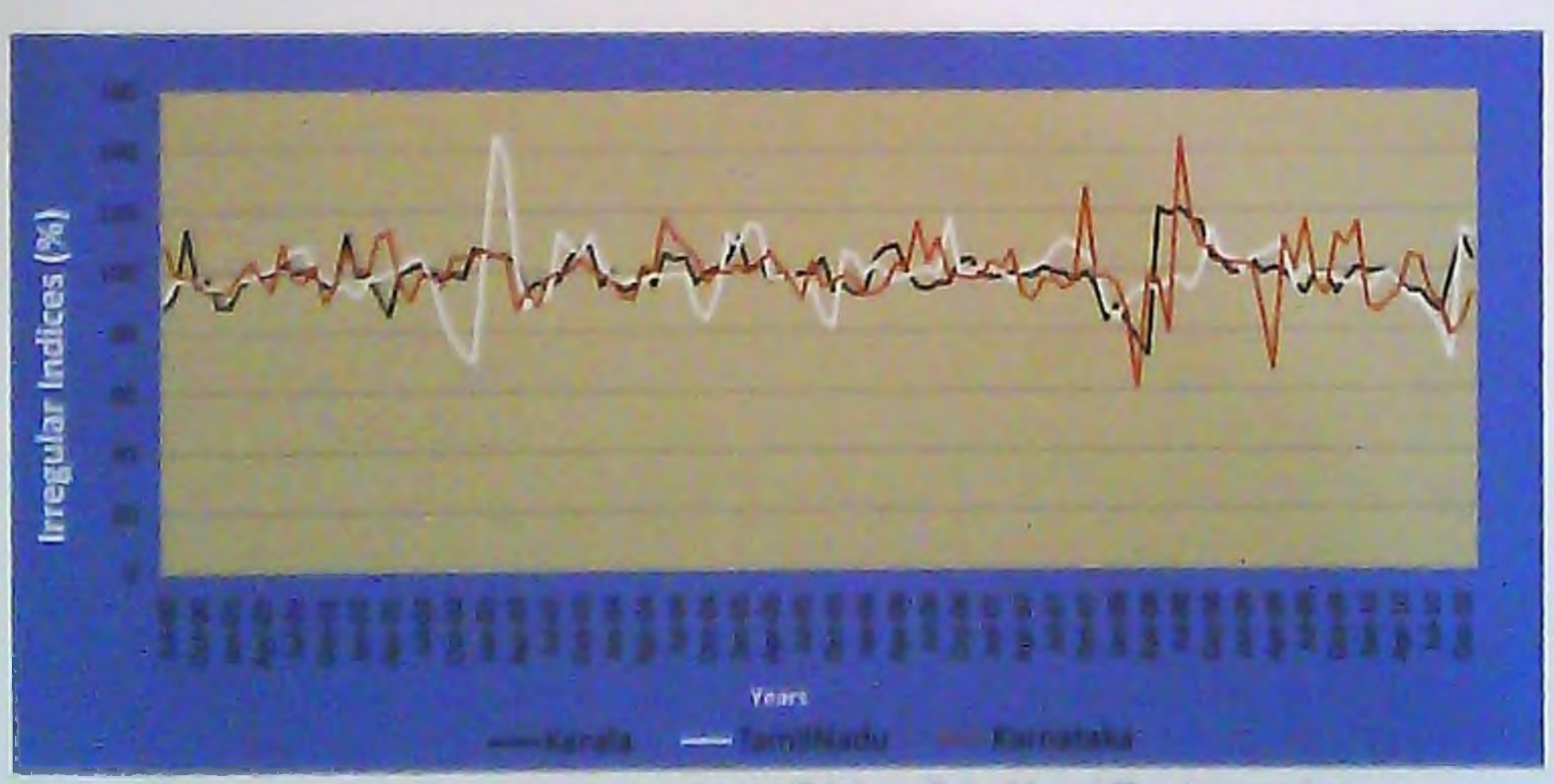


Figure 19. Random variations in coconut price at Trichur, Polachi and Tumkur markets

were identical random variations among the three states, with more pronounced random variation observed in the case of Pollachi prices. It indicated that the random factors operated similarly in Karnataka and Kerala whereas it behaved differently in Tamil Nadu.

