Oil Palm: Pricing for Growth, Efficiency & Equity

Towards a Rational Pricing Policy for Fresh Fruit Bunches
and Potential Solution for India's Burgeoning Edible Oil Imports

Ashok Vishandass

Ashok Gulati

Commission for Agricultural Costs and Prices
Department of Agriculture and Cooperation
Ministry of Agriculture
Government of India

Commission for Agricultural Costs and Prices
Department of Agriculture and Cooperation
Ministry of Agriculture
Government of India
New Delhi

January 2012

Oil Palm: Pricing for Growth, Efficiency & Equity

Towards a Rational Pricing Policy for Fresh Fruit Bunches
and Potential Solution for India's Burgeoning Edible Oil Imports

Ashok Vishandass

Ashok Gulati

Contact addresses: vishandass@nic.in / agulati115@gmail.com

Ashok Vishandass is Member (official) and Ashok Gulati is Chairman in the
Commission for Agricultural Costs and Prices
Department of Agriculture and Cooperation
Ministry of Agriculture
Government of India

January 2012

Preface and Acknowledgements

The report entitled *'Oil Palm : Pricing for Growth, Efficiency & Equity - Towards a Rational Pricing Policy for Fresh Fruit Bunches and Potential Solution for India's Burgeoning Edible Oil Imports'* is brought out in pursuance of a request from the Ministry of Agriculture, New Delhi to recommend suitable formula for pricing of Fresh Fruit Bunches (FFBs). In doing so, we have delved into several inter-related issues from pricing of FFBs to public investment strategy to boost oil palm in the country. In particular, we have taken into account the cost of production of FFBs after duly discounting the cost streams over the economic life of oil palm, the cost of processing, the OER, and also the likely import price parity of palm oil. Given the importance of oil palm and how much potential it has to save foreign exchange by cutting down imports of palm oil and augment farmers' incomes, we have also ventured to delineate an investment strategy for oil palm that can reap huge economic benefits.

We take this opportunity to express our gratitude to thousands of farmers who provided valuable insights into various aspects of cultivation of FFBs. Our special thanks are due to Shri K.S. Rao, Hon'ble Member of Parliament who facilitated our visits to various cultivators and processors. We are also grateful to Dr S. Ayyappan, Secretary, DARE and DG, ICAR, who was the first person that

talked to us right from the Godavari belt and acquainted us to the problems of oil palm growers in the region. He very much desired that we look into the issues that farmers were raising. We hope that with this report, we have responded to some of those issues.

Our sincere thanks are due to Shri G.C. Pati, Addl. Secretary to Govt. of India, Ministry of Agriculture, who formally requested us to suggest the pricing formula for FFBs and we are grateful to him for giving us this opportunity, and hope we have done justice to the subject. We express our sincere gratitude to Shri S.K. Dutta, DDG (CS), ICAR., Dr. K.L.Chadha, Ex.-DDG(H), ICAR, Shri N.C. Mistry, Add. MD, NHB, Ministry of Agriculture, Dr. S. Rajan, ADG(H), ICAR, Dr. Arul Raj, Director, DOPR (Pedavegi), ICAR, Dr. A.P. Singh, D.C. (DAC), Shri Ranvir Singh, Officer Incharge (TMOP, DAC) who actively deliberated in our meeting with them and enlightened us by their knowledge domain.

We are grateful to state governments officers namely Shri R.K. Vaish, Principal Resident Commissioner, Govt. of Tripura, Shri Sudhir Harisingh, D.C. & APC, Govt. of Karnataka, Dr. (Mrs.) G. Vani Mohan, District Magistrate (Eluru), A.P., Shri S.R. Chaudhry, Director (Horticulture), Govt. of Gujarat, Dr. D.L. Maheshwar, Addl. Director, Horticulture, Govt. of Karnataka, Shri T. Gopala Krishanan, Addl. Director, Govt. of Tamil Nadu, Dr. M. Jaganmohan, Jt. Commissioner, (Horticulture), A.P., Shri Swam Vikash Dass, Dy. Director (Horticulture), Govt. of Odisha, Shri P.M. Subham, Asstt. Director (Horticulture) (A.P.) who gave us the benefit of their constructive comments and observations.

Shri V. Venkatramaiah, MD, AP Oil Federation, Hyderabad, Shri R.R. Govindan, Godrej Agrovet Ltd., Shri Sanjay Goenka, Director, 3-F, Oil Palm, Hyderabad, Shri Nasim Ali, Associate Vice President, Godrej Agrovet Ltd., Shri N.K.Arora, Corporate Head, Ruchi Soya Ltd. Indore, Shri A. Rama Krishana, Member, Price Review Committee, Vizianagaram, A.P. did superb job in deepening our understanding of nuances of processing aspects. Our sincere thanks are due to them.

We also acknowledge with thanks the contribution of Staff of CACP who assisted in accessing websites, prepared relevant tables and provided other secretariat assistance.

Ashok Vishandass Ashok Gulati

12th January 2012

CONTENTS

	SECTION	Page No.
	Preface and Acknowledgements	i-ii
	List of Tables	iv-v
	List of Charts	vi-vii
	List of Annexure / Annexure Tables	viii-ix
	Acronyms	x
	Summary of Recommendations	x-xiii
I.	Overview	01-09
II.	Palm Oil: Global Scenario	11-18
III	Domestic Costs and Pricing formula for FFBs	19-30
IV.	Key Issues	31-45
V.	Pricing and Investment Strategy to Boost Oil Palm	47-55

List of Tables

	Description	Page No.
Table 1.1	Different Uses of Palm Oil	03
Table 1.2	State-wise Districts Covered under Oil Palm cultivation	07
Table 1.3	Five Year Plan Period-wise, Area Coverage under Oil Palm	08
Table 1.4	Production of FFBs and CPO in India during 1992-93 to 2009-10	08
Table 2.1	World Production of Nine Major Vegetable Oils	11
Table 2.2	Area, Production and Yield of FFBs in Major Producing Countries	12
Table 2.3	Production of Palm Oil in Major Producing Countries during 2007 to 2009	13
Table 2.4	Oil Extraction Ratio (OER) and Production of Palm Oil per Hectare	14
Table 2.5	International Annual Average Prices of Edible Oils vis-à-vis Crude Oil (Energy)	17
Table 3.1	Average Rate of Yield on long term (10 years) Government Security	19
Table 3.2	Establishment Cost of Cultivation of FFBs	20
Table 3.3	Maintenance Cost of Cultivation of FFBs	23

List of Tables

	Description	Page No.
Table 3.4	Weighted Average Land Productivity of a Typical FFBs	24
Table 3.5	Prevalent Pricing Formulae for FFBs in Major Producing States	25
Table 3.6	Simulation of Formula for Pricing FFBs	26
Table 3.7	Cost of Production of Crude Palm Oil	28
Table 4.1	Distribution of Water Tables across major Palm Oil Producing States during Summer (April/May, 2011)	33
Table 4.2	Evolution of India's Trade Policy	36
Table 4.3	Higher Prices of Various Vegetable Oils Relative to Palm Oil during 2000 to 2011	40
Table 4.4	Results of Trend Analysis of Prices of Palm Oil	41
Table 4.5	Projected Prices of Palm Oil from 2012 to 2016	44
Table 4.6	Prices of Palm Oil Projected for 2012 to 2016 by World Bank vis-à-vis those based on Statistical Models	44
Table 5.1	Recommended Subsidy during ‘Lock-in’ Period of Land under Oil Palm Cultivation	54

List of Charts

Chart No.	Description	Page No.
Chart 1.1	Composition of a Typical FFB by Volume	04
Chart 1.2	Composition of a Typical FFB by Value	04
Chart 1.3	Domestic Consumption (Absorption) and Availability from Domestic Production of Edible Oils	05
Chart 1.4	India's Imports of Edible Oils during 2005-06 to 2010-11	05
Chart 2.1	World Production of Palm Oil vs. Other Vegetable- Oils-2009	12
Chart 2.2	Distribution of Palm Oil Production in Major Producing Countries	14
Chart 2.3a	International Prices of Palm and Rapeseed Oils vis-à-vis Crude Oil (Current Prices)	16
Chart 2.3b	International Prices of Edible Oils vis-à-vis Crude Oil (Constant Prices)	16
Chart 4.1	Productivity of Palm Oil (Per Hectare basis) and Efficiency Gaps in Major Producing Countries	32
Chart 4.2	Import of Edible Oils vis-à-vis India's Domestic Production	36
Chart 4.3	Impact of Trade Policy on Imports of Edible Oils	38
Chart 4.4	Import Duties on Crude and Refined Palm Oils	39
Chart 4.5	Import Duties Counter-Cyclical to Global Prices of Palm Oil	39

List of Charts

Chart No.	Description	Page No.
Chart 4.6a	International Prices of Edible Oils vis-à-vis Crude Oil (Linear Model, using input prices for the period from 2001-2011)	42
Chart 4.6b	International Prices of Edible Oils vis-à-vis Crude Oil (Polynomial Model, using input prices for the period from 2001-2011)	42
Chart 4.6c	International Prices of Edible Oils vis-à-vis Crude Oil (Logarithmic Model using input prices for the period from 2001-2011)	42
Chart 4.7a	International Prices of Edible Oils vis-à-vis Crude Oil (Linear Model using input prices for the period from 2005-2011)	43
Chart 4.7b	International Prices of Edible Oils vis-à-vis Crude Oil (Polynomial Model using input prices for the period from 2005-2011)	43
Chart 4.7c	International Prices of Edible Oils vis-à-vis Crude Oil (Logarithmic Model using input prices for the period from 2005-2011)	43

Annexure Tables

Table No.	Subject	Page No.
Annexure	Letter of Ministry of Agriculture, New Delhi to CACP regarding request for recommending formula for pricing Fresh Fruit Bunches (FFBs) of Oil Palm	57-58
Table-I	Subsidy Extended by Ministry of Agriculture for Oil Palm Cultivation	59
Table-II	Annuity Value of Establishment Cost of Palm Oil	60
Table-III	International Prices of various Edible Oils & Crude Oil during 1990 to 2011 (Quarterly at Current Prices)	61-63
Table - IV	International Prices of various Edible Oils & Crude Oil during 1990 to 2011 (Quarterly at Constant Prices)	64-66
Table - V	Future Price Forecast of Coconut Oil, Groundnut Oil, Palm Oil, Crude Oil and Soybean meal	67
Table - VI	International Prices of Soybean Meal during 2001-2011	68
Table - VII	Country-wise Production of Palm Oil in the World during 2007 to 2009	69-70
Table - VIII	Country-wise Production of Palm Kernel Oil in the World during 2007 to 2009	71
Table - IX	Country-wise Production of Soyabean Oil in the World during 2007 to 2009	72-74
Table - X	Country-wise Production of Rapeseed Oil in the World during 2007 to 2009	75-76
Table - XI	Country-wise Production of Groundnut Oil in the World during 2007 to 2009	77-79

Annexure Tables

Table No.	Subject	Page No.
Table - XII	Country-wise Production of Coconut (Copra) Oil in the World during 2007 to 2009	80-81
Table - XIII	Country-wise Production of Olive Oil in the World during 2007 to 2009	82
Table - XIV	Country-wise Production of Cottonseed Oil in the World during 2007 to 2009	83-85
Table - XV	District-wise Water Table in Andhra Pradesh	86
Table - XVI	District-wise Water Table in Assam	87
Table - XVII	District-wise Water Table in Chhattisgarh	88
Table - XVIII	District-wise Water Table in Goa	89
Table - XIX	District-wise Water Table in Gujarat	90
Table - XX	District-wise Water Table in Odisha	91
Table - XXI	District-wise Water Table in Karnataka	92
Table – XXII	District-wise Water Table in Kerala	93
Table-XXIII	District-wise Water Table in Tamil Nadu	94-95
Table-XXIV	District-wise Water Table in Tripura	96
Table-XXV	Import Duty on Crude and Refined Palm Oils	97

Acronyms

A_2+FL Cost	Paid out cost
C_2 Cost	Comprehensive Cost
CACP	Commission for Agricultural Costs and Prices
CPO	Crude Palm Oil
DAC	Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi
DOPR	Directorate of Oil Palm Research, Pedavegi (A.P.)
EC	Establishment Cost
FFBs	Fresh Fruit Bunches
Ha.	Hectares
IPP	Import Parity Price
ISOPOM	Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize
Mgbl	Meter below Ground Level
MC	Maintenance Cost
MIS	Market Intervention Scheme
MSP	Minimum Support Price
NPV	Net Present Value
OPDP	Oil Palm Development Programme
PORLA	Palm Oil Registering and Licensing Authority, Malaysia
RBD	Refined, Bleached and Deodorised
RPO	Refined Palm Oil
TMOP	Technology Mission on Oilseeds

Summary of Recommendations

Price Policy Recommendation:

(i) It is recommended that formula for pricing of Fresh Fruit Bunches (FFBs) be fixed at 13.54 percent of net Crude Palm Oil (CPO) weighted average price plus 75.25 percent on 9% recovery of palm kernel nuts weighted average price. This is based on estimated cost of cultivators at 75.25 percent in the total cost of production of CPO from farm level to factory level. The recommendation is made after careful analysis of various factors, in particular the overall demand and supply, the domestic costs of production of FFBs and its conversion into CPO, domestic prices and import parity prices (IPP) in short and long run, productivity, competitiveness and other relevant issues.

(ii) As CACP has been recommending MSP for all crops in its mandate (24 in number) across the country without any state-specific differential, formula for pricing FFBs be the same across all the states.

Non Price Recommendations

(iii) It is recommended to keep the import duty trigger at US$ 800/MT, i.e. if and when the import price falls below US$800/MT, immediately the import tariffs need to go up and it be counter-cyclical to international prices.

(iv) As OER varies a great deal from one garden to another and average OER demotivates

efficient farmers, it is recommended that FFB Testing Centre be established in each oil palm industry, test every consignment of FFB for their Oil content (OER) and then industry may arrive at the consignment-specific price of the FFB, based on such test reports. These Testing Centers may be managed jointly by cultivators, processors with a nominee of the concerned state Government. This will induce and incentivize cultivators to adopt better farming practices and invest in modern technology.

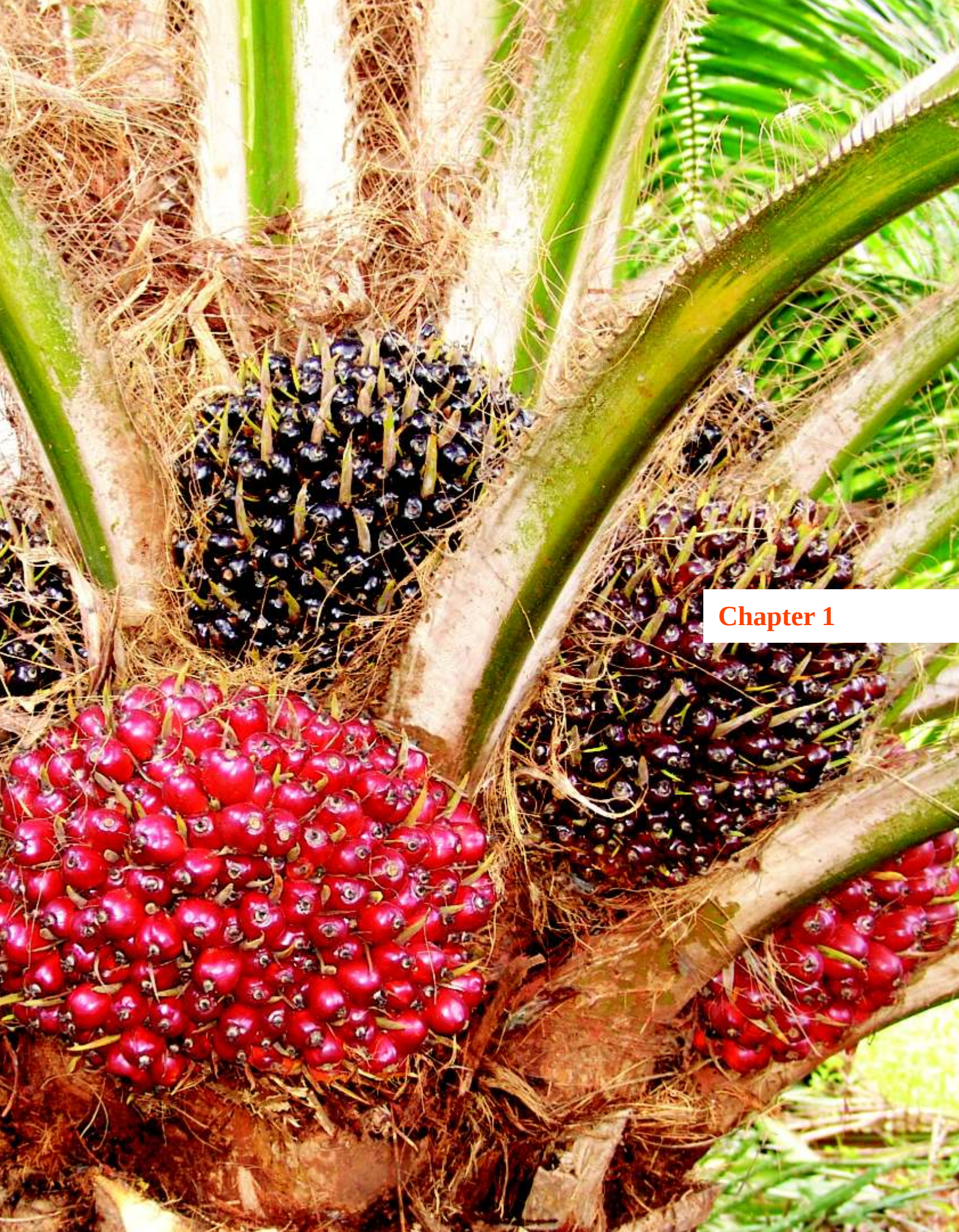
(v) Given that India is land scarce country, and the domestic production of edible oils from direct oilseed sources in the country is just 6.48 million MT with area coverage under oilseeds of more than 25.60 million ha., oil palm could be a hugely land saving strategy. Through the current mix of oilseeds, it implies that about 4 million MT of oil is being produced in the country by using 15.80 million ha. of land. This much quantity of palm oil could be produced from just 1 million ha. Thus, one million hectares under oil palm is akin to more than 15 million hectares under other mix of oilseeds. Currently, the country has only 1.7 lakh hectares under oil palm, while the potential identified for it is one million hectares. If additional 8 lakh ha. of area is brought under Oil palm cultivation (to make it approximately one million ha.) by scaling up incentives in a big way, together this one million hectares of oil palm can produce 4 million MT of palm oil, which could result in savings of imports to the tune of Rs.22458 crore at current prices. Since the fruit bearing life of oil palm is roughly 27 years, cumulated over this period, the foreign exchange savings at current prices will be worth about Rs. 606360 crores (i.e., US $ 117 billion). Given this potential saving in foreign exchange, the country needs to invest to reap this potential benefit through customized public investment strategy as indicated in para (vi) hereunder.

(vi) Two important constraints that seem to impede area expansion programme under palm oil are opportunity cost of land of farmers and high cost of irrigation. Compensating farmers for opportunity cost of their land @ Rs. 30,000 per annum per hectare during lock-in period of three years and providing one time subsidy for irrigation system @ Rs.36000 per hectare, which would have a financial implication of the order of Rs.10,080 crores (less than US $ 2 billion) in next six years, would bring additional 8 lakh hectares of area under oil palm. And in return it can save the foreign exchange outgo worth US $117 billion. Based on sound economic principle of rationality and long term vision, it is strongly recommended that the Government should earmark Rs 10,080 crores (less than US$2 billion) for providing subsidy / support to compensate cultivators for opportunity cost of their land and one time irrigation investment so as to expand the oil palm programme in a big way. Out of this outlays, Rs.9480 crores would be required in the XII Five Year Plan and the remaining Rs. 600 crores would spill over to the first year of XIII Five year Plan. This public policy would not only serve as a strategy for import substitution in a cost effective manner but also augment farmers' incomes and thus would be in the best interest of the country's agriculture sector.