Price Volatality

In view of coconut prices exhibiting considerable inter year and intra year variations, it was tested for price volatility. The Auto Regressive Conditional Heteroskedasticity (ARCH) Model introduced by Engle (1982) and generalized as GARCH (Generalized ARCH) by Bollerslev *et al* (1992) was used to test the price volatility of the markets. The coefficients, standard errors, and other related statistics of the estimation are presented market wise in Table 13, 14, and 15.

It may be noted that none of the estimates were statistically significant, thereby suggesting that that though coconut prices were unstable, empirical evidence of price volatility could not be established.

Market Integration

Market integration exists when prices of homogeneous commodities in spatially separated markets move mutually in response to the forces of demand and supply. Spatial integration of coconut markets in Kerala was established by Ramakumar and Sundaresan (2000). Therefore, an attempt was made to the extent of market integration of the three markets in South India. Johansen's cointegration method is the most widely used tool to study market integration. The necessary condition for doing the cointegration

Table 13. ARCH GARCH estimates for the Thrissur Market Price

Particulars	Coefficient	Standard Error	Z Statistic	Probability
Constant	505227.6	495061.7	1.020535	0.3075
ARCH (1)	1.084928	1.362700	0.796160	0.4259
GARCH (1)	- 0.817805	0.584825	- 1.398375	0.1620

Akaike Info criterion: 16.09332

Table 14. ARCH GARCH estimates for the Pollachi Market Price

Particulars	Coefficient	Standard Error	Z Statistic	Probability
Constant	218556.9	249011.8	0.877697	0.3801
ARCH (1)	1.104891	1.324276	0.834336	0.4041
GARCH (1)	-0.788504	0.761791	-1.035066	0.3006

Akaike Info criterion: 15.37013

Table 15. ARCH GARCH estimates for the Tumkur Market Price

Particulars	Coefficient	Standard Error	Z Statistic	Probability
Constant	13408611	32187004	0.416585	0.6770
ARCH (1)	0.749633	1.792894	0.418113	0.6759
GARCH (1)	-0.400657	2.169816	-0.184650	0.8535

Akaike Info criterion: 19.66287

Table 16. Johansen's Co integration test

Market	Eigen value	Likelihood Ratio	5% critical value	1% critical value	Hypothesized No. of CE(s)
Thrissur	0.071154	23.15211	34.55	40.49	None
Pollachi	0.064274	13.40882	18.17	23.46	At most 1
Tumkur	0.034539	4.034639	3.74	6.40	At most 2 *

CE denotes the Cointegrating Equation

**denotes the rejection of hypothesis at 1% significance level

*denotes the rejection of hypothesis at 5% significance level

analysis is to determine, whether the two price series are stationary or not. The Augmented Dickey Fuller (ADF) test was done separately for all the 3 markets, and the MacKinnon critical values indicated the rejection of the null hypothesis of a unit root. It meant that all the three series were stationary.

The results of Johansen's cointegration test are given in Table 16. The null hypothesis assumes that no two series are co integrated. The relationship that at most 2 cointegration equations is significant at 5 per cent level of significance, meant that the null hypothesis of independence of the markets is to be rejected.

The pair wise Granger Causality test was carried out to know the direction of influence of markets on each other. The pair wise Granger Causality test approach the question of whether 'X causes Y' is to was carried out to know how much of the current Y can be explained by past values of Y, and then to see whether adding lagged values of X can improve the explanation. It is to be noted that the statement 'X Granger causes Y' does not imply that Y is the effect or the result of X. ie. It does not indicate causality in the more common use of the term. Y is said to be Granger-caused by X if X helps in the prediction of Y, or equivalently if the lagged X's are statistically significant. If two way causation is underlying, then X Granger causes Y and Y Granger causes X will hold.

It may be noted that a unidirectional influence is present among the markets considered(Table 17). Thrissur prices influences Pollachi and Tumkur markets. Pollachi market prices influences Tumkur market, but was not found to influence Thrissur. Tumkur market did not exert any influence on Thrissur or Pollachi markets. With widespread interstate trade prevalent in coconut, copra and coconut oil, deficits in Kerala markets may be influencing the neighbouring Tamil Nadu

Table 17. Pair wise Granger Causality Test

Sample: 2000:01 2011:05
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Probability
TCR does not Granger Cause TUMK	133	4.55225	0.00183
TUMK does not Granger Cause TCR		0.84316	0.50038
POLLA does not Granger Cause TUMK	133	3.81742	0.00582
TUMK does not Granger Cause POLLA		0.87180	0.48297
POLLA does not Granger Cause TCR	133	0.22410	0.92451
TCR does not Granger Cause POLLA		4.42566	0.00223

and Karnataka markets. It is the experience that firm prices in Kerala attract the flow of coconut, copra and coconut oil from both Tamil Nadu and Karnataka.

If two time series are co integrated, it could also be inferred that a long run equilibrium exists between them. But there can be disequilibrium in the short run. However, the vector error correction models (VEC) could not be attempted due to paucity of daily or weekly price data of the three markets for a reasonable period of time.

SWOC Analysis

SWOC analysis is an acronym for identifying the strengths, weaknesses, opportunities and challenges in any sector. It is carried out to determine the distinctive capabilities and external limitations faced by the sector so as to prioritize actions. The strengths are identified characteristics of the sector that give it an advantage over others, while weaknesses represent characteristics that place limitations on the sector relative to others. Opportunities provide external chances that may provide options to improve the performance of the sector. Challenges indicate the external elements that could cause impediments for the sector in its smooth sailing ahead. The SWOC factors identified for the coconut sector is depicted in Table 18. In a 2x2 matrix method for SWOC analysis, strengths and weaknesses are reckoned as internal factors whereas opportunities and threats are reckoned as external factors.

The Roadmap Ahead

The road map ahead is not smooth. It is bumpy, but as India is increasingly becoming a new hub

Table 18. Strength, Weaknesses, Opportunities and Challenges of Coconut Sector

Strengths	Weaknesses	Opportunities	Challenges
Most suitable agro climate for cultivation in the major producing tracts	Small holders dominate the production scenario-economy of scale cannot be achieved individually	The crop has eco friendly cultivation practices. Most suitable for organic cultivation, especially for tender coconut production	Non availability of skilled climbers
The crop is not season bound – hence, round the year production possible	With low marketable surplus, organized marketing and on-farm processing options are limited	Group approaches are possible to overcome scale diseconomies	Unstable prices
Less capital intensive as compared to other plantation crops	Inefficiently organized markets, dominated by private traders	Tremendous scope for product development and diversification	High incidence of pests and diseases
Long economic life span once established	Monopsonistic market, with a coconut oil based pricing mechanism	Scope for alternate marketing like contract farming/ producer markets, value chain systems etc.	Declining productivity
Access to market infrastructure and extensive processing chains	Poor market intelligence system	Emerging global opportunities for biodiesel production	Free import of cheap substitutes like palm oil

of a global supply chain system. corrections in policy distortions and determined efforts may throw in many opportunities. The global coconut economy is at crossroads on account of global shortfalls in production due to high incidence of diseases and pests. declining crop productivity. coupled with shifts in climatic pattern during the last two years. As a result. the production in all major coconut producing countries like Philippines and Sri Lanka has been reeling. Sri Lankan production has recorded a 15 year low of 2.533 billion nuts in 2010. as a result of which nut prices sky rocketed to Rs.32 per nut. The rise in domestic price caused restlessness among urban consumers. which led the Sri Lankan Government to ban export of coconut and felling of coconut palms. and even arranging imports of nuts to bring the price line under control. Reports emanating from Philippines indicate that delivery of copra to mills nationwide has been severely affected by two typhoons that affected Philippines in September 2011. Country wide shortage of coconut due to drought and widespread coconut hispine beetle infestation in the heart of Thailand's coconut belt has hit the coconut economy so hard that the price of coconuts has jumped from seven baht in July 2010 to 20.5 baht in November 2011. compelling imports from Indonesia. Thus, barring Indonesia. coconut production in most coconut producing nation is reeling. resulting in global demand-supply mismatches. With the Sri Lankan sources drying up. importers in Bangladesh. Pakistan. Nepal and Middle East countries started outsourcing fresh nuts from India. pushing prices in India to firm levels. Thus, coconut prices moved up in nominal as well as real terms in India after a gap of 15 years. This is expected to stimulate a come back phase for the 'King of Tropical Palms' that was totally neglected by most farmers for over a decade.