(vii) Since the underlying basis of pricing formula rests in the relative costs of production of FFBs and their processing into oil, a more robust scientific survey of costs needs to be undertaken on priority basis, and on annual basis. For this purpose, collection of quality

data in a structured form, based on sound statistical sampling design is inescapable. This database should have four important ingredients viz. transparency, timeliness, reliability and adequacy. The current mode of collecting the cost data through DES (for other crops) does not fully satisfy these criteria, and therefore sometimes is mired in controversy. An alternative way to collect requisite data through an outside agency of repute on outsourcing basis under the overall supervision and monitoring of price recommending authority (such as CACP in this case, which is the prime user of this cost data) is the need of the hour. Besides, senior officers of the Commission may be drafted to other major oil palm producing countries to deepen the understanding of dynamics of this crop in its entirety. All this would help evolve "efficiency norms" in the production and processing of FFBs. Accordingly, suitable adjustments can be done in the formula where efficient producers and processors are rewarded.

(viii) Looking at the global experience in oil palm, especially in Indonesia and Malaysia, where both the household farmer model as well as corporate model of oil palm farming are practiced, it would be good for India too to experiment with both models. For the corporate sector to enter oil palm, we suggest that oil palm be declared as a plantation crop so that corporates can lease in land on longer term basis, and internalize costs of production and processing of FFBs. This would give them better cushion to weather external shocks of global prices. Given the financial and managerial strength of the corporate sector, and higher capacity to undertake risks, this model may take off even faster than the household model alone.



Chapter 1

Overview

Backdrop

1.1 Domestic consumption of edible oils in the country has been outstripping its production for quite some time. The wedge between the two is large and rising, necessitating imports that constitute almost half of consumption. In 2010-11, it cost the nation more than Rs 29,000 crores. If business as usual continues, it won't be a surprise that very soon the edible oil imports bill may cross Rs 50,000 crores constituting more than two-thirds of country's consumption. This burgeoning imports of edible oils can be turned into a major business opportunity for our farmers and processors, if there is a strategic change in the policy design, from investment strategy to pricing of oilseeds (including Fresh Fruit Bunches), that can ensure boosting of edible oil production in the country in an efficient and sustainable manner.

CACP is called upon to recommend formula for pricing FFBs for the first time

1.2 Since oil palm gives the highest yield of oil on per hectare basis (FAOSTAT), Department of Agriculture and Cooperation (DAC) has taken up area expansion programme under oil palm cultivation in the potential states on priority basis under ISOPOM Scheme. In 2006, Chadha Committee identified 1 million hectares as potential area for oil palm in the country, the largest being in Andhra Pradesh (40 percent). A special programme for bringing an additional area of 60,000 hectare under oil palm cultivation has been launched during 2010-11. Limited shelf life of Fresh Fruit Bunches (FFBs), which has only one use namely extracting oil from it, necessitates its processing immediately after harvesting. Given the fact there is only one set of buyers (processors), issues of fixation of reasonable prices and implementation of Market Intervention Scheme (MIS)

have assumed greater importance. At present, states decide the price of FFBs as per recommendations of their respective Price Fixation Committees. On 11th January, 2011, DAC set up a Committee under the Chairmanship of Director, Directorate of Oil Palm Research, Pedavegi (Andhra Pradesh) to review 'FFBs of Oil Palm Pricing Formula'. The Committee *'suggested that the Government of India may constitute an Arbitration Committee and call representatives of farmers and processors and negotiate a compromise proposal for fixing the FFB price (sic)...'.* In pursuance of this, DAC entrusted the responsibility with CACP, which has a mandate to fix MSP of 24 agricultural commodities at present, to recommend formula for pricing FFBs. In this context, senior officers of CACP visited East Godavari and West Godavari districts of Andhra Pradesh (18 to 20 October, 2011) where they interacted with a wide cross sections of stakeholders namely farmers, processors and researchers. This was followed by a meeting with officers from major oil palm producing states, farmers and processors, held in New Delhi on 25.11.2011.

1.3 In its efforts to recommend a rational pricing formula for FFBs, the CACP is guided by sound economic principles of pricing that can help promote growth of oil palm in the country, efficiency in its production and processing, and is also equitable to different stakeholders in the value chain of palm oil. Accordingly, CACP first looks at the overall domestic demand and supply of edible oils in general and palm oil in particular, domestic prices in relation to import parity prices in short and long run so that one can gauge the competitiveness of import substitution strategy, cost of production, productivity and other relevant issues. Before these parameters are analysed in greater details, it may be useful to deepen our understanding about oil palm as an oil bearing plant.

Oil Palm: An Introduction

Oil palm has high productivity of 4 MT of oil per ha.

1.4 Oil palm *(Eleais guineensis),* popularly known as African Oil Palm or Red Oil Palm, was originally found in the wild form in the forests of Guinea Coast and was used as vegetable oil by the natives all over Africa. Palm oil is one of nine major oils traded in the global edible oil and fat market. Today, it is the largest source

of vegetable oil in the world. Oil palm is one of the world's most efficient crops in terms of land utilization and productivity as far as getting oil from it is concerned. Oil palm is the highest oil (4 MT of oil per Ha.) producing perennial palm tree which starts yielding from about 4th year up to 30th year of economic life. Oil Palm gives two types of oils namely, palm oil (mesocarp oil) as well as palm kernel oil (seed oil) which is lauric oil. It has a variety of uses, ranging from edible oil, cosmetics, pharmaceuticals to biofuel and bio lubricants. Some of important uses of palm oil are exhibited in table-1.1.

Table 1.1: Different Uses of Palm Oil

Food Products	Non Food Products
Cooking Oil, Dough fat, Vanaspati	Bio fuel and bio lubricants
Vegetable Ghee	Cosmetic products / Aromatherapy
Margarine	Pharmaceutical products
Salad oil	Toiletries, Detergents including soaps & Soap Blends
Chocolate / Ice-cream /Frying fats, Speciality fats for coatings	Esters
Coca Butter substitutes	Oleo chemicals, Fatty acids & Fatty Alcohols

Composition of Fresh Fruit Bunches (FFBs):

1.5 Composition of a typical FFB of oil palm in volume terms is exhibited in chart-1.1 while chart-1.2 depicts its composition in value terms.

In terms of volume, a typical mature FFB contains 20 percent of CPO

Chart 1.1 : Composition of a Typical FFB by Volume

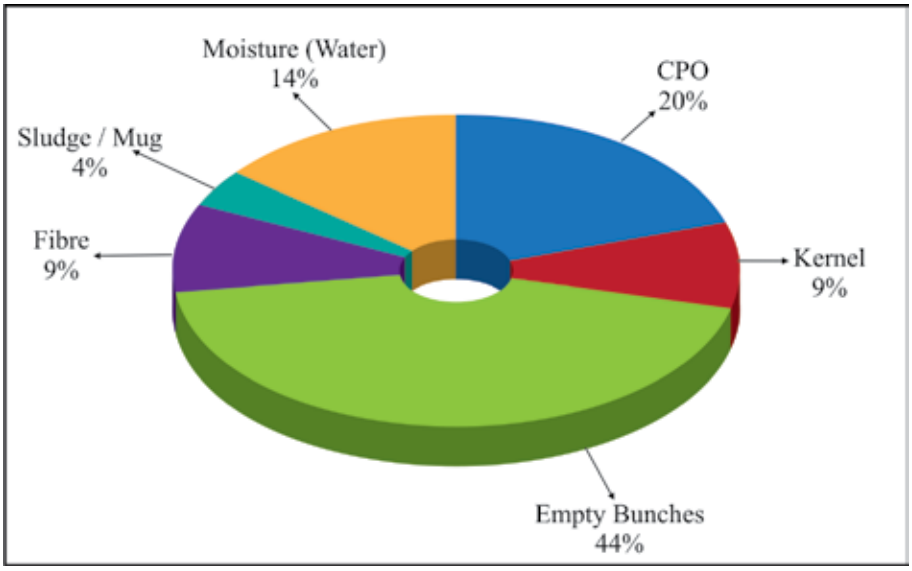
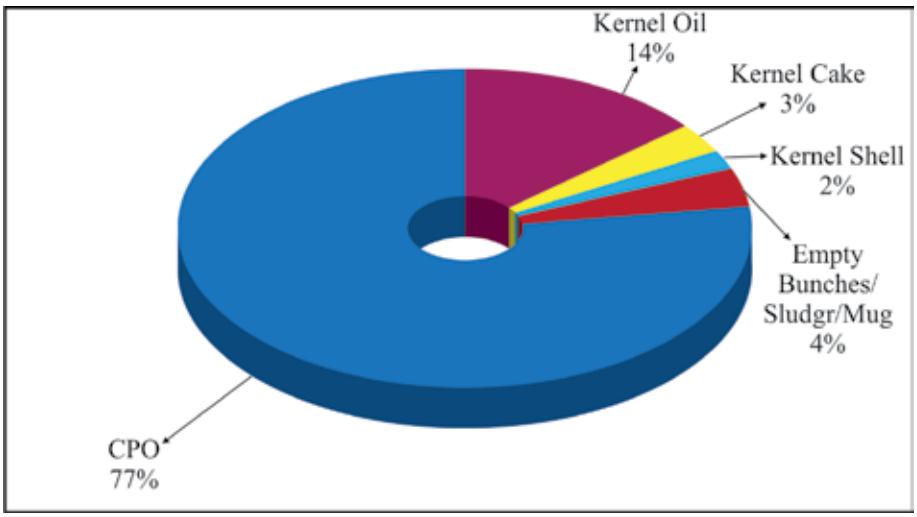


Chart 1.2 : Composition of a Typical FFB by Value

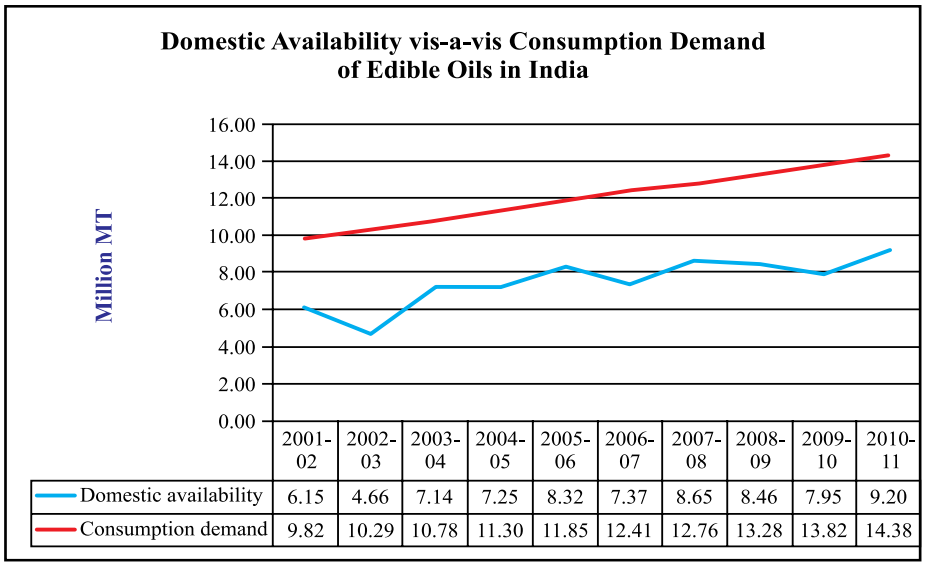
Value of CPO is about 77 percent of FFB at current prices



Overall Demand and Supply of Edible Oils

1.6 India is one of major producers and consumers of vegetable oils, accounting for 12-15 percent of the area under oilseeds and 6-7 percent of the production of vegetable oils in the world. Despite production of over 31 million MT of oilseeds during 2010-11 in the country, the domestic availability of edible oils continues to remain inadequate to meet the domestic demand. The domestic consumption vis-a-vis domestic production of edible oils in the country is exhibited in chart-1.3.

Chart 1.3: Domestic Consumption (Absorption) and Availability from Domestic Production of Edible oils

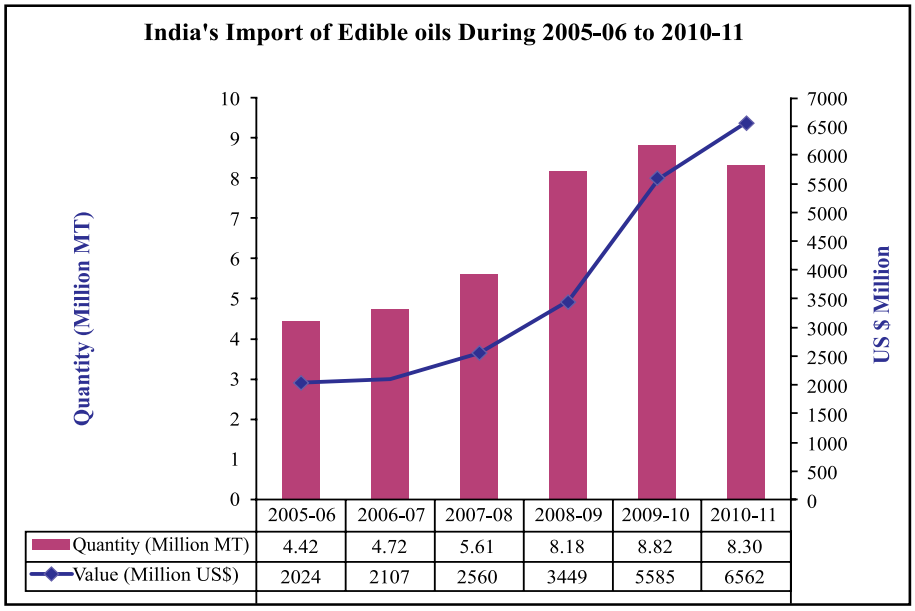


	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Domestic availability	6.15	4.66	7.14	7.25	8.32	7.37	8.65	8.46	7.95	9.20
Consumption demand	9.82	10.29	10.78	11.30	11.85	12.41	12.76	13.28	13.82	14.38

Demand for edible oils has been out-stripping domestic production

1.7 The gap between demand and availability is met by imports and the bulk of this imports is palm oil. During 2010-11, the country imported 8.30 million MT of edible oils valued at US $ 6.56 billion (Rs. 29,442 crore). In terms of volume, it was 47 percent of domestic availability (over 90 percent of domestic production) of edible oils. The quantities and values of edible oils imported during 2005-06 to 2010-11 are exhibited in chart-1.4.

Chart 1.4 : India's Imports of Edible Oils during 2005-06 to 2010-11



	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Quantity (Million MT)	4.42	4.72	5.61	8.18	8.82	8.30
Value (Million US$)	2024	2107	2560	3449	5585	6562

1.8 Given the swelling import bill on account of edible oils, it is in the national interest to promote oil bearing crops/plantations on a much higher priority, with a view to raise productivity of edible oils on per hectare basis, and which is in line with global efficiency norms.

Palm Oil : A Potential Source Of Vegetable Oil Security

1.9 Among the vegetable oil yielding crops, oil palm is the highest oil yielding plant in the world. Hence, it could play a critical role in meeting the vegetable oil requirements in the world. It has a potential to give 4.0 to 6.0 MT of palm oil and 0.4 to 0.6 MT of palm kernel oil per Ha. Taking cognizance of such a high potential, the Government of India introduced palm oil during 1985-86, as small holders' crop under the Technology Mission on Oil Seeds (TMO). In order to take up oil palm cultivation on a massive scale, an Oil Palm Development Programme (OPDP) was launched during 1991-92 in the country and the programme was brought under the purview of the "Technology Mission on Oilseeds and Pulses" (TMOP) under the Department of Agriculture & Cooperation, Ministry of Agriculture during the VIII Five Year Plan (1992-97) with a target of 80,000 ha. in other potential areas in the states of Andhra Pradesh, Karnataka, Tamil Nadu, Orissa, Gujarat and Goa from 1992 onwards. Though the programme was also sanctioned for Assam and Tripura, no tangible progress was made in these two states up to Ninth Plan. The OPDP was continued during IX Plan to bring an additional area of 80,000 ha. under oil palm. The details of districts in which oil palm cultivation is being implemented in OPDP implementing states are given in table-1.2.

Table 1.2 : State-wise Districts Covered under Oil Palm Cultivation

S. N.	State	No. of Districts	Name of the Districts
1	Andhra Pradesh	10	East Godavari, Guntur, Khammam, Krishna, Nellore, Prakasam, Srikakulam, Visakhapatnam, Vizianagaram, West Godawari
2	Goa	2	North Goa, South Goa
3	Gujarat	4	Valsad, Navsari, Surat, Anand
4	Karnataka	19	Mysore, Mandya, Chamarajnagar, Hassan, Kodagu, Shimoga, Chikinaglur, Davangere, Haveri, Bellary, Koppal, Gadag, Raichur, Belgaum, Bijapur, Bagallcot, Gulbarga, Uttar Kannada Yadgiri
5	Kerala	9	Trivandrum, Kollam, Pathanamthitta, Alpuzha, Kottayam, Ernakulam, Malappuram, Kozhikode, Wayanadu
6.	Maharashtra	3	Kolhapur, Sangli and Sindudurga
7	Mizoram	6	Lunglei, Mamit, Kolasib, Serchhip, Lawntlai and Aizawl
8	Orissa	14	Koraput, Ryagada, Ganjam, Gajapati, Dhenkanal, Jajpur, Mayurbhanja, Balasore, Bargars, Boudh Navrangpur, Cuttack, Bhadrak and Nayagarh
9	Tamil Nadu	11	Trichy, Karur, Perambalur, Thanjavur, Thiruvarur, Nagapattinam, Cuddalore, Villupuram, Tirunelveli, Theni and Vellore,
Total		**78**	

Extent of Oil Palm Cultivation in India:

1.10 The coverage of oil palm cultivation in India was in 8585 hectares prior to OPDP, i.e., at the end of 1991-92. Since then, area under the crop has expanded to 1.73 lakh ha. by March 2011 in a phased manner. The Five Year Plan period-wise details of oil palm plantation are given in table-1.3.

Table 1.3 : Five Year Plan period-wise Area Coverage under Oil Palm

S.No.	Period	Area ('000 Ha)
	Area covered upto IX Plan (Upto 2001-02)	62.73
	Area covered During Xth Plan (2002-03 to 2006-07)	47.07
	Area covered During XIth Plan (2007-08 to 2011-12)	81.27
	Cumulative Area planted so far (Upto March 2011)	191.07
	Area uprooted	-17.94
	Net Available Area (March 2011)	173.13

Compared to the total potential area of oil palm (1 million hectares as identified by Chadha Committee), this is less than one-fifth of the potential. This opens up a huge business opportunity for farmers and processors if policy is designed to exploit the remaining potential on priority.

1.11 The year-wise production of Fresh Fruit Bunches (FFBs) of oil palm and Crude Palm Oil (CPO) during 1992-93 to 2009-10 is presented in Table-1.4.

Table 1.4 : Production of FFBs and CPO in India during 1992-93 to 2009-10

('000 MT)

Year	Production	
	FFBs	CPO
1992-1993	21.23	-
1993-1994	24.62	1.13
1994-1995	NA	3.00
1995-1996	9.14	5.17
1996-1997	14.23	7.92
1997-1998	47.41	10.06
1998-1999	67.37	10.94
1999-2000	144.43	18.16

2000-2001	142.82	25.29
2001-2002	128.87	22.61
2002-2003	157.74	28.17
2003-2004	168.42	28.82
2004-2005	176.14	30.84
2005-2006	244.69	51.33
2006-2007	258.90	43.96
2007-2008	259.01	45.40
2008-2009	309.99	52.93
2009-2010	396.70	66.49

1.12 Thus, the facts and figures provided above clearly indicate that over the last 25 years, i.e., since the mid-1980s, various efforts and programs aimed at promoting oil palm in the country could exploit only less than 2 lakh hectares of area for oil palm in India. If this business-as-usual continues, then it will take many years to exploit the remaining potential of this crop in the country. Given the rapidly rising demand of edible oils in the country in the wake of rising incomes, it is not in the interest of the country to neglect this anymore. It needs a different vision, a different investment strategy, and a different pricing policy for FFBs, to take a giant leap forward towards exploiting the remaining potential of this crop at the earliest as this would have high economic pay-off. This calls for a rational policy decision in favour of oil palm as delineated in chapter-V.

Chapter 2

Palm Oil: Global Scenario

Global Edible Oil Scenario

2.1 In the global basket of vegetable oils, Soybean oil used to command the highest share and accounted for 29 percent (compared to 25 percent in case of palm oil) of total production of vegetable oils in the world in 2000. It slowly lost its first position to palm oil, whose share increased to 33 percent while that of soybeans dwindled to 26 percent in 2009. This seems to have happened mainly due to higher productivity (and thus lower prices) of palm oil. The year-wise and edible oil-wise details of world production are presented in table-2.1.