This calls for a reassessment of our policy perspective on the coconut economy based on its strengths and weaknesses. The current policy adhocism is characterised by a reluctance to recognise coconut as neither a plantation crop nor an oil seed crop. The term *plantation* is informal and not precisely defined in literature on plantation economics. It is used to denote a large artificially established farm or estate. where crops are grown for sale. often in distant markets rather than for local on-site consumption (Stephens *et al.* 1998; Best. 2001). According to the Encyclopaedia Britannica. a plantation is usually a large estate in a tropical or subtropical region that is cultivated by unskilled or semiskilled labour under some central direction. This meaning of the term arose during the period of European colonization in the tropics and subtropics of the New World. essentially. wherever huge tracts of crops cultivated by slave labour became an economic mainstay. According to Shanmugaratnam (1981). plantation agriculture is a commercial tropical agriculture system which is essentially export-oriented. According to Government of India (2007a). a plantation is a large tract of monoculture having a long gestation period. However. the term "plantation' as defined under the Plantation Labour Act. 1951. includes land used or intended to be used for growing tea. coffee. rubber. cinchona. and cardamom which admeasures 5 hectares or more and in which fifteen or more persons are employed or were employed on any day of the preceeding twelve months. By this yardstick. 'genuine coconut plantations' are difficult to be spotted in the major growing states. Similarly. the Task Force on Plantation Sector designates a grower up to 10 ha of holding plantation land as a small grower (Government of India, 2007b). It raises serious inconsistancies of what actually constitutes a plantation and who is a 'small grower'!

Similar paradoxes are to be encountered in treating coconut as an oil crop and coconut oil as a cooking oil. Around 30 percent of coconut oil is consumed as edible oil in the State of Kerala. Kanyakumary district of Tamil Nadu. Southern Canara region of Karnataka and in pockets outside where non-resident Keralites dominate. It is thus evident that the bulk of current coconut oil production is having industrial uses in soap.

toiletry and cosmetic industries. It is also finding new uses in the paint industry, pharmaceuticals, biscuit and bakery items. A review of the policy of Government of India with regard to edible oil sector shows 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. 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 per cent on all edible oils, significantly below the implied tariff when imports were under quantitative controls. Importers responded to the lower tariffs and declining international prices by importing 4.6 million tonnes of vegetable oil in 1998-99 and more than double the level of imports in 1997-98. The country witnessed a record 9.05 lakh tons of vegetable oil imports in September 2009 against 6.67 lakh tons during the same period in the previous year, registering a 35.68 % growth in imports. Thus, India has become the largest importer of edible oil in the world next to China in 2009.

The palm group of oils comprised more than 75 per cent of the total imports, which have a direct bearing on the coconut economy in the country. There are indications that imports of crude palmolein and palm oil for industrial uses are being diverted to the edible sector. This may be due to the diverse interest represented by oil crushers, who have under utilized capacity and face shortage of raw materials. The second market player, viz. the solvent extractors, want to import cheap crude oil from the international market to process and refine it into value-added branded products. The interest of the third group viz., the growers is weakened with the government allowing import to control the price level so that consumer affordability is not adversely affected. The growers want all forms of edible oil import be stopped. A consolidation of these conflicting interests is a tough task and has resulted in the policy *ad hocism*.

India has a fairly captive domestic market, which absorbs almost entire domestic production of coconut, copra and coconut oil. There is no exportable surplus of these three commodity forms on a regular basis. Therefore, coconut, copra and coconut oil do not constitute a major export item in India's agricultural export basket. The NPC estimations under exportable hypothesis also indicate that Indian nuts lack international competitiveness. The NPC values of Indian coconut during the period from 2003-04 to 2009-10 under the exportable hypothesis showed that the domestic price was 21 per cent higher than the international price. With the Coconut Development Board designated as Export Promotion Council, there shall be more concerted effort to chalk out a sustainable export strategy.

The coconut markets are oligopsonistic in nature. The prices were marked by pronounced seasonal, cyclical and random variations in the major market under consideration. 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 price advantage to the farmers.

The following policy interventions are suggested based on the above findings to keep the coconut economy vibrant and healthy.