Palm oil commands 33% share in total production of vegetable oils in the World

Table 2.1 : World Production of Nine Major Vegetable Oils

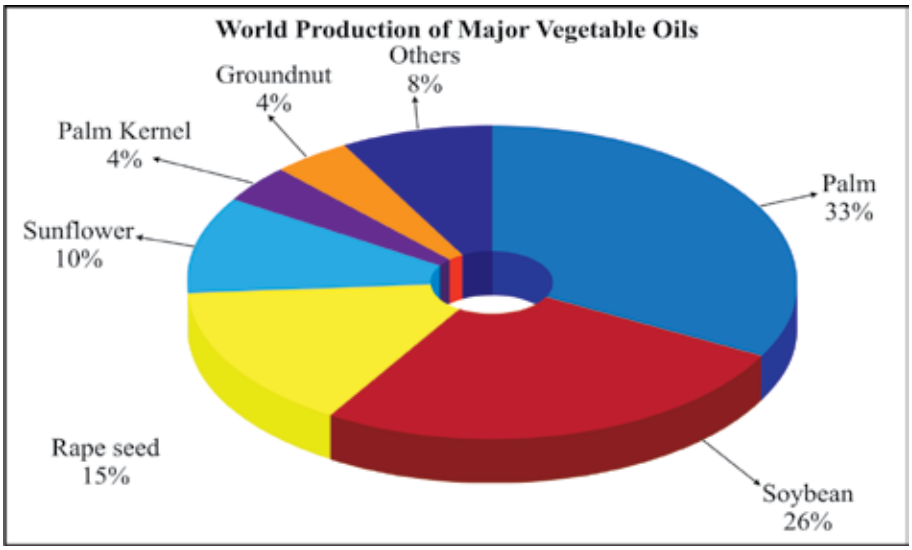
(Million MT, Percent)

Vegetable oils	1980	1990	2000	2007	2008	2009	% share in 2009
Palm	4.54	11.01	21.87	38.85	43.43	45.08	32.73
Soybean	13.38	16.10	25.54	37.28	36.63	35.87	26.05
Rape seed	3.48	8.16	14.47	17.91	19.16	21.18	15.37
Sunflower	5.02	7.87	9.70	11.19	11.06	13.23	9.60
Palm Kernel	0.55	1.45	2.69	4.98	5.50	5.73	4.16
Groundnut	2.86	3.90	4.56	5.71	5.52	5.56	4.04
Cotton	2.99	3.78	3.86	4.99	4.88	4.66	3.38
Coconut	2.72	3.39	3.28	3.69	3.40	3.50	2.54
Olive	1.70	1.86	2.54	2.76	2.62	2.91	2.11
Total	37.25	57.51	88.52	127.36	132.21	137.73	100.00

Source: *faostat.fao.org (Accessed on Nov 7, 2011)*

The distribution of production of major vegetable oils in 2009 is depicted in chart-2.1

Chart 2.1 : World Production of Palm oil vs. Other vegetable oils-2009



Global FFBs and Palm Oil Scenario

2.2 According to FAO, Fresh Fruit Bunches (FFBs) were cultivated in 14.58 million hectares in forty four countries which produced 208.29 million MT of FFBs during 2009. Five countries namely Indonesia, Malaysia, Nigeria, Thailand and Colombia account for over 90 percent of world' s total production of FFBs. The details of area, production and yield of FFBs in major palm oil producing countries are given in table-2.2

Table 2.2 : Area, Production and Yield of FFBs in Major Producing Countries

(Million Ha., Million MT, MT/Ha.)

S.N.	Countries	2007			2008			2009			Share in World Production (%)
		Area	Produ-ction	Yield	Area	Produ-ction	Yield	Area	Produ-ction	Yield	
1	Indonesia	4.54	78.00	17.18	5.00	85.00	17.00	5.00	86.00	17.20	41.29
2	Malaysia	3.74	79.10	21.14	3.90	83.00	21.28	4.00	84.84	21.20	40.73
3	Nigeria (sic*)	3.15	8.50	2.70	3.20	8.50	2.66	3.20	8.50	2.66	4.08

4	Thailand	0.43	6.39	15.00	0.46	9.27	20.09	0.51	8.16	16.00	3.92
5	Colombia	0.17	3.20	19.39	0.17	3.20	19.39	0.17	3.20	19.39	1.54
6	Ecuador	0.14	2.10	15.56	0.14	2.10	15.56	0.14	2.10	15.56	1.01
7	Papua New Guinea	0.10	1.40	14.58	0.12	1.70	14.53	0.12	1.73	14.54	0.83
8	Brazil	0.07	0.66	10.00	0.08	0.76	9.99	0.09	0.91	10.04	0.44
	World	13.60	191.48	14.08	14.37	206.01	14.33	14.58	208.29	14.29	100.00

Source: *faostat.fao.org (Accessed on Nov 7, 2011)*

** : There seems to be some problem in reporting of area by Nigeria.*

2.3 FFBs, cultivated at farm level, are processed and converted into palm oil at factory level. As in case of production of FFBs, Indonesia is the leading producer of palm oil, accounting for 45 percent of the world's production. The details of production of palm oil in major palm oil producing countries in the world are presented in table-2.3 and their relative shares in production are exhibited in chart-2.2.

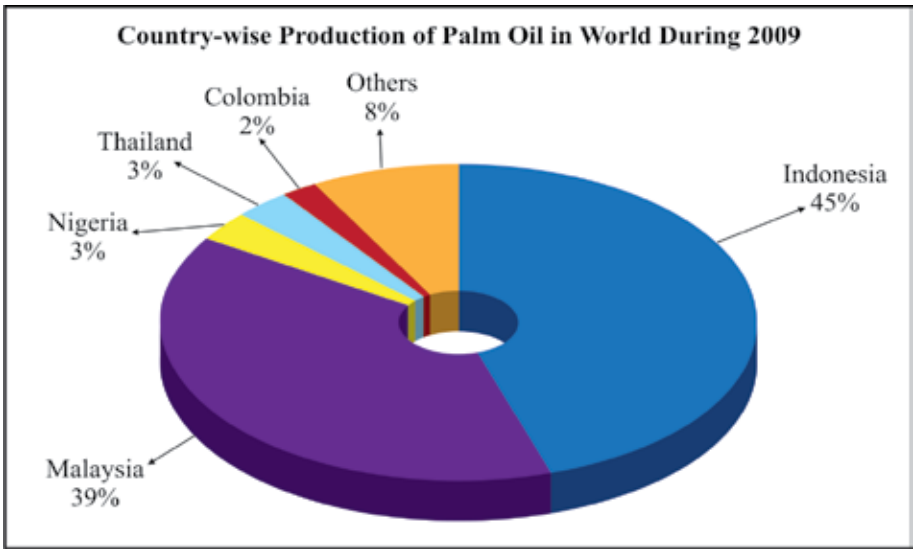
Table 2.3 : Production of Palm Oil in Major Producing Countries during 2007 to 2009

(Million MT)

Country	2007	2008	2009
Indonesia	16.76	18.91	20.55
Malaysia	15.82	17.73	17.56
Nigeria	1.31	1.33	1.38
Thailand	1.05	1.30	1.31
Colombia	0.78	0.78	0.80
Ecuador	0.30	0.31	0.32
Papua New Guinea	0.38	0.47	0.47
Brazil	0.19	0.22	0.27

Source: *faostat.fao.org (Accessed on Nov 7, 2011)*

Chart 2.2 : Distribution of Palm Oil Production in Major Producing Countries



2.4 As cultivation of FFBs is undertaken with the sole objective of extracting oil from it, it is logical to work out as to how much oil could be produced from per unit area of land. Country-wise production of palm oil and Oil Extraction Ratio (OER) in major producing countries is presented in table-2.4.

Table 2.4 : Oil Extraction Ratio (OER) and Production of Palm Oil Per Hectare

(MT/Ha., Percent)

S.N.	Country	OER			Palm Oil per Ha.		
		2007	2008	2009	2007	2008	2009
1	Indonesia	21.49	22.25	23.90	3.69	3.78	4.11
2	Malaysia	20.00	21.37	20.70	4.23	4.55	4.39
3	Thailand	16.43	14.02	16.05	2.46	2.82	2.57
4	Colombia	24.38	24.31	25.08	4.73	4.71	4.86
5	Ecuador	14.05	14.71	15.29	2.19	2.29	2.38
6	Papua New Guinea	27.29	27.35	27.17	3.98	3.97	3.95
7	Brazil	28.79	28.99	28.99	2.88	2.89	2.91

2.5 It is noted that Columbia has the highest OER (25 percent) as well as the highest production of palm oil on per hectare basis. This does not necessarily imply that its land productivity is also the highest. In fact, its land productivity is lower by 9 percent compared to the highest land productivity observed in Malaysia. Benchmarking of palm oil productivity will be discussed in chapter-IV.

Energy Markets

2.6 Besides producing oils and fats, at present there is increasing interest in palm oil as a renewable energy source, especially as bio-diesel. The palm oil bio-diesel is biodegradable, non-toxic, and has significantly fewer emissions than petroleum-based diesel (petro-diesel) when burnt. Besides this, oil palm is also a well-known plant for its other sources of renewable energy. For example, huge quantities of biomass by-products are developed to produce value added products such as methane gas, bio-plastic, organic acids, bio-compost, plywood, activated carbon, and animal feedstock. Production of bio-diesel is important because of environmental protection and energy supply security reasons. Even waste effluent palm oil mill effluent (POME) is converted to produce energy. Palm oil, thus, has created many opportunities for energy markets.

Relationship Between Crude Oil (Energy) & Edible Oils Prices

2.7 Energy is a critical input for socio-economic development. The crude oil prices have lately increased significantly, and have been fluctuating in the world market for crude. It crossed a level of more than US $120 per barrel in 2008[1] . Such an escalation of crude oil prices severely strains domestic economy, which necessitates search for an alternative to crude oil (energy). Against this background, it is hypothesised that Government policy towards biofuels[2] and behaviour of energy markets impinges upon

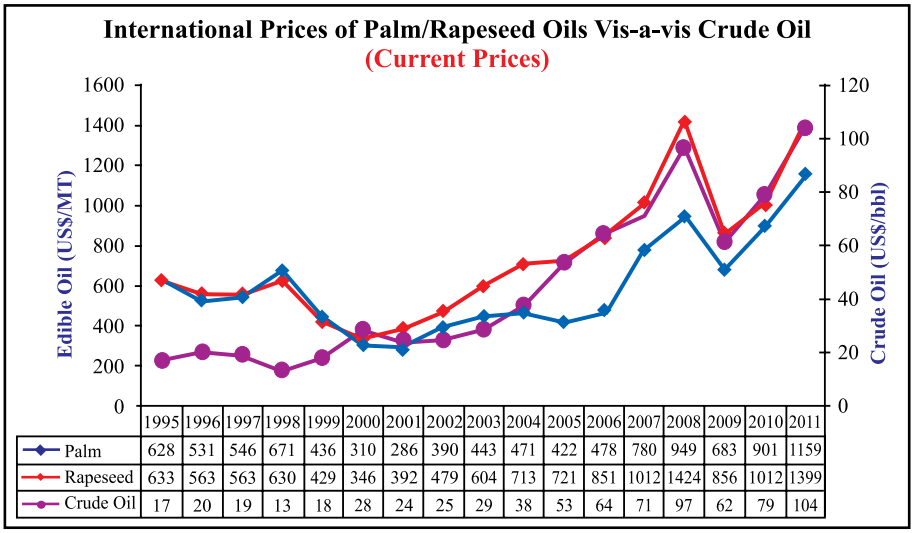
[1] *Average price during April-June, 2008*

[2] *Biofuels are liquid or gaseous fuels produced from biomass resources and used in place of, or in addition to, diesel, petrol or other fossil fuels for transport and other applications. Biomass resources are biodegradable fraction of products, wastes and residues from agriculture, forestry and related industries as well as biodegradable fraction of industrial and municipal wastes.*

development of oilseeds sector. If vegetable oil prices fall too low, demand from biofuel sector will swiftly rise which would pull vegetable oil demand (& consequently its prices) up. Logically, its converse will also hold good. Therefore, fossil fuel prices are likely to affect prospects for oilseeds and edible oils in foreseeable future.

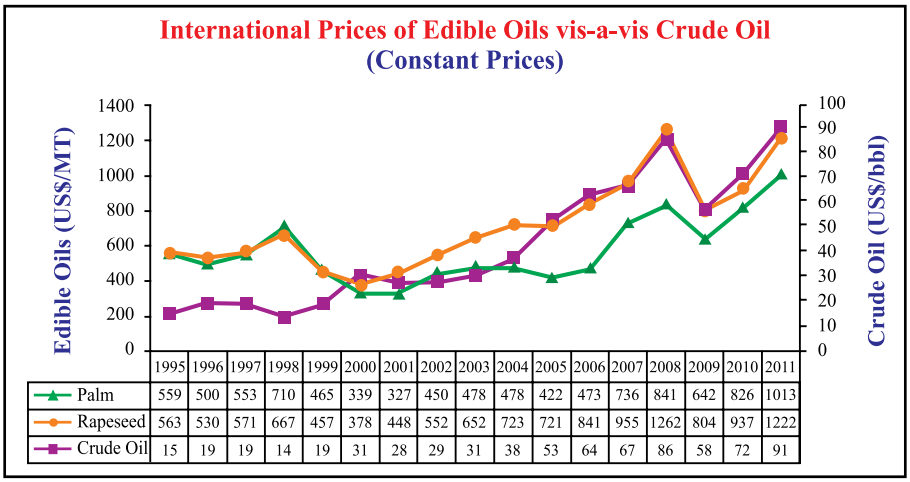
2.8 Long term trends in international prices of crude oil vis-à-vis palm oil and rapeseed oil, both at current and constant prices, are depicted in charts-2.3a and 2.3b.

Chart 2.3 a : International Prices of Palm and Rapeseed Oils vis-a-vis Crude Oil



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Palm	628	531	546	671	436	310	286	390	443	471	422	478	780	949	683	901	1159
Rapeseed	633	563	563	630	429	346	392	479	604	713	721	851	1012	1424	856	1012	1399
Crude Oil	17	20	19	13	18	28	24	25	29	38	53	64	71	97	62	79	104

Chart 2.3 b : International Prices of Edible Oils vis-a-vis Crude Oil



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Palm	559	500	553	710	465	339	327	450	478	478	422	473	736	841	642	826	1013
Rapeseed	563	530	571	667	457	378	448	552	652	723	721	841	955	1262	804	937	1222
Crude Oil	15	19	19	14	19	31	28	29	31	38	53	64	67	86	58	72	91

2.9 To examine inter-relationship between prices of various edible oils and crude oil, pair-wise correlation of crude oil with some of important edible oils are worked out and the results are presented in table-2.5.

Table 2.5 : International Annual Average Prices of Edible Oils vis-a-vis Crude Oil (Energy)

(US $/MT, US $/bbl)

Year	Coconut	Groundnut	Palm Oil	Rapeseed	Crude oil (US$/bbl)
1995	669.58	990.92	628.25	632.71	17.18
1996	751.58	897.25	530.92	563.07	20.42
1997	656.83	1010.42	545.83	562.83	19.17
1998	657.92	909.42	671.08	630.48	13.06
1999	737.08	787.67	436.00	428.69	18.07
2000	450.33	713.67	310.25	346.24	28.23
2001	318.08	680.25	285.67	391.88	24.35
2002	421.00	687.08	390.25	479.18	24.93
2003	467.33	1243.17	443.25	603.58	28.90
2004	660.75	1161.00	471.33	713.20	37.73
2005	616.98	1060.44	422.08	720.97	53.39
2006	606.91	970.23	478.35	851.32	64.29
2007	918.88	1352.08	780.25	1011.86	71.12
2008	1224.00	2131.12	948.54	1423.71	96.99
2009	725.38	1183.67	682.83	856.18	61.76
2010	1123.58	1403.88	900.83	1011.75	79.04
2011	1848.33	1888.67	1159.22	1398.93	104.29
Correlation-I	0.7886	0.8506	0.7696	0.9299	1.0000
Correlation-II	0.9190	0.8739	0.9387	0.9714	1.0000

Note : *While Correlation-I is with crude oil, based on price data for 1995 to 2011, correlation-II is based on price data for 2000 to 2011*

2.10 It is noticed from table-2.5 that the correlation between crude oil and rapeseed oil is the highest at 0.9299, compared to 0.8506, 0.7886 and 0.7696 with groundnut, coconut and palm oil respectively. Correlation coefficients significantly increase when period prior to 2000 is truncated. This only indicates that the linkage between fossil oil and edible oil prices has become stronger in recent times, especially after 2000. Based on time series data of prices, future prices of palm oil will be projected in Chapter- IV.

2.11 Suffice it to say here that edible oil prices in global markets are likely to be increasingly influenced by energy prices. This evolving relationship between crude prices and edible oil prices opens up new vistas for business opportunities in agriculture. Farmers and processors can tap this potential, depending upon their comparative advantage, as the demand for energy (crude oil) is likely to be secularly rising as growth engines keep revving up in emerging economies of Asia, Latin America and Africa.

Chapter 3

Domestic Costs and Pricing formula for FFBs

Domestic Cost of Production at Farm Level

3.1 The total cost of cultivation of perennial crops such as oil palm can be classified into the following two broad categories *viz*.

- Establishment Cost (EC)
- Maintenance cost (MC)

During gestation period of the first three years of cultivation, oil palms do not bear any fruit but it entails some financial 'outgo'. As money has its time value, cost incurred during year t is to be worked out by

$$P_t = P_o * (1+r/100)^t$$

where P_o = Cost incurred in the base year (period zero)

P_t = Cost incurred in the tth year

r = rate of interest (as opportunity cost of money)

t = time period (in years), t=1, 2 and 3

3.2 To find out net present value (NPV) of costs incurred in different years during gestation period, future costs are to be discounted at an appropriate rate. There are two issues involved in working out NPV. First, what constitutes the relevant cost that is to be discounted and secondly the rate at which this cost is to be discounted to arrive at NPV. Broadly speaking, there are two kinds of costs namely 'paid out cost' (roughly corresponding to A_2 +FL) and comprehensive cost (corresponding to C_2), which are used by DES and CACP in formulation of price policy for various crops. As C_2 cost takes all relevant costs, including imputed rental value of owned land and interest on owned capital, into its ambit, it will be only just and fair if C_2 cost is taken into consideration in pricing of FFBs.

Furthermore, it will be seen later in table-3.7 that all relevant costs of processors, akin to C_2, are taken into account while working out cost of processing of FFBs. Thus, principle of equity also justifies adoption of C_2 cost at farm level. With regard to discount rate, it is considered appropriate to take average 'yield' rate on long term government securities (10 years maturity) for the purpose, which works out to be 7.38 percent for the decade of 2000s (table-3.1).

Table 3.1 : Average Rate of Yield on long term (10 years) Government Security

Year	Average Annual Rate of interest (%)
2001-02	8.69
2002-03	6.89
2003-04	5.39
2004-05	6.29
2005-06	7.16
2006-07	7.78
2007-08	7.88
2008-09	7.59
2009-10	7.26
20010-11	7.93
20011-12 (April-Nov, 2011)	8.34
Average	7.38

Source: *Ministry of Finance, New Delhi*

3.3 The streams of annual establishment costs (EC) and corresponding NPV to arrive at total EC of cultivation of FFBs are presented in table-3.2.

Table 3.2 : Establishment Cost of Cultivation of FFB

(Rs./Ha., Percent)

S.N.	Item of Expenditure	Establishment Cost (Nominal, without time value of money)				NPV of Total Establishment Cost	% of total
		I Year	II Year	III Year	Total		
1	Planting (Cost of seedling, Tank silt, ploughing & levelling of land, Pit Making, Gap filling & Ablation)	15229	6074	4399	25702	24701	10.04
2	Irrigation (Creating irrigation facility including Bore well & drip irrigation system, Irrigation channel preparation, Basin Making, Micro irrigation maintenance cost)	45668	5600	6921	58189	65059	26.45
3	Fertilisers & Manure etc.	8144	4917	9509	22570	20970	8.53
4	Plant Protection & Cultural Operation (Pesticide, Weeding, Weedicide, Mulching)	3861	4025	3417	11303	10573	4.30
5	Land Rent	30445	30445	30445	91335	85202	34.64
6	Interest on capital	6480	3400	3647	13528	12810	5.21
7	Other Misc. (Fencing of the farm, Maintenance of transformer etc., imputed value of family labour / other misc. cost)	15626	5943	6297	27865	26621	10.82
8	Gross EC (C_2 Cost) (Without Subsidy)	125454	60403	64635	250492	245935	100.00
9	Less : Subsidy (Annexure Table-I)					128458	
10	Net EC (C_2 Cost, net of Subsidy)					117477	

Notes : 1 In consonance with norm adopted under CS Scheme, interest is charged at the rate of 12.5% per annum on the working capital for half the period of crop (six months in this case) and 10% per annum on value of fixed assets.
2. Average life span of pump set for irrigation purpose is assumed to be 10 years. Therefore, this cost is to be incurred three times. First time in the first year itself, second time at the end of 10th year and finally at the end of 20th year. Net Present Value (NPV) of these costs is, therefore, more than undiscounted total cost during first three years of gestation period.

NPV of Establishment cost is Rs.117477 per ha., after adjusting NPV of subsidy of Rs.128458 per ha.

3.4 Out of various cost components, costs on account of irrigation (bore well and drip irrigation) and land rent together command 54 percent[3] of total cost of cultivation of FFBs. Therefore, it is appropriate to explain these two components in more detail. It may be noted (table-4.1 and Annexure tables XVI to XXV) that about 80 percent of identified oil palm growing areas have water tables above 10 meters of depth. Based on inputs provided by Rural Water Supply Sanitation Circle, West Godavari District (A.P.) and other experts, average total cost of borewell and drip irrigation including cost of motor is estimated at Rs.40000 per ha. Further, average life of motor is expected to be 10 years which would necessitate its replacement at the beginning of 11th and 21st year. Two replacement cost of motor, assumed to be Rs.12,000 at each time, has been taken on board while working out its Net Present Value (NPV). As regards land rent, the rental value of paddy land under CS Scheme is available upto 2008-09. Applying observed compound annual growth rate (9.75 percent) in land rent during 2000-01 to 2008-09, land rent for 2011-12 has been projected. The land rent thus projected is for paddy fields which is multiplied by average cropping intensity (136 percent) of 10 palm oil growing districts in A.P. to arrive at imputed land rent for oil palm gardens. Other cost are based on interviews of farmers and discussions of officers of CACP with officers of DOPR, Pedavegi (A.P.) and other state government officers.

3.5 NPV of EC at the end of gestation period of three years is to be distributed over its 27 years of economic life span. Now, an 'amortised' value of EC of Rs.117477 per ha., given by Annuity value = $\{EC * (1+r)^n * r\}/\{(1+r)^n - 1\}$, works out to be Rs. 10155 (annexure table-2) which is added to MC to arrive at total cost of cultivation (on per ha. basis). The details are presented in table-3.3.

---

[3] *Rental value of land (28.9% in MC + 9.6% of 34.64% of EC = 32.2%) and irrigation cost (19.3% in MC + 9.6% of 26.45% of EC = 21.8%) together account for 54 percent of total cost of cultivation of FFBs.*

[4] *Life span of oil palm from 'womb' to 'tomb' is reported to be 30 years, based on discussions with experts. After deducting 3 years of gestation period, economic life span works out to 27 years.*

Table 3.3: Maintenance Cost of Cultivation of FFBs

S. N.	Input	Amount (Rs./ha.)	Cost as % to total
1	Irrigation : Labour charges, formation of irrigation channels & maintenance of basin	20290	19.3
2	Fertilizers & Manures	26440	25.1
3	Pest Control (Pesticides, Fungicides including mulching with Fronds & other materials)	2630	2.5
4	Harvesting, collection & Transportation of FFB : i. Harvesting charges @Rs. 300 per MT	9800	9.3
5	Land Rent	30445	28.9
6	Interest on capital	5600	5.3
7	Amortised value of EC (Annexure Table-II)	10155	9.6
8	Total Cost of cultivation (Both MC and amortised value of EC)	105360	100.0

Source: *Compiled by CACP, based on note 1 below table-3.2 and para-3.4.*

3.6 As cost of production on per MT basis is a function of land productivity which varies considerably during its economic life span depending upon its age, it will be appropriate if weighted average productivity of oil palm during its entire economic life span is worked out and then divide cost of cultivation (on per hectare basis) by weighted average productivity to deduce cost of production on per MT basis. The weighted average land productivity works out to 18.70 MT per hectare as may be seen from table-3.4.

Table 3.4 : Weighted Average Land Productivity of a Typical FFBs

S.N.	Age of Oil Palm (Years)	Expected land Productivity (MT/Ha.)	Weight
1	4	12	3.70
2	5	14	3.70
3	6	16	3.70
4	7	18	3.70
5	8 to 22	20	55.56
6	23 to 25	19	11.11
7	26 to 28	18	11.11
8	29 to 30	17	7.41
Weighted Average Productivity during entire life span of Oil Palm		18.70	100.00

Note: *Weights are in proportion to duration of age-specific productivity to the total economic life of oil palm.*

3.7 Based on tables-3.3 and 3.4, the cost of production of FFB is estimated at Rs. 5633/MT. Needless to say, this is an estimated weighted average cost of producing one MT of FFB. It can differ from region to region, state to state, district to district and farm to farm. There would be many farmers whose cost is more than this, but also many others whose costs are much lower than this. It would be good to carry out a nation-wide systematic cost survey on annual basis, as is done for many other crops, to know the variance and robustness of the estimates. Pending all that, we believe that this estimate is robust enough to use it for pricing purpose.

12% of CPO price to farmers as per existing pricing formula implicitly assumes share of farmers in total cost of production from farm level to factory level at 66.67% which is not validated by any study.

Pricing of FFBs : Formulae in Vogue

3.8 The existing pricing formulae in vogue in major oil palm producing states viz. Andhra Pradesh, Karnataka and Tamil Nadu on the basis of which sale proceeds of CPO is shared with farmers are given in table-3.5.

Table 3.5 : Prevalent Pricing Formulae for FFBs in Major Producing States

S.N.	State	Formula for Pricing of FFBs
1	Andhra Pradesh	12% on net CPO weighted average price + 33% on 9% recovery of palm kernel nuts weighted average price.
2	Karnataka	12% of the CPO price + 16.5% of realized value of nuts (the rate of realization of nut is 9% of FFB)
3	Tamil Nadu	12% of the Weighted average price of CPO (AP Oil Fed Price) less 4 % purchase tax + Rs.250/- per MT for kernel & other by-products;

Notes :*1. Net CPO price refers to net of taxes;*
2. Weighted average price refers to average of daily prices by applying weights as quantities sold on each day.

It is noted that a key common thread that runs across states in pricing formulae is 12% of CPO average price. A pertinent question arises as to where from figure of 12 percent, a crucial parameter in pricing formula, is arrived at. Analysis undertaken in paras-3.9 and 3.10 provide an answer to this question.

3.9 Let cost of farmers in gross cost of production of 1 MT of CPO be 'f' percent and let OER be 'R' percent. Without loss of generality, it is assumed that 100 MT of CPO is produced. For production of this much quantity of CPO, it would require 100/R MT of FFBs. Thus, when 100/R MT of FFBs is processed (equivalently 100 MT of CPO is produced), share of farmers in the gross cost of production is f. It is logical that farmers' share in the total value of CPO to be realised on its sale is to be in proportion to their cost in the gross cost of production of CPO (from farm level to factory level). Therefore, when 100 MT of CPO is produced, then farmers' share in revenue realised on account of sale of CPO would be

$$= f/(100/R)$$

$$= (f*R)/100$$

For various permutations and combinations of these two parameters *viz.* 'f' and 'R', percent share of realised value of CPO that farmers may receive are given in table-3.6.

Table 3.6 : Simulation of Formula for Pricing FFBs

(Various Permutations and Combinations of OER & % Cost of Farmers in Gross Cost of Production of 1 Unit of CPO)

S.N.	OER (%)	Share of Farmers' Expenditure (%) in Gross Cost of Production of CPO							
		60.00	62.50	66.67	67.50	72.50	75.00	75.25	80.00
1	14.00	8.40	8.75	9.33	9.45	10.15	10.50	10.53	11.20
2	14.50	8.70	9.06	9.67	9.79	10.51	10.88	10.91	11.60
3	15.00	9.00	9.38	10.00	10.13	10.88	11.25	11.29	12.00
4	15.50	9.30	9.69	10.33	10.46	11.24	11.63	11.66	12.40
5	16.00	9.60	10.00	10.67	10.80	11.60	12.00	12.04	12.80
6	16.50	9.90	10.31	11.00	11.14	11.96	12.38	12.42	13.20
7	17.00	10.20	10.63	11.33	11.48	12.33	12.75	12.79	13.60
8	17.50	10.50	10.94	11.67	11.81	12.69	13.13	13.17	14.00
9	18.00	10.80	11.25	12.00	12.15	13.05	13.50	13.54	14.40
10	18.50	11.10	11.56	12.33	12.49	13.41	13.88	13.92	14.80
11	18.70	11.22	11.69	12.47	12.62	13.56	14.03	14.07	14.96
12	19.00	11.40	11.88	12.67	12.83	13.78	14.25	14.30	15.20
13	19.50	11.70	12.19	13.00	13.16	14.14	14.63	14.67	15.60
14	19.70	11.82	12.31	13.13	13.30	14.28	14.78	14.82	15.76
15	20.00	12.00	12.50	13.33	13.50	14.50	15.00	15.05	16.00

Source: *Constructed by CACP*

3.10 It may be noted from table-3.6 that when farmers get 12 percent from sale of CPO proceeds, it implicitly assumes share of cost incurred by farmers in gross cost of production of CPO (from farm level to factory level) to be two-third or 66.67 percent, OER exogenously fixed at 18 percent. Equivalently, cost incurred by processors was assumed to be 33.33 percent. Thus, two parameters namely OER and relative shares of expenditure incurred by farmers and processors in gross cost of production of CPO (from farm level to factory level) are crucial which impinge on formula for pricing FFBs. These two issues are discussed in following paras.

Oil Extraction Ratio (OER)

3.11 The Oil Extraction Ratio (OER), a measure of the efficiency of entire palm oil production process, is influenced both by the condition of the plantation and the efficiency of processing mill. At present, there seems to exist no credible mechanism to verify

the reported OER which leads to a deficit of trust between growers and processors. Domestic factories are reportedly getting only 18% OER which is significantly low compared to international standard of OER. The determinants of OER include climatic parameters, source of planting material, management practices, harvesting standard, method of FFB procurement etc. care and maintenance of machinery , mechanisms to recover oil from waste steams, control of spillage, proper steam supply and maintenance required temperature in all processing lines etc. Thus, both plantation parameters and processing efficiency affects OER. Tight management and control on FFB harvesting, collection, handling and modernising mills are necessary to improve OER. Higher OER, *ceteris paribus,* would bring down the cost of production of CPO. Till Testing Centers or any other scientific mechanism to determine OER is put in place, we are inclined to continue with currently reported OER at 18 percent.

Need for Transparent OER Mechanism

3.12 The prime objective of cultivation of FFBs and then processing it is to extract oil. For any pricing of FFB to be based on sound principle, it needs to have explicit and direct relation with OER. Further, any price fixed on the basis of 'assumed' average OER (whether simple / weighted average or any other variant of it) would be an over simplification of the matter, given that OER varies a great deal from one garden to another depending upon their age profiles, farming practices, technology adoption and other relevant factors. Average OER demotivates efficient farmers. Optimally, therefore, it would be imperative to establish FFB Testing Centre in each oil palm industry and test every consignment of FFB for their Oil content (OER) and then industry may arrive at the consignment-specific price of the FFB, based on such test reports (OER %). These Testing Centers may be managed jointly by cultivators, processors with a nominee of the concerned state Government. This will induce and incentivize cultivators to adopt better farming practices and processors to invest in modern technology.

Adoption of average OER as at present does not promote efficiency. FFB testing centers need to be established to reward efficiency.

3.13 In Malaysia, the Palm Oil Registering and Licensing Authority (PORLA) recommends to fix the price of FFB based on grading of

FFB. They have established theoretical extraction rate of oil and kernel for different age profiles and regions, which is called basic extraction rate. Bunches are graded according to the criteria set by PORLA and graded extraction rates are calculated by subtracting a penalty from basic extraction rate and payment is made based on this. Since the processors may not get information on age of palms of small holders and farmers, age is correlated to bunch weight and basic extraction rates are established based on bunch weight also. Average bunch weight is arrived at by dividing the total bunch weight with number of bunches in a consignment.

Relative Shares of Farmers and Processors in Cost of Production of Crude Palm Oil

Costs incurred by farmers & processors in producing CPO from farm level to factory level is estimated in the ratios 75.25 : 24.75

3.14 FFBs are cultivated solely for the purpose of extracting oil from it. Therefore, it is important to analyse component-wise details of cost of production of CPO. However, we could get only limited information on processing cost which is presented in table-3.7.

Table-3.7 : Cost of Production of Crude Palm Oil

(Rs., Percent)

Broad Cost components	Cost of Production
i. Cost of Production of FFB per MT	5633
ii. Processing Cost of converting 1 MT of FFB into CPO (As per note of AP Cooperative Oilseeds Growers Federation dated 24.04.11) {sub-total (a) to (f)}	1853
a. Processing Cost	500
b. Depreciation of P & M	359
c. Interest on Working Capital	60
d. Interest on Fixed Capital	359
e. Transportation	375
f. Administrative Expenses	200
iii. Sub-Total (**Total Cost of** processing **of FFB per MT**) (i+ii)	7486
iv. Less : Sale proceeds of by-products	-250
v. Total (Net Cost of production of CPO, using 1 MT of FFB) (iii-iv)	7236
vi. Cost of Production of CPO (Rs./MT) (OER assumed to be 18%)	40201

vii. Cost of Production of CPO (US $/MT) (OER assumed to be 18%) (Rs. 52/ US$)	773
viii. Farmers' cost as percent of Gross Cost of Production {(i) as % of (iii)}	75.25
ix. Processors' cost as percent of Gross Cost of Processing {(ii) as % of (iii)}	24.75
x. Percent Share of Farmers in CPO sale price {(viii) *OER (18%)}	13.54

Source: *Compiled by CACP on the basis of inputs provided by AP Cooperative Oilseeds Growers' Federation Ltd., Hyderabad*

3.15 The supply side cost of production of CPO, as worked out in table-3.7, is equivalent to US$ 773/MT. According to industry experts, the cost of production in Indonesia and Malaysia is approximately US$ 450/ MT. Though we do not have access to an authentic data on cost structure of production of palm oil in these countries, it is possible that opportunity cost of land might not have been reckoned in their cost of production. If this component is adjusted in Indian cost calculations, domestic cost of production of palm oil in India would be around US$ 579/MT. This would still be higher by over 29 percent compared to those in Indonesia and Malaysia. This difference in cost is explained, in great measure, by natural endowment of rain in Indonesia and Malaysia where about 90 percent of the crop is rainfed. So, judged purely from cost side, Indian cost of production of palm oil is much higher than the lead producers of palm oil in the world. However, the "savior" in the Indian case is the demand driven high prices of palm oil, which are way above their cost of production. While it gives large profits to Indonesians and Malaysians, it offers an opportunity for Indians to take advantage of these demand led high prices, though with a little caution. We expect that it is the demand side pressures in the foreseeable future which will be the main determinants of palm oil prices in the global markets. And it is this demand led pricing that will sustain domestic production of palm oil in India. In extreme case, if global prices witness a crest fall to the level of US$ 782/MT {as projected by World Bank (table-4.6) which is possible given low costs of Malaysians and Indonesians}, it would still be sustainable as it would cover comprehensive cost of production (C_2) including imputed rental value of owned land and imputed interest on owned capital. In any case, to be globally competitive, measures to substantially improve productivity not

only at farm level but also to modernize processing units and enhance processing capacity are called upon to offset disadvantage due to cost of irrigation, else inefficient structures would be built in the system. This issue along with demand side prices are being discussed in greater details in Chapter-IV.

Chapter 4

Key Issues

Productivity levels : Benchmarking Productivity

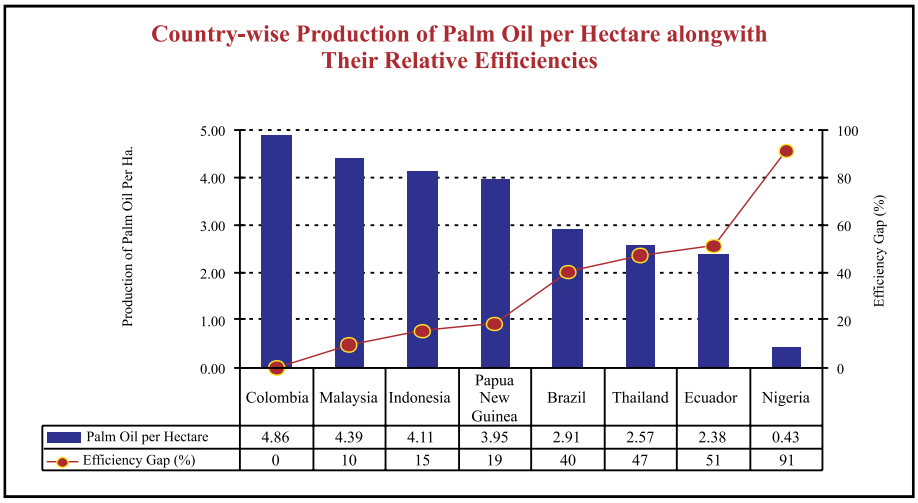
4.1 The role of productivity in enhancing competitiveness of agricultural commodities, for that matter all other commodities, is critical. Empirical evidence does suggest that volume of international trade, *ceteris paribus*, is greatly influenced by prices. One way to reduce prices of commodities is to increase their total factor productivity much faster than demand. Land Productivity[5], though a partial component of total factor productivity, is a critical factor influencing real prices of agricultural products. It would therefore be interesting to see how do major oil palm producing countries fare on relative efficiency scale. This would help in "benchmarking" productivity standards, and set our targets accordingly with a view to gain greater competitiveness. Keeping this in view, an indicator of efficiency gap is defined as (1-e) *100, where 'e' denotes the ratio of production in a country to that of the highest observed production of palm oil on per hectare basis. In the limiting case, the productivity of a country could be equal to that of benchmark. In that event, the efficiency gap will be zero as the value of 'e' would be unity. The country specific production per hectare alongwith their respective efficiency gaps[6] are presented in chart-4.1.

Colombia leads the World in terms of realization of palm oil per unit of area at 4.86 MT/ha., followed by Malaysia at 4.39 MT/ha.

[5] *In terms of production of palm oil per hectare which implicitly takes care of land productivity and OER but does not take labour and capital components into account.*

[6] *The highest average productivity of oil (per hectare basis) of a country is taken as 'benchmark'.*

Chart 4.1 : Productivity of Palm Oil (Per Hectare basis) and Efficiency Gaps in Major Producing Countries



Irrigation

4.2 Water is a crucial input for oil palm cultivation. A monthly average rainfall of 150 mm (1800 mm annually) is optimum for growing oil palm. Almost all the states identified as potential oil palm areas, except Mizoram, experience seasonal rains and witness extended period of dry period. Inadequate water leads to non-opening of spear leaves and decrease leaf production rate, which in turn affects the photosynthesis. Any deficit in the availability of moisture adversely affects yield, both in terms of number of bunches and their weights. As oil palm in the country is mostly grown under irrigated conditions in contrast to rainfed conditions in leading oil palm producers in the world, it may be tough for India to be globally competitive if oil palm is cultivated in areas where water tables are too low. Given the fact that ground water depletion is a major concern, it is imperative to have a hard look at distribution of water tables across major oil palm producing states (or identified as potential areas). Table-4.1 presents distribution of water tables across relevant states in different bands of water tables alongwith modal, maximum and minimum levels.

Table 4.1 : Distribution of Water Tables across Major Palm Oil Producing States during Summer (April / May, 2011)

(Mbgl, Percent)

States	Sample size*	Minimum (Mbgl)	Maximum (Mbgl)	Modal Band (Mbgl)	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Andhra Pradesh	720	-0.59	41.8	5 to 10	12.08	36.67	36.67	14.03	0.42	0.14	100
Assam	209	0.05	19.58	2 to 5	19.44	58.37	20.1	2.39	0	0	100
Chhattisgarh	360	0.53	24.9	5 to 10	3.33	21.67	55.56	19.17	0.28	0.00	100
Gujarat	665	0.34	64.58	2 to 5	3.13	53.13	25.00	15.63	3.13	0.00	100
Goa	44	1.21	26.09	2 to 5	6.82	45.45	31.82	13.64	2.27	0.00	100
Karnataka	901	0.38	30.68	5 to 10	8.77	28.75	41.51	20.64	0.33	0.00	100
Kerala	665	0.12	41.2	5 to 10	10.08	29.17	44.21	14.74	1.65	0.15	100
Orissa	873	-0.07	16.55	5 to 10	9.74	41.12	44.67	4.47	0.00	0.00	100
Tamil Nadu	984	-0.40	100.4	2 to 5	8.54	37.30	33.74	14.53	5.89	0.00	100
Tripura	27	1.39	6.6	2 to 5	11.11	59.26	29.63	0.00	0.00	0.00	100

**: Number of Wells analysed*
Mbgl: Meter below ground level
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

4.3 District-wise details within each of the above states may kindly be seen in Annexure tables. On perusal of these tables, the availability of ground water seems to be within feasible range. However, given the fact that oil palm is a perennial crop with economic life up to 30 years, it is all the more necessary to use the water efficiently and judiciously. Research studies, as quoted by Director (DOPOR), Pedavegi (AP) during visit of senior officers of CACP in the month of October, 2011, do indicate that micro-irrigation systems like drip and micro jets are more efficient than basin systems in terms of better water use efficiency. It is, therefore, recommended that emphasis should be laid on micro-irrigation systems to conserve precious water resources.