- Coconut is basically a small holder crop, cultivated mainly as a rainfed crop in India. The palms are a neglected lot due to continuously low prices that made erosion into the coconut grower's farm income. The adoption of scientific cultivation practices are low and coconut being a perennial crop, such neglect can have carry over effects into the subsequent years. A sizeable portion of bearing coconut palms in the traditional belts have reached the stage of senility, and every year the number of senile palms are increasing. As the production potential of these palms is low, it requires a concerted effort aimed at replanting the senile palms with palms of higher yield potential.

- Indonesia. Philippines and India are the major global producers of coconut, accounting for about 75 per cent of world production. Even though ranked third in terms of coconut production, productivity wise ranking puts India at the 28th position. The coconut productivity in the major producing States of India like Kerala and Tamil Nadu are afflicted by old and senile palms. On the other hand, the domestic price of coconut has been consistently higher than that of the international prices. This renders the Indian coconut economy non competitive at the global level. Hence, productivity enhancement measures shall receive priority over extension of the crop to non-traditional areas. As moisture stress is a productivity limiting factor, more coverage of palms under irrigation is also urgent.

- The MSP was used by the Government to create a favourable atmosphere for the oilseeds sector. However, during the years of excessive price falls, the State Governments were procuring copra with less than 6 per cent moisture due to technical reasons. As many coconut growers do not convert coconut to copra due to a host of reasons, the procurement of copra is not found to benefit the coconut farmers, but the copra traders. Policy corrections are needed to procure coconut directly from farmers.

- A number of factors are likely to shape the prospects of coconut industry in the coming years, the first and foremost among them being the marketing problems. Coconut farming community of India has been subjected to low and unsteady farm gate prices for the last 15 years. A number of marketing inefficiencies in the industry like farm level disposal as unhusked commodity, different strata of middlemen, enhanced transport and handling charges and the existence of considerable seasonality in prices. This urges the need to go up the value chain and turn into a high value-added industry (Fig.20). Sizeable markets exist in domestic as well as export market for value-added products from

Figure 20. Product diversification in coconut

coconut. It shall be a concerted approach that can be used as an effective mechanism to harness higher incomes per unit area cultivated.

- As coconut is essentially a small holders crop in the traditional pockets, individual processing and value addition may not be feasible. Hence group efforts are needed to encourage group processing at farm level. The 'Coconut Clusters' promoted by the Coconut Development Board can play a very significant role in this regard. The demand for tender coconut as a health drink must be fully exploited through better R&D efforts and aggressive marketing. Ideal cultivars like Chowghat Orange Dwarf (Fig.21) should be popularised in this regard.

- The liberalized trade environment and IT enabled market communication has made the world a smaller place on the one hand and a larger market on the other. Paradoxically, lack of accurate and relevant market information continues to be a major factor influencing the efficient performance of agricultural markets in India. Asymmetry to market information has been a major factor hindering the market transparency in most Indian states. While large corporate buyers and industrial users rely upon sophisticated IT enabled market information and intelligence systems to meet their information needs small traders, processors, consumers and most farmers rely on word-of-mouth accounts of commodity prices and changing market conditions. The poor quality of market information and dissemination makes it imperative to have a time tested, regional and farmer centric agricultural market intelligence system for coconut farmers to reduce the price risk.

- With the price of crude petroleum surging ahead, the bio-diesel industry is growing fast world wide (Adkins *et al.* 2006). The diversion of lauric oils into the bio-diesel industry are not properly acknowledged now. It is expected that any further increase in crude petroleum would place higher demand on coconut based bio diesel (Coconut Methyl Ester) because coconut oil based bio-diesel is a cleaner burning fuel. With world bio diesel demand getting stronger, higher demand for coconut oil based bio diesel can be expected. Though India has released the 'National Policy on Bio Fuels', the potential of coconut oil as an excellent source of bio fuel is to be harnessed fully.

Figure 21. Chowghat Orange Dwarf : Ideal cultivar for tender coconut

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APPENDIX I

Coconut Prices (Rs/Qtl) at Different Markets

Months	Thrissur	Tumkur	Pollachi	Months	Thrissur	Tumkur	Pollachi	Months	Thrissur	Tumkur	Pollachi
Jan-00	650	750	495	Nov-03	700	1250	600	Sep-07	550	850	623
Feb-00	575	750	495	Dec-03	650	1250	550	Oct-07	600	1125	617
Mar-00	550	750	485	Jan-04	700	1275	550	Nov-07	600	900	598
Apr-00	475	750	285	Feb-04	650	1275	500	Dec-07	600	900	511
May-00	475	750	285	Mar-04	650	1250	490	Jan-08	700	900	505
Jun-00	425	750	285	Apr-04	700	1375	465	Feb-08	700	875	501
Jul-00	400	775	280	May-04	650	1375	460	Mar-08	700	625	514
Aug-00	400	700	280	Jun-04	700	1450	435	Apr-08	700	1000	519
Sep-00	475	750	280	Jul-04	700	1500	425	May-08	1250	1000	513
Oct-00	400	750	280	Aug-04	700	1450	425	Jun-08	1250	750	527
Nov-00	400	750	280	Sep-04	650	1500	400	Jul-08	1350	1500	534
Dec-00	375	750	240	Oct-04	700	1400	400	Aug-08	1350	1250	526
Jan-01	375	750	280	Nov-04	700	1500	450	Sep-08	1400	1250	615
Feb-01	400	825	280	Dec-04	750	1450	550	Oct-08	1350	1250	749
Mar-01	400	850	280	Jan-05	800	1450	550	Nov-08	1350	1250	731
Apr-01	400	800	280	Feb-05	700	1400	550	Dec-08	1350	1250	740
May-01	400	775	280	Mar-05	700	1375	540	Jan-09	1350	1250	745
Jun-01	400	825	280	Apr-05	650	1350	450	Feb-09	1350	1250	750
Jul-01	400	825	280	May-05	650	1250	450	Mar-09	1250	1000	752
Aug-01	400	825	280	Jun-05	600	1050	440	Apr-09	1250	750	753
Sep-01	400	950	280	Jul-05	600	1025	400	May-09	1200	1250	738
Oct-01	400	875	280	Aug-05	575	1125	400	Jun-09	1100	1000	620
Nov-01	400	1000	280	Sep-05	600	1075	375	Jul-09	1050	1250	633
Dec-01	500	1125	280	Oct-05	550	1075	375	Aug-09	1100	1000	604
Jan-02	450	1075	280	Nov-05	550	1125	510	Sep-09	1100	1000	634
Feb-02	450	1100	280	Dec-05	550	1100	510	Oct-09	1050	1250	634
Mar-02	425	1225	280	Jan-06	550	1050	510	Nov-09	1100	1250	633
Apr-02	400	1225	280	Feb-06	600	1075	510	Dec-09	1200	1325	635
May-02	475	1075	280	Mar-06	600	1075	510	Jan-10	1200	1000	635
Jun-02	475	900	280	Apr-06	600	1125	510	Feb-10	1200	987.5	630
Jul-02	500	1075	280	May-06	550	1100	525	Mar-10	1200	1000	645
Aug-02	500	1075	280	Jun-06	500	1125	525	Apr-10	1200	1000	625
Sep-02	500	1100	280	Jul-06	500	1075	525	May-10	1200	1125	625
Oct-02	550	1225	280	Aug-06	500	1140	525	Jun-10	1200	1000	640
Nov-02	550	1250	280	Sep-06	500	1075	675	Jul-10	1200	1000	637
Dec-02	650	1250	280	Oct-06	550	1075	600	Aug-10	1200	1000	634
Jan-03	650	1375	460	Nov-06	550	1075	621	Sep-10	1450	1000	631
Feb-03	650	1275	620	Dec-06	550	1050	646	Oct-10	1750	1125	1125
Mar-03	650	1250	620	Jan-07	550	1075	679	Nov-10	1700	1375	1200
Apr-03	650	1000	475	Feb-07	550	1050	640	Dec-10	1800	1500	1350
May-03	600	1075	425	Mar-07	550	1050	615	Jan-11	2000	1875	1350
Jun-03	600	900	450	Apr-07	550	875	627	Feb-11	2100	2050	1313
Jul-03	600	1075	450	May-07	550	850	627	Mar-11	1800	1750	1350
Aug-03	600	1075	550	Jun-07	550	800	608	Apr-11	2100	2000	1350
Sep-03	650	1150	550	Jul-07	550	850	607	May-11	2100	2000	1350
Oct-03	700	1225	550	Aug-07	550	800	609				