Inadequate Incentives : Need for Scaling Up of New Plantation to correct allocative inefficiency

4.4 Unlike leading producers of oil palm in the world where oil palm is a plantation crop, this crop in India is cultivated in preponderate proportion by marginal, small and medium sized farmers. Their propensity to bear the risk and opportunity cost of no inflow of cash during the entire gestation period of 3 years before palm start bearing FFBs is minimal, if not zero. In this scenario, it is too optimistic to hope for rapid area expansion under business as usual (BAU) model. Under the existing plan, the scale of incentives extended by the centre is recapitulated in annexure table-I.

4.5 During the field visit of senior officers of CACP to East Godavari and West Godavari districts in October 2011, it was gathered that farmers, particularly marginal and small farmers, did not find the above incentives attractive enough to go for oil palm cultivation whole heartedly. There is a need to scale up the incentives in a big way to accelerate area expansion. This will be quite cost effective in medium to long term as may be seen from the following paragraph.

1 million ha. under palm oil can give as much edible oil as 15.80 million ha. under other oilseeds give to the country at present, besides saving a net outgo amounting to Rs. 22458 crore on account of import bill.

4.6 The domestic production of edible oils in the country is 6.48 million MT[7] with area coverage under oilseeds being over 25.60 million ha[8]. It implies that about 4 million MT of oil was produced in the country by using 15.80 million ha. of land. This much quantity of palm oil could be produced from just 1 million ha. Further, the country imported edible oils of the order of 8.3 million MT, valued at Rs.29,442 crore at present. If 1 million ha. of area is brought under oil palm cultivation by scaling up incentives in a big way, it can produce an additional 4 million MT of edible oil which could

---

[7] *Excluding edible oils from secondary sources such as rice bran, cottonseed, solvent extracted oils, coconut oil tree and forest origin oils besides, palm and kernel oils. The reason for not taking these oils into reckoning for the purpose under reference is either non-availability of reliable data on area under the corresponding crops or non-availability of fairly reliable data on proportion of that crop being used for extraction of oil (in case of coconut in particular).*

[8] *Excluding area under non-edible oilseeds, secondary sources, palm and kernel oils.*

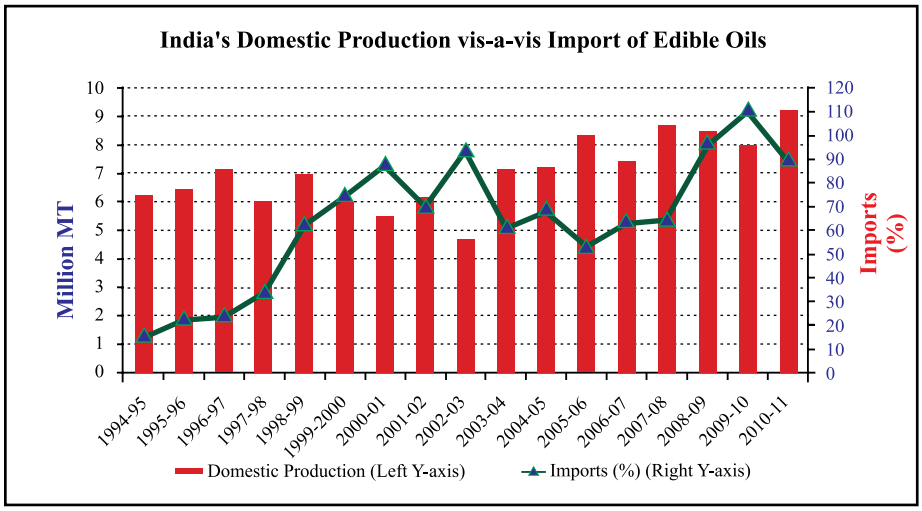
result in savings to the tune of Rs.22458 crore[9] at current prices. Even if just about Rs. 10080 crore of this amount (see Chapter-V) is earmarked for incentivising farmers, the programme of expansion of palm oil area expansion can prove to be a path breaking. Since the fruit bearing life of oil palm is roughly 27 years, cumulated over this period, the foreign exchange savings at current prices will be worth about Rs. 606360 crores (i.e., US $ 117 billion at an exchange rate of Rs 52 per US dollar).

Trade & Tariff Policies

4.7 To bridge the gap between domestic production and consumption demand, India has been resorting to imports of edible oils. Out of various edible oils imported during 2010-11, Crude Palm Oil (CPO) commanded the largest share (69.58%), followed by a distant second oilseed viz. Soybean (16.80%) and Sunflower (10.39%). The reason of disproportionate share of CPO in the country's import basket of edible oils lies in its significant price advantage compared to its other substitutes. The imports of edible oils to India, as percentage of domestic production, have varied a great deal from year to year. During the late 1970s, it hovered around 40 percent, dropped to less than 5 percent during 1990-91 to 1993-94, and then again increased touching a high of more than 90 percent during 2008-09 to 2010-11, when import duties on Crude Palm Oil (CPO) were slashed to zero. In 2009-10, it had touched a peak at 111 percent, i.e., imports of edible oils were more than what was being produced at home. Chart-4.2 exhibits these wide fluctuations in imports of edible oils.

[9] *It is indicative, based on quarterly average price at US$ 1079.7/MT (Q3 of 2011) and exchange rate at Rs.52 per US Dollar.*

Chart 4.2 : Import of Edible Oils vis-a-vis India's Domestic Production



Impact of Trade and Domestic Policy on Flow of Edible oils Imports

4.8 India's trade policy has evolved over the years. Starting from 1994 till date, India's trade policy can be broadly divided into three distinct phases which is recapitulated in table-4.2.

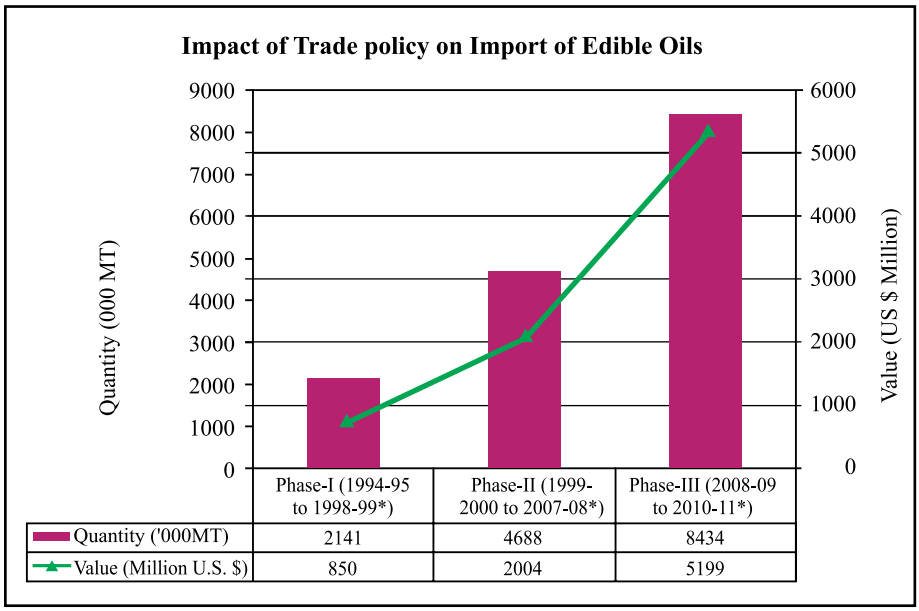
Table 4.2 : Evolution of India's Trade Policy

Phases of Trade Policy Regime	Key Characteristic of trade policy/ trigger that caused paradigm shift in policy	Average Imports	
		('000 MT)	(Million U.S. $)
Phase-I (1994-95 to 1998-99) Liberalisation	In April, 1994, palmolein brought under OGL subject to 65 % duty. Earlier, import of edible oils was partly canalised. Import duty gradually reduced to 25% in 1996-97 (Budget) and further to 15% in July 1998.	2141	850

Phase-II (1999-2000 to 2007-08) Reversal of liberalisation & high protection	Strategy of import substitution severely affected other competing crops, especially cereals. This strategy could not be sustained due to implicit allocative inefficiency in terms of diversion of area from other crops to oilseeds. After the east Asian financial crisis of 1997, palm oil prices dropped sharply. Farmers started uprooting oil palm plantations, necessitating a reversal in import duty structure in 1999. Import duties were revised upwards in 1999 and they went up to 92.2% for RPO in April 2001 and remained at that level till March 2003. Then, these varied in the range of 27.5% and 90% in the period from April 2003 to March 2008.	4688	2004
Phase-III (2008-09 to 2010-11) Back to liberalisation. Import duties slashed due to high global prices	In 2008 (April), import duty on CPO & RPO reduced to zero & 7.5% respectively to meet rising domestic demand. Besides, export of major edible oils was banned from 17.3.2008 except for a small quantity in 5 kg packages.	8434	5199

4.9 In pre-1994 period, there were quantitative restrictions (QRs) on most of agri-imports, including edible oil imports. From April 1994, the country started opening up its agriculture sector when palm oil imports were placed under OGL. During this liberalisation period (phase-I), average quantity of imported edible oils increased to 5.8 times compared to average of preceding six years (1988-89 to 1993-94). During next phase-II, average quantity imported more than doubled compared to that during previous phase and it further increased by 80 percent during phase-III. The impact of shifts in trade policy over the years is exhibited in chart-4.3.

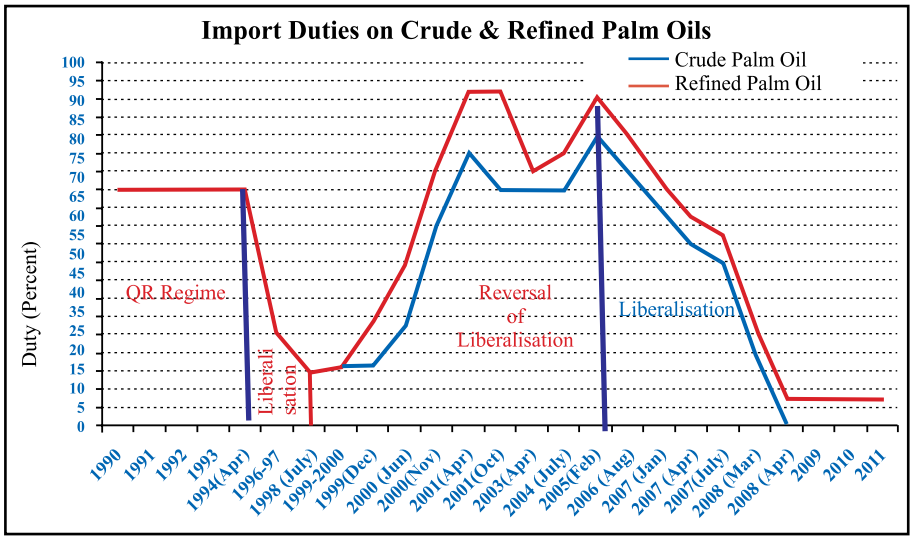
Chart 4.3 : Impact of Trade Policy on Imports of Edible Oils



** : Average during relevant years*

4.10 The import duty structure of edible oils is reviewed from time to time, depending on the domestic requirement and supply positions. Upto 1993-94, edible oils were on the negative list of imports. These were first decanalised partially in April, 1994 when import of edible vegetable palmolein was put under OGL subject to 65 percent import duty. Subsequently, imports of other edible oils were also placed under OGL. Import duty on edible oils progressively came down to a low level of 15 percent in July, 1998. In 1999-2000 (Budget), it was marginally increased to 16.5 percent for both CPO and RPO. However, it was further increased to 28.6 percent for RPO in 1999 (December), leaving CPO at the same level. In fact, after 1999 duties witnessed a general upward trend to reach a level of 92.2 percent for RPO in April, 2001. Finally, import duties have been reduced to the levels of zero percent and 7.5 percent for CPO and RPO respectively by 2008, possibly as a countervailing measure to high global prices of palm oil. The import duties on crude and refined palm oils during last two decades are exhibited in Chart-4.4.

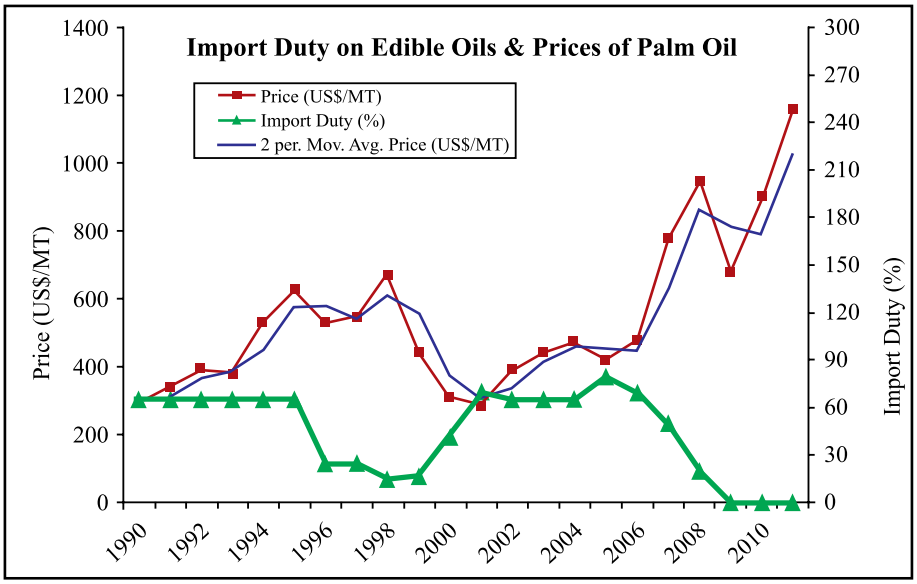
Chart 4.4: Import Duties on Crude and Refined Palm Oils



Import duty counter-cyclical to prices

4.11 It is interesting to note that import duties on edible oils have moved basically in counter-cyclical nature to the level of edible oil prices in global markets. This seems very legitimate policy choice given the need to stabilize edible oil prices in the domestic market. The counter-cyclical nature of import duties and global prices of palm oil is depicted in chart-4.5.

Chart 4.5: Import Duties Counter-Cyclical to Global Prices of Palm Oil



The details of import duty on palm oil and other vegetable oils are presented in annexure table-XXV.

Domestic & International Prices

4.12 It is noted from table-2.5 that average international prices of palm oil were quite close (either lower or higher) to those of soybean oil until 1999 but latter decisively outstripped the former in post-2000 era. In fact, the prices of all major vegetable oils have been ruling above those of palm oil in post-2000 era in varying magnitudes as may be seen from table-4.3.

Table 4.3 : Higher Prices of Various Vegetable Oils Relative to Palm Oil during 2000 to 2011

Prices of palm oil have been lowest during post-2000 period. Average prices of other edible oils were higher by 5% to 180%.

Edible Oil	Premium in Prices over Palm Oil (%)				
	Average	Highest		Lowest	
		Percent	Year	Percent	Year
Soybean	21.27	32.65	2008	8.97	2000
Rapeseed	37.17	77.97	2006	11.6	2000
Groundnut	109.6	180.47	2003	55.84	2010
Coconut	26.69	59.45	2011	5.43	2003

4.13 Low prices of palm oil seems to have been achieved mainly due to productivity gains attained by major palm oil producing countries like Indonesia and Malaysia, and perhaps also because of preference function where high income consumers of US and Europe prefer other oils (like olive oils, canola, or soyoil, etc,) for direct human consumption. These two countries, who account for over 82 percent of world palm oil production, have exploited natural endowment of rainfall to the best of their comparative advantage which explains, in good measure, low prices of this oil. It will be quite interesting to examine as to how prices in future will behave. With this end in view, an attempt has been made to statistically project future prices of palm oil by fitting linear, polynomial and logarithmic curves on current average annual prices of palm oil and crude oil. The summary of relevant results are presented in table-4.4.

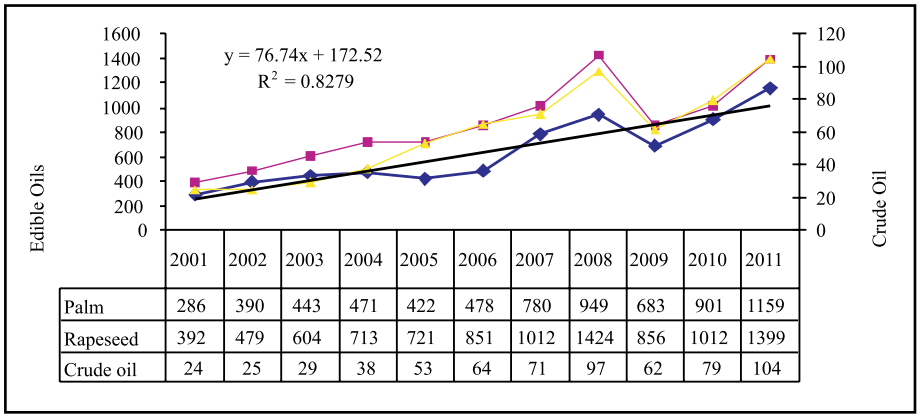
Table 4.4 : Results of Trend Analysis of Prices of Palm Oil

Period	Functional Form of Models		
	Linear	Polynomial	Logarithm
1990-2011	y = 23.285x + 278.29	y = 2.4694x2 - 33.511x + 505.47	y = 154.38Ln(x) + 205.93
	R^2 = 0.43	R^2 = 0.5848	R^2 = 0.303
1990-2000	y = 15.108x + 368.51	y = -10.224x2 + 137.8x + 102.67	y = 93.892Ln(x) + 309.77
	R^2 = 0.1497	R^2 = 0.6844	R^2 = 0.2918
2001-2011	y = 76.74x + 172.52	y = 4.8601x2 + 18.419x + 298.89	y = 308.71Ln(x) + 141.77
	R^2 = 0.8279	R^2 = 0.8538	R^2 = 0.6762
2005-2011	y = 105.68x + 344.74	y = -3.2963x2 + 132.05x + 305.18	y = 330.48Ln(x) + 364.96
	R^2 = 0.7548	R^2 = 0.757	R^2 = 0.7419

4.14 It may be noted that low value of R^2 , for instance at 0.303 for the period 1990-2011 in case of logarithm model, indicates that only 30 percent of variation in prices is explained by the model being employed. Therefore, it is statistically not a sound proposition to project future prices on the basis of models with low value of R^2. One reason for low R^2 in all the models for the period 1990-2011 as also for 1990-2000 could be that prices undergo 'loss of memory'[10] in the sense that current prices may not be significantly correlated with prices that prevailed in distant past. In other words, recent prices are more relevant for projection of future prices. It, therefore, makes a sense to project future prices based on prices for the periods from 2001 to 2011 and also from 2005 to 2011. In all these 6 alternative scenarios (3 models each for 2 sets of period), value of R^2 varied in the range of 67 percent to 85 percent and as such these can be employed to project future prices. These six alternative scenarios are exhibited in charts-4.7a to 4.7c and 4.8a to 4.8c.

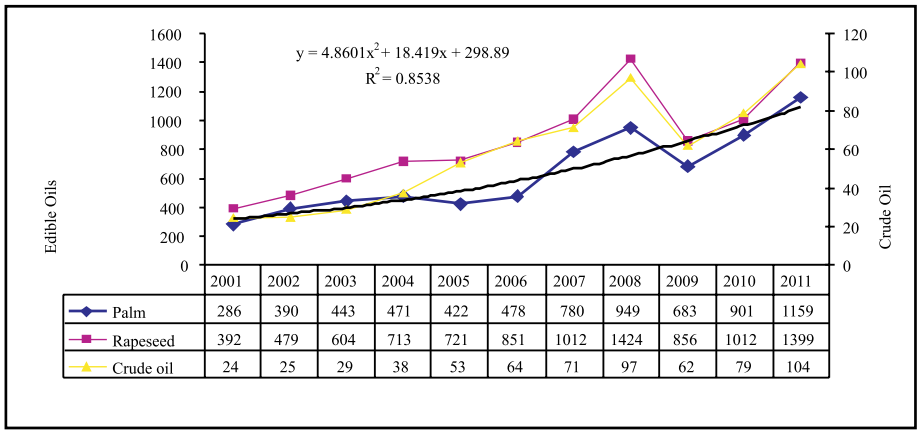
[10] *Akin to Poisson distribution*

Chart 4.6a : International Prices of Edible Oils vis-a-vis Crude oil
(Linear Model, using input prices for the period from 2001 to 2011)



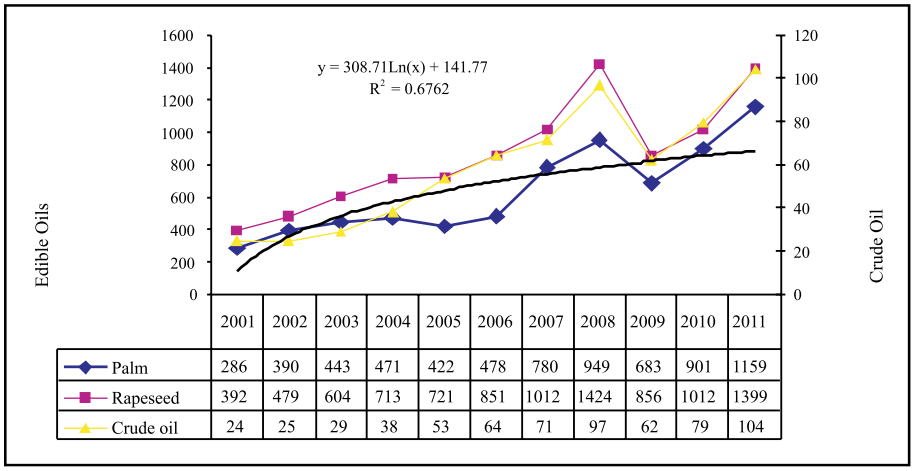
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Palm	286	390	443	471	422	478	780	949	683	901	1159
Rapeseed	392	479	604	713	721	851	1012	1424	856	1012	1399
Crude oil	24	25	29	38	53	64	71	97	62	79	104

Chart 4.6b : International Prices of Edible Oils vis-a-vis Crude oil
(Polynomial Model, using input prices for the period from 2001 to 2011)



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Palm	286	390	443	471	422	478	780	949	683	901	1159
Rapeseed	392	479	604	713	721	851	1012	1424	856	1012	1399
Crude oil	24	25	29	38	53	64	71	97	62	79	104

Chart 4.6c : International Prices of Edible Oils vis-a-vis Crude oil
(Logarithm Model, using input prices for the period from 2001 to 2011)



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Palm	286	390	443	471	422	478	780	949	683	901	1159
Rapeseed	392	479	604	713	721	851	1012	1424	856	1012	1399
Crude oil	24	25	29	38	53	64	71	97	62	79	104

Chart 4.7a : International Prices of Edible Oils vis-a-vis Crude oil
(Linear Model, using input prices for the period from 2005 to 2011)

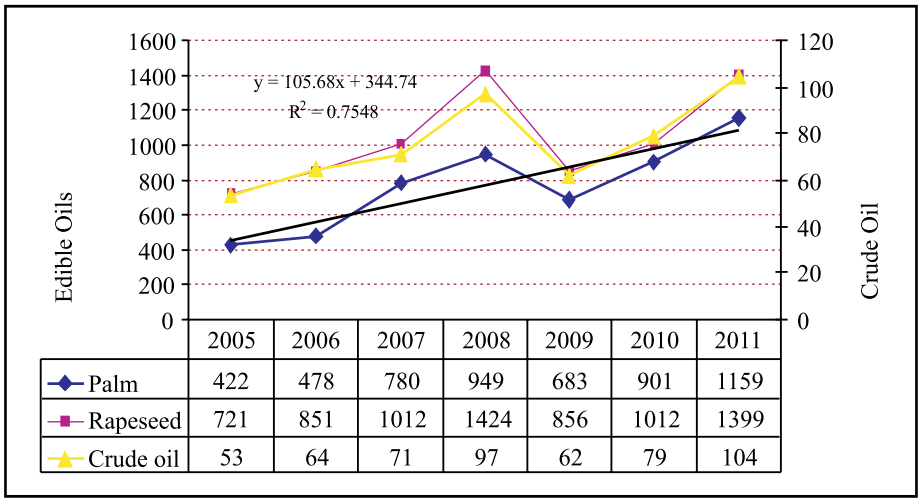


Chart 4.7b : International Prices of Edible Oils vis-a-vis Crude oil
(Polynomial Model, using input prices for the period from 2005 to 2011)

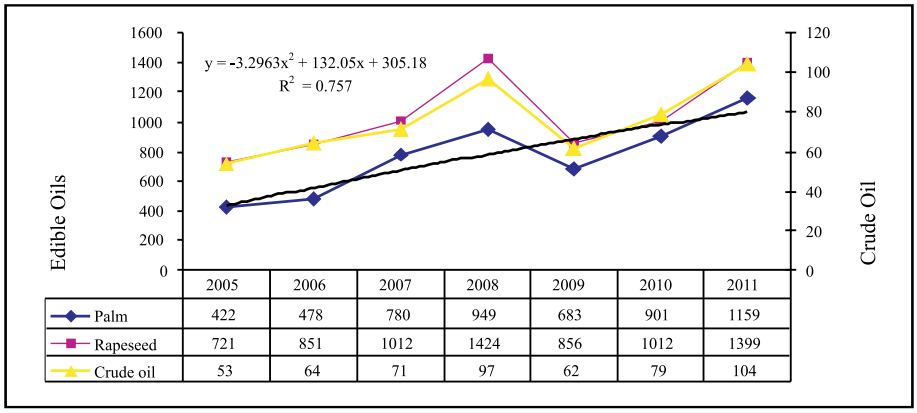
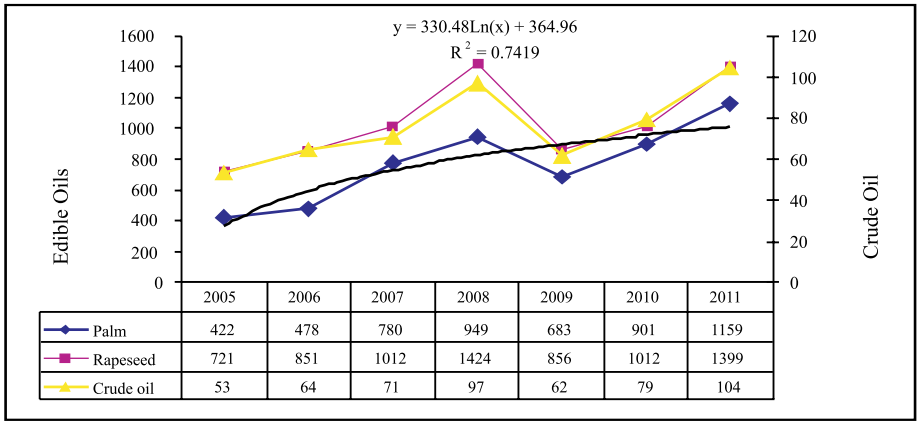


Chart 4.7c : International Prices of Edible Oils vis-a-vis Crude oil
(Logarithm Model, using input prices for the period from 2005 to 2011)



4.15 Based on foregoing models, future prices of palm oils for the period from 2012 to 2016 are projected and presented in table-4.5 alongwith relevant prices projected by OECD/World Bank.

Table 4.5 : Projected Prices of Palm Oil from 2012 to 2016

(US$/MT, US$/bbl)

Year	Projected Prices of Palm Oil, based on Statistical models and using input prices for the period **2001 to 2011**				Projected Prices of Palm Oil, based on Statistical models and using input prices for the period **2005 to 2011**			
	Linear Model	Polynomial Model	Logarithmic Model	Regression*	Linear Model	Polynomial Model	Logarithmic Model	Regression*
2012	1016	1090	882	1036	1507	1359	1157	1109
2013	1093	1220	909	1005	1613	1415	1186	1065
2014	1170	1360	934	976	1719	1465	1213	1024
2015	1246	1509	956	948	1824	1508	1237	985
2016	1323	1669	978	920	1930	1544	1260	946

**:Prices of Crude Oil as an independent variable and those of Palm Oil as dependent variable*

Based on empirical evidence, it can be said that projections results are likely to be close to true value when Statistical models use, ceteris paribus, larger number of observations. We are, therefore, inclined to adopt projections based on prices for longer period viz. 2001 to 2011 instead of those based on period 2005 to 2011. Furthermore, as palm oil is being increasingly diverted towards production of bio-diesel, long term import parity price (IPP) of CPO is bound to get locked with global energy prices. In this background, prices projected on the basis of regression[11] analysis seem more appropriate. The prices of palm oil thus projected for 2012 to 2016 vis-a-vis those projected by World Bank are presented in table-4.6

Table 4.6 : Prices of Palm Oil Projected for 2012 to 2016 by World Bank vis-à-vis those based on Statistical Models

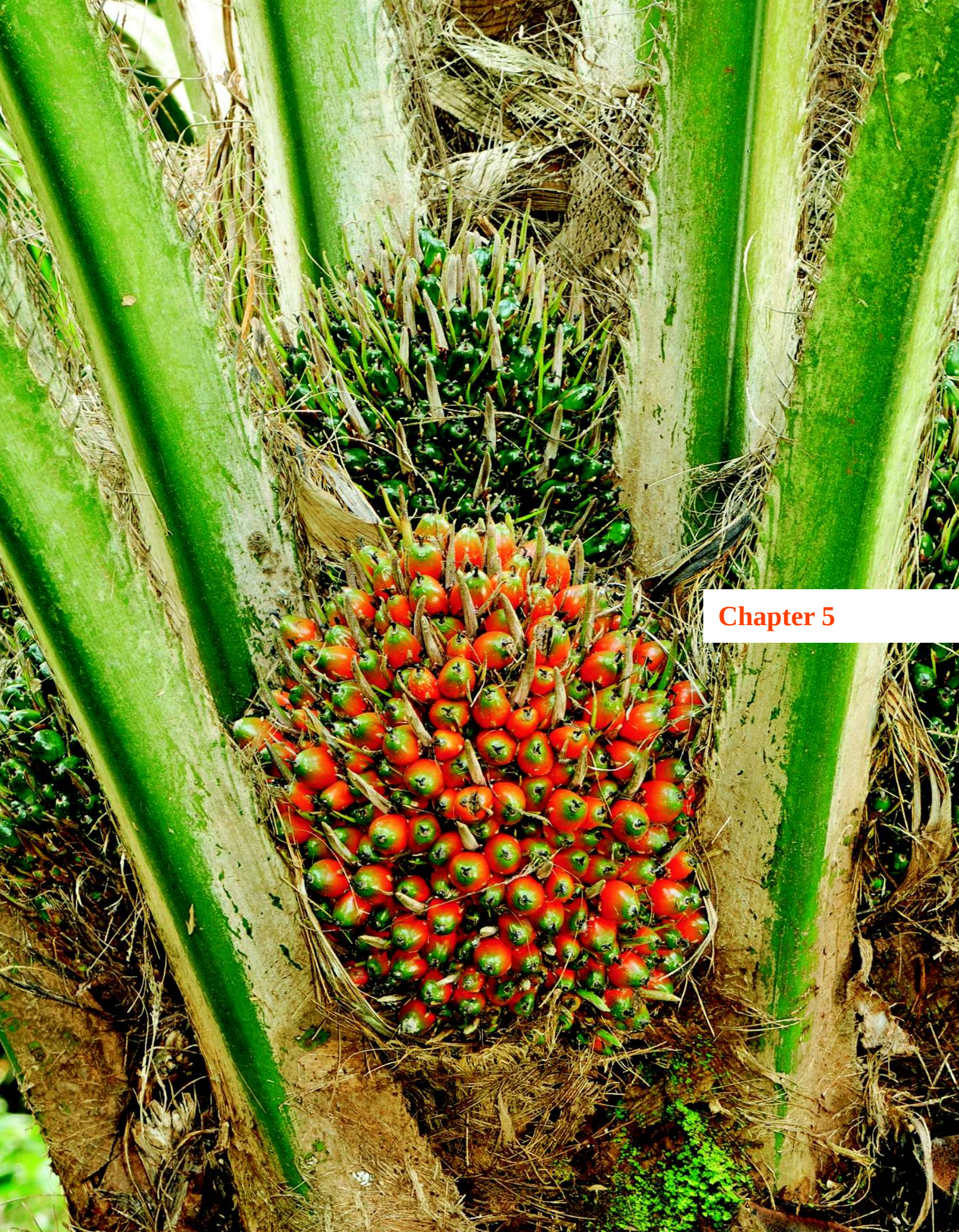
(US$/MT, US$/bbl)

Year	Projected Prices of Palm Oil, using regression, with input prices for the period 2001 to 2011	Projected prices of Palm Oil as per World Bank Forecast	Projected Prices of Crude Oil as per World Bank Forecast
2012	1036	900	102.10
2013	1005	850	98.70
2014	976	810	95.60
2015	948	800	92.60
2016	920	782	89.60

Sources: *Prices in column 2 have been Statistically forecast by authors and those in column 3 & 4 : http://econ. World Bank.org (accessed on 15.11.2011 Price Forecast)*

4.16 From the forgoing discussions, it may be inferred that vegetable oil prices have become tied to petroleum prices. Even though biofuel usage accounts for less than 15 percent of global vegetable oil consumption, large and very rapid response from the biodiesel sector drives vegetable oil prices. This may create a price band, with biofuels acting as the intermediary between oils, fats and petroleum markets to keep vegetable oil prices within an envelope with a defined cup and cap. And that cup and cap could be US $900 /MT and US $ 1036/MT respectively in so far as year 2012 is concerned. On long term horizon, cup could go further down to US$ 782/MT in 2016 while cap may remain at US$ 1036/MT in next five years. We hope that demand side prices may rule well above supply side prices due to shortage of this commodity. It is imperative to keep the import duty trigger at around 'cup' level of prices, say at US$ 800/MT, i.e. if and when the import price falls below US$800/MT, immediately the import tariffs need to go up and it ought to be counter-cyclical to international prices. As import duty trigger level happens to be slightly above domestic comprehensive cost of production (C_2), it will also keep farmers incentivized.

[11] *Price of crude petroleum oil is taken as an independent variable*



Chapter 5

Pricing and Investment Strategy to Boost Oil Palm

Pricing Formula for FFBs

5.1 MSP or formula for pricing FFBs (for that matter any other agriculture produce) can be sustained only if it is arrived at after analysing domestic demand and supply, competitiveness, domestic prices and import parity prices (IPP) in short and long run, cost of production and processing, productivity and other relevant issues. All these issues have been analysed in preceding chapters. The key points that emerge from the analyses are recapitulated hereunder, and based on these points, formula for pricing FFBs is recommended.

5.2 The total cost of cultivation on per hectare basis of perennial crops such as oil palm can be classified into two broad categories viz. Establishment Cost (EC) and Maintenance cost (MC). The total cost of cultivation (C_2) including amortized value of EC is estimated at Rs.105360/ha., net of subsidies.

5.3 Cost of production of FFBs (on per MT basis) depends on land productivity besides cost of cultivation (on per hectare basis). As land productivity of a given garden varies depending upon its age, it will only be appropriate if age-specific land productivity over the entire economic life span of the oil palm garden is taken into consideration. Weighted average productivity, considering age-specific productivity, works out to be 18.70 MT/ha. Based on this, the cost of production of FFBs is estimated at Rs.5633/MT.

5.4 Average processing cost of converting 1 MT of FFBs into CPO is

estimated to be Rs.1853. Together with average cost of production of FFBs at Rs.5633 per MT, total cost of processing 1 MT of FFBs into CPO works out to Rs.7236 after adjusting for by-products. Assuming OER at 18 percent, cost of production of CPO is estimated at Rs. 40201/MT (US $ 773/MT at exchange rate of Rs.52 per US).

5.5 Both demand side price and supply side cost of FFBs are to be taken into consideration for ensuring sustainability of a pricing formula. At present, there is a continuous increasing interest concerning oil palm as a source of renewable energy, especially as bio-diesel. The palm oil bio-diesel is biodegradable, non-toxic, and has significantly fewer emissions than petroleum-based diesel (petro-diesel) when burnt. As palm oil is being increasingly diverted towards production of bio-diesel, long term import parity price (IPP) of CPO is bound to get locked with global energy prices. If edible oil prices fall too low, demand from bio-fuel sector will swiftly rise which would pull edible oil demand (and consequently its prices) up. Logically, its converse will also hold good. Statistical analysis does indicate that the linkage between fossil oil and edible oil prices has become stronger in recent era, especially after 2000.

5.6 The prices of all major edible oils have been ruling above those of palm oil in post-2000 era in varying magnitudes. Low prices of palm oil in relation to other edible oil prices seem to have been driven mainly by productivity gains attained by major oil palm producing countries like Indonesia and Malaysia, and perhaps also because of preference function where high income consumers of US and Europe prefer other oils (like olive oils, canola, or soyoil, etc,) for direct human consumption. Indonesia and Malaysia, which account for over 82 percent of world palm oil production, have exploited natural endowment of rainfall to the best of their comparative advantage which explains, in good measure, their low cost of production and processing, and therefore low prices of this oil.

5.7 Projections of future prices of palm oil, based on regression analysis and also by statistically fitting linear, polynomial and logarithmic curves on current average annual prices of palm oil and crude oil,

do indicate that price of CPO in 2012 may be within an envelope with a defined cup and cap. And that cup and cap could be US $900 /MT and US $ 1036/MT respectively in so far as year 2012 is concerned. On long term horizon, cup could go further down to US$ 782/MT in 2016 while cap may remain at US$ 1036/MT in next five years. We hope that demand side pressures will keep its prices firm in most of the years of foreseeable future. However, if they drop below, say US$800 per MT, which is a possibility, though with low probability, then it should trigger a hike in import duty, as far as India is concerned. Thus, the level of US $800 per MT should be identified as a "trigger point" for imposing an appropriate import duty, and it ought to be counter-cyclical to international prices.

International prices of palm oil are projected to be within an envelope with a defined cup (US$ 782/MT) and cap (US$ 1036/MT) during the period 2012 to 2016. If they drop below US$ 800/MT, they should attract an appropriate import duty.

5.8 The existing pricing formulae in vogue in major palm oil producing states, recapitulated in the table-3.5 of the report, were reviewed. The formula in Andhra Pradesh, for instance, is 12% on net CPO weighted average price + 33% on 9% recovery of palm kernel nuts weighted average price. Two parameters namely OER and share of costs incurred by farmers in gross cost of production of CPO (from farm level to factory level) ought to determine the prices that could be paid to farmers for their FFBs. On careful perusal of table-3.6, it emerges that formula for pricing FFBs at 12 percent of net weighted price of CPO, OER exogenously fixed at 18 percent, implicitly assumes percentage share of farmers in the total cost of production of CPO from farm level to factory level to be 66.67 percent. This presupposes that processing cost of entrepreneurs (processors) will be one-third. However, there exists no study or any credible record to support this assumption.

5.9 Ratios of cost of cultivators and those of processors in gross cost of conversion of one unit of FFB into CPO are in 75.25 : 24.75 (Table-3.7 of the report). Based on business model of sharing of revenue in proportion to cost of each partner in a joint venture, it would be just and fair if farmers and processors share the realised revenues on account of CPO in proportion to their respective costs. Carrying this principle forward, read in conjunction with table-3.6, formula for pricing FFBs is recommended at 13.54 percent of net CPO weighted average price. In addition, farmers be given 75.25

percent on 9% recovery of palm kernel nuts weighted average price. Furthermore, as CACP has been recommending MSP for all crops in its mandate (24 in number) across the country without any state-specific differential, formula for pricing FFBs be the same across all the states.

5.10 It may be pertinent to add here that formula recommended in the preceding paragraph presupposes OER at 18 percent. Any change in OER would have corresponding impact on pricing formula. Incidentally, it may be mentioned that higher OERs have been attained by Brazil (28.99 percent), Paupa New Guinea (27.17 percent), Colombia (25.08 percent), Indonesia (23.90 percent) and Malaysia (20.70 percent). There are indications that average observed OER is no less than 18 percent in India.

5.11 OER varies a great deal from one garden to another depending upon their ages, farming practices, technology adoption and other relevant factors. Average OER demotivates efficient farmers. It is, therefore, recommended that FFB Testing Centre be established in each oil palm industry, test every consignment of FFB for their Oil content (OER) and then industry may arrive at the consignment-specific price of the FFBs, based on such test reports (OER %). These Testing Centers may be managed jointly by cultivators, processors with a nominee of the concerned state Government. This will induce and incentivize cultivators to adopt better farming practices and invest in modern technology. Till the time this can be put in practice, an OER of 18% should be the base of formula for pricing FFBs.

5.12 Further, since the underlying basis of pricing formula rests in the relative costs of production of FFBs and their processing into oil, a more robust scientific survey of costs needs to be undertaken on priority basis, and on annual basis. For this purpose, collection of quality data in a structured form, based on sound statistical sampling design is inescapable. This database should have four important ingredients viz. transparency, timeliness, reliability and adequacy. The current mode of collecting the cost data through DES (for other crops) does not fully satisfy these criteria and therefore sometimes is mired in controversy. An alternative way

to collect requisite data through an outside agency of repute on outsourcing basis under the overall supervision and monitoring of price recommending authority (such as CACP in this case, which is the prime user of this cost data) is the need of the hour. Besides, senior officers of the Commission may be drafted to other major oil palm producing countries to deepen the understanding of dynamics of this crop in its entirety. All this would help evolve "efficiency norms" in the production and processing of FFBs. Accordingly, suitable adjustments can be done in the formula where efficient producers and processors are rewarded.

Investment Strategy to Boost Oil Palm Cultivation in India

5.13 As indicated earlier in chapter-I, that it took more than 25 years to exploit less than 2 lakh area of oil palm in India. This is too slow a progress. If business as usual continues, India will be spending a huge lot of foreign exchange in ever increasing imports of palm oil, and also miss the business opportunity to develop this crop domestically for our own farmers and processors. Two important constraints that seem to impede area expansion programme under oil palm are opportunity cost of land of farmers and high cost of irrigation. So long as India follows the model of small holder farming for oil palm growth (in contrast to corporate farming, which can be done to some extent if this crop is declared as a plantation crop on the lines of tea plantations), these challenges remain high as small holders do not have much sustaining capacity without any fruit at least in the first three years. Nor do they have much resources to invest in assured irrigation facilities with borewells and drips. If India has to leap-frog in oil palm cultivation, it has to find a way to break these two barriers. The pace and scale of expansion of this will depend upon how bold is the government strategy in overcoming these two challenges. Keeping in mind what advantages it can bring about in terms of saving of foreign exchange by reducing dependence on imports, and augmenting farmers' incomes within the country, we strongly recommend that compensating farmers for opportunity cost of their land during lock-in period of three years and helping them to create irrigation

facilities (through borewells and drips) will be quite cost effective in medium to long term. Given that India is land scarce country, and the domestic production of edible oils from direct oilseed sources in the country is just 6.48 million MT[13] with area coverage under oilseeds of more than 25.60 million ha[14], oil palm could be a hugely land saving strategy. Through the current mix of oilseeds, it implies that about 4 million MT of oil is being produced in the country by using 15.80 million ha. of land. This much quantity of palm oil could be produced from just 1 million ha. Thus, one million hectares under oil palm is akin to more than 15 million hectares under other mix of oilseeds. Currently, the country has only 1.7 lakh hectares under oil palm, while the potential identified for it is one million hectares. If additional 8 lakh ha. of area is brought under palm oil cultivation (to make it approximately one million ha.) by scaling up incentives in a big way, together this one million hectares of oil palm can produce 4 million MT of palm oil, which could result in savings of imports to the tune of Rs.22458 crore[15] at current prices. Since the fruit bearing life of oil palm is roughly 27 years, cumulated over this period, the foreign exchange savings at current prices will be worth about Rs. 606360 crores (i.e., US $ 117 billion at an exchange rate of Rs 52 per US dollar). Given this potential saving in the import bill at current prices, how much the country needs to invest to reap this potential benefit? What should be the role of public policy in this? These are important questions that the investment strategy needs to take care.

5.14 As farmers' capacity to forego any returns on land for three years is very low, as also their capacity to undertake any risks of a new crop, any investment strategy under public policy must think of the ways and means to compensate farmers against that potential loss (i.e., opportunity cost of their land during 'lock-in' period of 3

---

[13]*Excluding edible oils from secondary sources, palm and kernel oils.*

[14]*Excluding edible oils from secondary sources such as rice bran, cottonseed, solvent extracted oils, coconut oil, tree and forest origin oils, besides palm and kernel oils. The reason for not taking these oils into reckoning for the purpose under reference is either non-availability of reliable data on area under the corresponding crops or non-availability of fairly reliable data on proportion of that crop being used for extraction of oil (in case of coconut in particular).*

[15]*It is indicative, based on quarterly average price at US$ 1079.7/MT (Q3 of 2011) and exchange rate at Rs.52/US$.*

years). If the public policy attempts to cover about 2 lakh hectare of additional area under oil palm annually for 4 years from 2012-13 and plans to compensate the farmers @ Rs.30000/-[16] per hectare p.a. for three years for their land, it would cost the exchequer Rs 7200 crores (table 5.1).

5.15 Next biggest cost item for public policy to see is the cost of irrigation. Out of a total estimated cost of cultivation of FFBs, about 22 percent is on account of irrigation facilities (borewell, drip, and associated channels, etc). Higher irrigation cost discourages farmers to go for oil palm cultivation. To address this constraint, even if the government gives irrigation investment subsidy @ Rs. 36,000/- per ha., (which is approximately 90 percent of cost of irrigation system per hectare), for 8 lakh additional hectares to be brought in under oil palm, it would cost the government only Rs 2880 crores (table-5.1).

[16] *Approximately equal to an annual opportunity cost of land.*

5.16 The two components discussed in preceding two sub-para would together require an outlay of Rs 10,080 crores (less than US $ 2 billion), distributed over 6 years (Table 5.1).

Table 5.1 : Recommended Subsidy under Oil Palm Cultivation

S.N	Year	Support against opportunity cost of Land		Subsidy for irrigation		Total {(4) +(6)} (Rs. Crore)
		Area[17] (Lakh Ha.)	Rs. Crore (@ Rs.30000/ha.)	Area (Lakh Ha.)	Rs. Crore (@ Rs.36000/ha.)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	2012-13	2	600	2	720	1320
2	2013-14	4	1200	2	720	1920
3	2014-15	6	1800	2	720	2520
4	2015-16	6	1800	2	720	2520
5	2016-17	4	1200			1200
6	2017-18	2	600			600
Total			7200		2880	10080

And in return it can save the foreign exchange outgo worth $ 117 billion. Based on sound economic principle of rationality and long term vision, it is strongly recommended that the Government should earmark this amount for providing subsidy / support to compensate cultivators for opportunity cost of their land and one

[17]*Let set of 2 lakh hectare of area to be covered in first, second, third and fourth year be denoted by 'A', 'B', 'C' and 'D' respectively. During first year of gestation period, only area 'A' i.e. 2 lakh hectares need to be given support against opportunity cost of land. In second year, set of areas 'B' would join area 'A' and thus 4 lakh hectares to be supported. Likewise, in third year, set of areas 'C' would join 'A' and 'B' which would increase total additional area to 6 lakh hectares. In fourth year, set of areas 'D' would join but set of area 'A' would start fructification and that set of areas would be at its own and no support needs to be extended to them any more. Thus, in fourth year also, 6 lakh hectares would be supported. In fifth year, set of areas 'B' would not be supported and thus only 4 hectare area need to be supported. Finally, in the sixth year, only set of area 'D' i.e. only 2 hectares need to be supported.*

time irrigation investment so as to expand the oil palm programme in a big way. Out of this outlays, Rs.9480 crores would be required in the XII Five Year Plan and the remaining Rs. 600 crores would spill over to the first year of XIII Five year Plan. This public policy would not only serve as a strategy for import substitution in a cost effective manner but also augment farmers' incomes and thus would be in the best interest of the country's agriculture sector.

5.17 Looking at the global experience in oil palm, especially in Indonesia and Malaysia, where both the household farmer model as well as corporate model of oil palm farming are practised, it would be good for India too to experiment with both models. For the corporate sector to enter oil palm, we suggest that oil palm be declared as a plantation crop so that corporates can lease in land on longer term basis, and internalize costs of production and processing of FFBs. This would give them better cushion to weather external shocks of global prices. Given the financial and managerial strength of the corporate sector, and higher capacity to undertake risks, this model may take off even faster than the household model alone.

Annexure

अपर सचिव
भारत सरकार
कृषि मंत्रालय
(कृषि एवं सहकारिता विभाग)
कृषि भवन, नई दिल्ली–110114

G.C. Pati
Additional Secretary
Tel: 23383744
Fax: 23382977

सत्यमेव जयते

Additional Secretary
Government of India
Ministry of Agriculture
(Department of Agriculture & Cooperation)
Krishi Bhawan, New Delhi-110114

D.O.No. 12-22/22/2010/(TMOP) Dated : 22nd July, 2011

Dear,

As you are aware, expanding area under oilpalm cultivation in the potential States is a priority area for the Department of Agricultrue and Cooperation (DAC) to reduce the gap between demand and production of edible oils in the country. It is estimated that net area of about 1.73 lakhs hectares exists under oilpalm cultivation in the country. A Systematic programme of Oil Palm Development Programme (OPDP) was initiated in 1992 under the Technology on Oilseeds and Pulses (TMOP). Subsequently, it was undertaken under ISOPOM Scheme, which helped in bringing more than 1.24 lakh hectares area under oilpalm cultivation since 2004. A Special programme for bringing an additional area of 60,000 ha under Oil palm cultivation has been launched this year.

2. Oil palm starts bearing Fresh Fruit Bearing Fresh Fruit Bunches (FFBs) After 3-4 years of its plantation in the field. FFBs are required to be procured and processed immediately after harvesting. The prices of FFBs are influenced by the international and national prices of palm oil. There is demand for implementation of market intervention scheme (MIS) when prices of FFBs decline or crash due to international price fluctuations in palm oil. Presently, the States are deciding the prices of FFBs as per the recommendation of the price fixation committee under the Chairmanship of Secretary (Agriculture/Horticulture) of the concerned State Government.

3. In order to facilitate the State Governments, DAC constituted a committee in January, 2011 (copy enclosed) under the Chairmanship of the Director, Directorate of Oil palm Research, Pedavegi, Andhra Pradesh to review the existing FFBs pricing formula and suggest a formula acceptable both to farmers and processors. The report submitted by this committee is inconclusive since no agreement between farmers/growers and processors could be reached in the Committee on the pricing formula. A copy of the report is enclosed for your reference.

4. Apart from other suggestions relating to cost of production of FFBs and price stabilization fund which were not included in the ToR, the report also suggests constitution of a committee involving stakeholders for recommending a formula for fixing prices of FFBs.

D.O. No.12-22/2010/(TMOP) Dated: 22nd July, 2011

5. Taking into account the facts and suggestions of the report submitted by the Chairman of the Committee, it has been decided to request CACP to examine the issue and recommend suitable formula for pricing FFBs, which may be different for different oil palm producing States, after due consultation with the stakeholders.

6. I would be grateful if appropriate action in the matter is taken by the Commission.

Yours sincerely

Encl: As above

(G.C. Pati)

Dr. Ashok Gulati,
Chairman,
Commission for Agricultural Cost and Prices,
Krishi Bhawan
New Delhi

Annexure Table-I

Subsidy Extended by Ministry of Agriculture for Oil Palm Cultivation

S.N.	Components	Subsidy	Subsidy (Rs./Ha.)				
			I Year	II Year	III Year	IV Year	Net Present Value of Subsidy
1	Distribution of planting material	85% of the cost of planting material limited to Rs. 10000/-per ha for entire land holding of the farmer.	10000	0	0	0	10000
2	Assistance for cost of cultivation during gestation period.	50% of the cost of cultivation to the farmers@ 6000/ha for first year.	6000	3500	4500	6000	18008
3	Supply of drip irrigation systems	50% of the cost of drip irrigation system for spacing of oil palm plantation at 9X9M. The assistance will be provided as per the subsidy admissible under National Mission on Micro- Irrigation (NMMI) up to 5 ha per farmer.	10450	0	0	0	10450
4	Supply of Diesel/ Electric pump set for drip system	Pump set (diesel/electric) of capacity up to 10 HP @ 50% of the cost limited to Rs. 10000/pump set.	10000	0	0	0	10000
5	Inputs to inter-cropping in oil palm fields	50% of the cost limited to @ Rs.10000/ha for purchase of planting material of horticulture inter-crops/seed material of field crops (75% funds for procurement of planting material/seeds and 25% for production/protection inputs for inter-crop fields)	10000	0	0	0	10000
6	Assistance for INM, IPM, Fertigation, PP Chemicals & tree guards etc.	50% of the cost for INM, IPM, Fertigation, PP Chemicals & tree guards etc. limited to 5000/ha.	5000	0	0	0	5000
7	Construction of Vermi-compost units at Oil Palm fields	50% of the cost limited to @ Rs.15000/units of 15 Meter length,0.9 meter width and 0.24 meter depth.	15000	0	0	0	15000
8	Subsidy for bore wells at oil palm farm.	50% of the cost limited to @ Rs.50000/bore well or water harvesting structure.	50000	0	0	0	50000
	Sub-Total		116450	3500	4500	6000	128458

Source: Department of Agriculture & Cooperation, Ministry of Agriculture, New Delhi
Note: NPV has been worked out by authors by applying discount rate determined by table-3.1

Annexure Table-II

Annuity Value of Establishment Cost of Oil Palm

(Amount in Rs.)

Year	Amortised Value (of EC*)	Principal	Interest	Balance
4	10155	1485	8670	115992
5	10155	1595	8560	114397
6	10155	1712	8442	112685
7	10155	1839	8316	110846
8	10155	1974	8180	108872
9	10155	2120	8035	106751
10	10155	2277	7878	104475
11	10155	2445	7710	102030
12	10155	2625	7530	99405
13	10155	2819	7336	96587
14	10155	3027	7128	93560
15	10155	3250	6905	90310
16	10155	3490	6665	86820
17	10155	3748	6407	83072
18	10155	4024	6131	79048
19	10155	4321	5834	74727
20	10155	4640	5515	70087
21	10155	4982	5172	65105
22	10155	5350	4805	59755
23	10155	5745	4410	54010
24	10155	6169	3986	47841
25	10155	6624	3531	41217
26	10155	7113	3042	34104
27	10155	7638	2517	26466
28	10155	8202	1953	18264
29	10155	8807	1348	9457
30	10155	9457	698	0

* Annuity = $\{EC * (1+r)^n * r\}/\{(1+r)^n - 1\}$ = 10155

where EC = 117477

r = 0.0738

n = 27 (4th to 30th Year)

Annexure Table-III

International Prices of various Edible Oils and Crude Oil during 1990 to 2011

(Quarterly at Current Prices)

Period	US$/MT					US$/bbl
	Coconut	Groundnut	Palm Oil	Soyabean	Rapeseed	Crude Oil
Jan-Mar 90 Q1	399.3	935.7	278.7	429.0	425.3	19.4
Apr-Jun 90 Q2	337.7	929.3	273.3	441.3	434.7	16.1
Jul-Sep 90 Q3	291.7	959.7	284.7	452.7	426.6	25.4
Oct-Dec 90 Q4	317.3	1030.0	322.3	466.3	427.4	30.6
Jan-Mar 91 Q1	337.7	1020.7	345.0	451.0	402.8	19.6
Apr-Jun 91 Q2	342.3	947.3	316.0	448.0	420.5	18.4
Jul-Sep 91 Q3	459.7	901.0	334.0	452.0	421.9	19.5
Oct-Dec 91 Q4	592.3	710.3	361.0	464.3	421.1	20.0
Jan-Mar 92 Q1	694.7	606.3	387.0	425.7	392.6	17.5
Apr-Jun 92 Q2	624.7	644.0	398.7	440.0	422.3	19.7
Jul-Sep 92 Q3	507.7	602.0	385.0	419.7	425.6	20.0
Oct-Dec 92 Q4	483.3	587.3	403.3	430.3	379.8	19.0
Jan-Mar 93 Q1	436.7	611.3	414.3	438.3	427.0	18.0
Apr-Jun 93 Q2	418.7	673.3	373.0	452.3	444.3	18.0
Jul-Sep 93 Q3	446.3	825.3	356.7	492.3	462.3	16.2
Oct-Dec 93 Q4	499.3	846.3	367.0	538.7	509.9	15.2
Jan-Mar 94 Q1	569.0	1005.7	395.3	588.3	585.0	13.8
Apr-Jun 94 Q2	589.0	1021.3	476.7	583.0	598.8	16.2
Jul-Sep 94 Q3	599.0	1017.7	561.0	610.7	606.4	17.0
Oct-Dec 94 Q4	673.0	1046.3	680.7	680.3	694.8	16.5
Jan-Mar 95 Q1	630.0	1023.0	667.7	663.0	693.1	17.2
Apr-Jun 95 Q2	634.3	973.0	622.3	605.3	645.5	18.1
Jul-Sep 95 Q3	685.3	976.7	619.0	618.7	609.7	16.5
Oct-Dec 95 Q4	728.7	991.0	604.0	613.3	582.6	16.9
Jan-Mar 96 Q1	724.0	931.7	524.0	546.7	539.0	18.3
Apr-Jun 96 Q2	783.3	898.7	540.7	578.7	571.6	19.4
Jul-Sep 96 Q3	746.0	888.7	511.3	561.0	574.0	20.8
Oct-Dec 96 Q4	753.0	870.0	547.7	519.7	567.7	23.2
Jan-Mar 97 Q1	757.7	885.3	568.7	534.0	534.1	21.0
Apr-Jun 97 Q2	667.0	988.7	549.3	544.0	558.2	18.4
Jul-Sep 97 Q3	593.0	1090.7	509.0	544.7	524.3	18.6
Oct-Dec 97 Q4	609.7	1077.0	556.3	636.3	634.7	18.7
Jan-Mar 98 Q1	565.0	1011.0	650.3	637.0	641.1	14.1
Apr-Jun 98 Q2	664.3	906.3	675.3	654.0	659.0	13.3
Jul-Sep 98 Q3	662.0	862.7	679.3	606.3	602.3	13.0
Oct-Dec 98 Q4	740.3	857.7	679.3	606.3	619.4	11.9
Jan-Mar 99 Q1	736.0	808.0	563.3	492.3	500.7	11.8
Apr-Jun 99 Q2	832.3	755.7	458.7	426.7	432.4	16.1

Contd…

Annexure Table-III

International Prices of various Edible Oils and Crude Oil during 1990 to 2011

(Quarterly at Current Prices)

Period	US$/MT					US$/bbl
	Coconut	Groundnut	Palm Oil	Soyabean	Rapeseed	Crude Oil
Jul-Sep 99 Q3	681.3	781.7	353.7	406.3	404.7	20.7
Oct-Dec 99 Q4	698.7	805.3	368.3	384.0	377.0	23.7
Jan-Mar 00 Q1	599.0	773.0	343.0	363.3	356.8	26.7
Apr-Jun 00 Q2	489.3	728.7	337.0	345.3	362.9	26.8
Jul-Sep 00 Q3	367.7	668.0	302.0	327.0	340.8	29.8
Oct-Dec 00 Q4	345.3	685.0	259.0	316.7	324.5	29.6
Jan-Mar 01 Q1	297.7	690.3	249.3	312.3	341.9	26.1
Apr-Jun 01 Q2	301.7	697.7	246.7	310.3	364.5	26.7
Jul-Sep 01 Q3	347.7	665.7	334.0	404.3	417.3	25.3
Oct-Dec 01 Q4	325.3	667.3	312.7	389.0	443.8	19.3
Jan-Mar 02 Q1	368.0	667.0	335.3	366.7	429.2	20.9
Apr-Jun 02 Q2	425.7	648.0	377.0	401.7	419.9	25.2
Jul-Sep 02 Q3	432.7	655.3	410.3	489.0	497.0	26.9
Oct-Dec 02 Q4	457.7	778.0	438.3	559.7	570.7	26.7
Jan-Mar 03 Q1	470.7	1023.3	445.3	521.3	599.2	31.3
Apr-Jun 03 Q2	440.0	1307.7	419.7	534.3	611.7	26.5
Jul-Sep 03 Q3	430.3	1445.0	408.7	531.0	577.5	28.4
Oct-Dec 03 Q4	528.3	1196.7	499.3	629.0	625.8	29.4
Jan-Mar 04 Q1	637.0	1197.3	527.0	679.3	689.5	32.1
Apr-Jun 04 Q2	703.3	1198.7	497.0	628.0	718.0	35.6
Jul-Sep 04 Q3	651.0	1117.7	432.3	597.3	770.2	40.5
Oct-Dec 04 Q4	651.7	1130.3	429.0	559.3	675.1	42.7
Jan-Mar 05 Q1	667.3	1152.4	413.3	521.3	729.8	46.2
Apr-Jun 05 Q2	654.9	1101.3	421.7	548.0	691.5	50.8
Jul-Sep 05 Q3	571.7	1025.0	415.0	551.7	687.7	60.0
Oct-Dec 05 Q4	574.0	963.0	438.3	558.7	775.0	56.6
Jan-Mar 06 Q1	578.3	917.7	436.4	535.3	786.9	61.0
Apr-Jun 06 Q2	578.7	896.3	438.7	576.3	866.5	68.3
Jul-Sep 06 Q3	599.4	946.3	492.7	620.3	867.9	68.8
Oct-Dec 06 Q4	671.2	1120.7	545.7	662.2	884.0	59.0
Jan-Mar 07 Q1	754.3	1170.0	608.7	709.7	878.3	57.2
Apr-Jun 07 Q2	900.2	1190.0	762.3	793.9	866.1	66.1
Jul-Sep 07 Q3	923.0	1397.0	822.3	917.5	1008.3	73.5
Oct-Dec 07 Q4	1098.0	1651.3	927.7	1104.7	1294.7	87.6
Jan-Mar 08 Q1	1379.3	2007.3	1156.0	1384.0	1537.1	95.3
Apr-Jun 08 Q2	1498.7	2327.9	1198.2	1466.0	1594.7	121.0
Jul-Sep 08 Q3	1246.3	2416.5	928.0	1353.0	1519.0	115.7
Oct-Dec 08 Q4	771.7	1772.7	512.0	830.0	1044.0	56.0
Jan-Mar 09 Q1	677.3	1283.3	577.3	754.8	780.0	44.1

Contd…

Annexure Table-III

International Prices of various Edible Oils and Crude Oil during 1990 to 2011

(Quarterly at Current Prices)

Period	US$/MT					US$/bbl
	Coconut	Groundnut	PaClm Oil	Soyabean	Rapeseed	Crude Oil
Apr-Jun 09 Q2	778.8	1166.0	743.0	863.0	871.3	59.2
Jul-Sep 09 Q3	711.0	1133.3	678.7	856.0	863.3	68.2
Oct-Dec 09 Q4	734.3	1152.0	732.3	921.0	910.0	75.5
Jan-Mar 10 Q1	834.3	1358.7	807.7	917.3	908.8	77.1
Apr-Jun 10 Q2	955.0	1351.7	813.0	875.3	881.9	78.2
Jul-Sep 10 Q3	1158.7	1301.3	874.7	983.8	996.7	75.5
Oct-Dec10 Q4	1546.3	1603.8	1108.0	1242.0	1259.6	85.4
Jan-Mar 11 Q1	2073.0	1722.7	1251.0	1348.7	1423.4	99.8
Apr-Jun 11 Q2	1996.3	1830.0	1147.0	1311.0	1419.5	110.1
Jul-Sep 11 Q3	1475.7	2113.3	1079.7	1325.3	1353.8	103.1

Source: World Bank (Pink Sheets) and website www.indexmundi.com accessed on 31.10.2011

Annexure Table-IV

International Prices of various Edible Oils and Crude Oil during 1990 to 2011

(Quarterly at Constant Prices)

Period	US$/MT					US$/bbl
	Coconut	Groundnut	Palm Oil	Soyabean	Rapeseed	Crude Oil
Jan-Mar 90 Q1	407.7	955.2	284.5	438.0	434.2	19.8
Apr-Jun 90 Q2	344.7	948.8	279.1	450.6	443.8	16.5
Jul-Sep 90 Q3	297.8	979.8	290.6	462.1	435.5	26.0
Oct-Dec 90 Q4	324.0	1051.6	329.1	476.1	436.3	31.2
Jan-Mar 91 Q1	336.3	1016.6	343.6	449.2	401.2	19.5
Apr-Jun 91 Q2	341.0	943.6	314.7	446.2	418.8	18.3
Jul-Sep 91 Q3	457.8	897.4	332.7	450.2	420.2	19.4
Oct-Dec 91 Q4	590.0	707.5	359.6	462.5	419.4	19.9
Jan-Mar 92 Q1	679.2	592.8	378.4	416.2	383.9	17.1
Apr-Jun 92 Q2	610.7	629.6	389.8	430.2	412.9	19.2
Jul-Sep 92 Q3	496.3	588.6	376.4	410.3	416.2	19.5
Oct-Dec 92 Q4	472.6	574.2	394.3	420.7	371.4	18.5
Jan-Mar 93 Q1	428.9	600.5	407.0	430.5	419.4	17.6
Apr-Jun 93 Q2	411.2	661.4	366.4	444.3	436.4	17.7
Jul-Sep 93 Q3	438.4	810.7	350.3	483.6	454.1	15.9
Oct-Dec 93 Q4	490.5	831.3	360.5	529.1	500.9	14.9
Jan-Mar 94 Q1	540.6	955.5	375.6	559.0	555.9	13.2
Apr-Jun 94 Q2	559.6	970.4	452.9	553.9	568.9	15.4
Jul-Sep 94 Q3	569.1	966.9	533.0	580.2	576.2	16.2
Oct-Dec 94 Q4	639.4	994.1	646.7	646.4	660.2	15.7
Jan-Mar 95 Q1	560.4	910.0	593.9	589.8	616.5	15.3
Apr-Jun 95 Q2	564.3	865.5	553.6	538.5	337.9	16.1
Jul-Sep 95 Q3	609.6	868.8	550.6	550.3	542.3	14.6
Oct-Dec 95 Q4	648.2	881.5	537.3	545.6	518.2	15.0
Jan-Mar 96 Q1	681.7	877.3	493.4	514.8	507.5	17.2
Apr-Jun 96 Q2	737.6	846.2	509.1	544.9	538.2	18.3
Jul-Sep 96 Q3	702.4	836.8	481.5	528.2	540.5	19.5
Oct-Dec 96 Q4	709.0	819.2	515.7	489.3	534.5	21.9
Jan-Mar 97 Q1	768.2	897.6	576.6	541.4	541.6	21.3
Apr-Jun 97 Q2	676.3	1002.4	557.0	551.6	566.0	18.6
Jul-Sep 97 Q3	601.2	1105.8	516.1	552.2	531.6	18.8
Oct-Dec 97 Q4	618.1	1092.0	564.1	645.2	643.5	19.0
Jan-Mar 98 Q1	597.9	1070.0	688.3	674.1	678.5	14.9
Apr-Jun 98 Q2	703.1	959.2	714.7	692.1	697.4	14.1

Contd…

Annexure Table-IV

International Prices of various Edible Oils and Crude Oil during 1990 to 2011

(Quarterly at Constant Prices)

Period	US$/MT					US$/bbl
	Coconut	Groundnut	Palm Oil	Soyabean	Rapeseed	Crude Oil
Jul-Sep 98 Q3	700.6	913.0	718.9	641.7	637.4	13.8
Oct-Dec 98 Q4	783.5	907.7	718.9	641.7	655.6	12.5
Jan-Mar 99 Q1	784.6	861.3	600.5	524.8	533.8	12.6
Apr-Jun 99 Q2	887.3	805.5	488.9	454.8	460.9	17.2
Jul-Sep 99 Q3	726.3	833.2	377.0	433.1	431.4	22.0
Oct-Dec 99 Q4	744.8	858.5	392.6	409.3	401.8	25.3
Jan-Mar 00 Q1	653.6	843.5	374.3	396.5	389.3	29.1
Apr-Jun 00 Q2	534.0	795.1	367.7	376.8	396.0	29.2
Jul-Sep 00 Q3	401.2	728.9	329.6	356.8	371.9	32.6
Oct-Dec 00 Q4	376.8	747.5	282.6	345.6	354.1	32.3
Jan-Mar 01 Q1	340.5	789.8	285.2	357.3	391.1	29.8
Apr-Jun 01 Q2	345.1	798.2	282.2	355.0	417.0	30.6
Jul-Sep 01 Q3	397.7	761.5	382.1	462.6	477.4	28.9
Oct-Dec 01 Q4	372.2	763.5	357.7	445.0	507.7	22.1
Jan-Mar 02 Q1	424.0	768.5	386.4	422.5	494.5	24.1
Apr-Jun 02 Q2	490.5	746.6	434.4	462.8	483.8	29.0
Jul-Sep 02 Q3	498.5	755.1	472.8	563.4	572.6	31.0
Oct-Dec 02 Q4	527.3	896.4	505.1	644.9	657.5	30.7
Jan-Mar 03 Q1	508.1	1104.6	480.7	562.8	646.8	33.8
Apr-Jun 03 Q2	475.0	1411.6	453.0	576.8	660.3	28.6
Jul-Sep 03 Q3	464.5	1559.8	441.1	573.2	623.4	30.6
Oct-Dec 03 Q4	570.3	1291.7	539.0	679.0	675.6	31.7
Jan-Mar 04 Q1	645.6	1213.5	534.1	688.5	698.8	32.6
Apr-Jun 04 Q2	712.8	1214.8	503.7	636.5	727.7	36.1
Jul-Sep 04 Q3	659.8	1132.7	438.2	605.4	780.6	41.1
Oct-Dec 04 Q4	660.5	1145.6	434.8	566.9	684.2	43.3
Jan-Mar 05 Q1	667.3	1152.4	413.3	521.3	729.8	46.2
Apr-Jun 05 Q2	654.9	1101.3	421.7	548.0	691.5	50.8
Jul-Sep 05 Q3	571.7	1025.0	415.0	551.7	687.7	60.0
Oct-Dec 05 Q4	574.0	963.0	438.3	558.7	775.0	56.6
Jan-Mar 06 Q1	571.4	906.6	431.2	528.9	777.4	60.3
Apr-Jun 06 Q2	571.7	885.4	433.4	569.4	856.0	67.5
Jul-Sep 06 Q3	592.2	934.9	486.7	612.9	857.5	68.0

Contd…

Annexure Table-IV

International Prices of various Edible Oils and Crude Oil during 1990 to 2011

(Quarterly at Constant Prices)

Period	US$/MT					US$/bbl
	Coconut	Groundnut	Palm Oil	Soyabean	Rapeseed	Crude Oil
Oct-Dec 06 Q4	663.1	1107.2	539.1	654.2	873.3	58.3
Jan-Mar 07 Q1	711.6	1103.8	574.2	669.5	828.6	54.0
Apr-Jun 07 Q2	849.2	1122.6	719.2	749.0	817.0	62.4
Jul-Sep 07 Q3	870.8	1317.9	775.8	865.5	951.3	69.3
Oct-Dec 07 Q4	1035.8	1557.9	875.2	1042.1	1221.5	82.6
Jan-Mar 08 Q1	1222.9	1779.7	1024.9	1227.1	1362.8	84.5
Apr-Jun 08 Q2	1328.7	2064.0	1062.3	1299.8	1413.9	107.3
Jul-Sep 08 Q3	1105.0	2142.5	822.8	1199.6	1346.8	102.6
Oct-Dec 08 Q4	684.2	1571.7	453.9	735.9	925.6	49.7
Jan-Mar 09 Q1	636.4	1205.8	542.5	709.2	732.9	41.4
Apr-Jun 09 Q2	731.8	1095.6	698.1	810.9	818.7	55.6
Jul-Sep 09 Q3	668.0	1064.9	637.7	804.3	811.2	64.1
Oct-Dec 09 Q4	690.0	1082.4	688.1	865.4	855.0	70.9
Jan-Mar 10 Q1	764.7	1245.2	740.2	840.7	832.9	70.6
Apr-Jun 10 Q2	875.3	1238.8	745.1	802.2	808.3	71.6
Jul-Sep 10 Q3	1061.9	1192.7	801.6	901.6	913.5	69.2
Oct-Dec10 Q4	1417.2	1469.9	1015.5	1138.3	1154.4	78.3
Jan-Mar 11 Q1	1811.1	1505.0	1093.0	1178.3	1243.6	87.1
Apr-Jun 11 Q2	1744.1	1598.8	1002.1	1145.4	1240.2	96.1
Jul-Sep 11 Q3	1289.2	1846.4	943.3	1157.9	1182.8	90.1

Note: Constant Prices have been worked out by applying MUV (Manufacturers Unit Value) Index on Current Prices.

Source: For Current Prices-World Bank (Pink Sheets) and website www.indexmundi.com accessed on 31.10.2011.

Annexure Table-V

Future Price Forecast of Coconut Oil, Groundnut Oil, Palm Oil, Crude Oil and Soyabean meal

(US$/MT, US$/bbl)

S.No.	Commodity	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	Coconut Oil	1800	1300	950	900	850	836	821	807	794	780
2	Groundnut Oil	1600	1400	1380	1350	1325	1299	1274	1249	1224	1200
3	Palm Oil	1100	900	850	810	800	782	765	748	731	715
4	Crude Oil	107.2	102.1	98.7	95.6	92.6	89.6	86.8	84.1	81.4	80.4
5	Soybean meal	420	350	330	310	308	307	307	306	305	304

Source : http://econ.worldbank.org (accessed on 09.11.2011 & 15.11.2011)

Annexure Table-VI

International Prices of Soybean Meal during 2001-2011

(US$/MT)

Year	Quarterly Averages			
	Jan-March	April-June	July-Sept.	Oct.-Dec.
2001	189	172	184	179
2002	189	172	178	182
2003	189	196	197	262
2004	288	277	204	196
2005	214	221	219	204
2006	201	197	208	230
2007	256	260	309	408
2008	443	484	450	320
2009	365	424	431	412
2010	369	342	378	424
2011	437	400	399	374

Source : http://econ.worldbank.org (accessed on 09.11.2011)

Annexure Table-VII

Country-wise Production of Palm Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production (%)
1	Indonesia	16760.00	18910.00	20550.00	45.58
2	Malaysia	15823.70	17734.40	17564.90	38.96
3	Nigeria	1309.00	1330.00	1380.00	3.06
4	Thailand	1050.00	1300.00	1310.00	2.91
5	Colombia	780.00	777.80	802.40	1.78
6	Papua New Guinea	382.00	465.00	470.00	1.04
7	Côte d'Ivoire	288.82	290.00	325.00	0.72
8	Ecuador	295.00	309.00	321.00	0.71
9	Honduras	265.80	273.40	290.00	0.64
10	Brazil	190.00	220.00	265.00	0.59
11	China	221.00	225.00	230.00	0.51
12	Costa Rica	185.60	194.22	190.76	0.42
13	Democratic Republic of the Congo	180.00	182.00	185.00	0.41
14	Cameroon	215.46	225.61	182.00	0.40
15	Guatemala	130.00	185.00	180.00	0.40
16	Ghana	122.00	128.00	130.00	0.29
17	Philippines	75.00	82.00	90.00	0.20
18	Venezuela (Bolivarian Republic of)	70.40	89.40	82.20	0.18
19	Mexico	57.00	62.00	65.00	0.14
20	Angola	55.00	46.00	55.00	0.12
21	Guinea	50.00	50.00	50.00	0.11
22	Sierra Leone	46.20	48.00	50.00	0.11
23	Liberia	44.00	44.88	48.18	0.11
24	Benin	40.00	42.00	44.00	0.10
25	Solomon Islands	37.40	39.00	40.00	0.09
26	Dominican Republic	32.00	35.00	38.00	0.08
27	Peru	34.00	35.00	37.00	0.08

Contd…

Annexure Table-VII

Country-wise Production of Palm Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production (%)
28	Congo	25.00	25.11	26.00	0.06
29	Panama	17.71	15.00	16.50	0.04
30	Nicaragua	9.00	9.50	11.00	0.02
31	Togo	7.00	7.50	7.80	0.02
32	Senegal	6.10	6.22	6.68	0.01
33	Guinea-Bissau	6.15	6.35	6.40	0.01
34	United Republic of Tanzania	6.20	5.97	6.40	0.01
35	Gabon	6.70	6.73	5.87	0.01
36	Equatorial Guinea	5.99	6.02	5.25	0.01
37	Madagascar	3.84	4.13	4.02	0.01
38	Paraguay	3.14	3.13	3.34	0.01
39	Sao Tome and Principe	3.28	3.30	2.88	0.01
40	Gambia	2.55	2.50	2.13	0.00
41	Burundi	1.90	2.15	2.00	0.00
42	Central African Republic	2.50	1.90	2.00	0.00
43	Suriname	0.24	0.22	0.23	0.00
	World's Total Production	38846.68	43428.43	45083.93	100.00

Source: http://faostat.fao.org accessed on 11.11.2011

Note: Countries have been arranged in descending order of their respective shares of production in 2009 in total world production.

Annexure Table-VIII

Country-wise Production of Palm Kernel Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production (%)
1	Indonesia	1820.10	2062.60	2282.90	39.81
2	Malaysia	1907.71	2131.00	2097.10	36.57
3	Nigeria	586.29	606.33	616.71	10.76
4	Thailand	99.90	121.10	124.50	2.17
5	Brazil	77.00	88.00	101.00	1.76
6	Colombia	81.00	60.93	60.37	1.05
7	Guatemala	39.00	55.50	55.50	0.97
8	Papua New Guinea	37.20	42.10	43.00	0.75
9	Ecuador	35.30	36.40	37.80	0.66
10	Honduras	32.00	32.80	34.90	0.61
11	Cameroon	31.50	31.50	34.20	0.60
12	Côte d'Ivoire	29.90	28.50	30.80	0.54
13	China	26.40	27.84	26.56	0.46
14	Democratic Republic of the Congo	21.20	21.80	23.00	0.40
15	Germany	16.87	17.48	18.50	0.32
16	Costa Rica	13.20	13.81	18.10	0.32
17	Ghana	16.00	16.00	16.00	0.28
18	Togo	15.48	15.75	15.75	0.27
19	Benin	11.70	12.40	13.20	0.23
20	Philippines	8.67	9.57	10.47	0.18
21	Sierra Leone	10.13	10.13	10.13	0.18
22	Angola	9.60	8.00	9.70	0.17
23	Mexico	6.00	6.60	7.10	0.12
24	Paraguay	6.45	6.44	6.88	0.12
25	Venezuela (Bolivarian Republic of)	5.86	5.85	5.85	0.10
26	Liberia	5.76	5.43	5.14	0.09
27	Guinea	4.88	4.88	4.88	0.09
28	Dominican Republic	3.50	4.00	4.50	0.08
29	United Republic of Tanzania	3.94	4.43	4.50	0.08
30	Peru	3.90	4.00	4.10	0.07
31	Guinea-Bissau	3.84	3.84	3.90	0.07
32	Senegal	2.72	2.87	2.91	0.05
33	Equatorial Guinea	1.20	1.21	1.12	0.02
34	Nicaragua	0.90	0.90	1.08	0.02
35	Madagascar	0.70	0.75	0.73	0.01
36	Burundi	0.64	0.73	0.69	0.01
37	Sao Tome and Principe	0.30	0.36	0.33	0.01
38	Suriname	0.01	0.01	0.01	0.00
	World's Total Production	**4976.742**	**5501.827**	**5733.901**	**100.00**

Source: http://faostat.fao.org accessed on 11.11.2011

Note: Countries have been arranged in descending order of their respective shares of production in 2009 in total world production.

Annexure Table-IX

Country-wise Production of Soyabean Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production (%)
1	Albania	9397.00	9049.80	8795.70	24.52
2	Argentina	6623.90	7087.70	7828.60	21.82
3	Australia	6046.00	6266.00	5896.00	16.44
4	Austria	6962.20	6024.10	5771.80	16.09
5	Barbados	1399.00	1571.00	1179.30	3.29
6	Belgium	667.27	643.30	574.90	1.60
7	Benin	444.30	549.50	509.70	1.42
8	Bolivia (Plurinational State of)	576.34	542.34	476.94	1.33
9	Bosnia and Herzegovina	562.50	571.70	469.80	1.31
10	Brazil	427.18	320.33	355.44	0.99
11	Bulgaria	349.00	342.00	320.00	0.89
12	Cambodia	323.20	323.90	289.90	0.81
13	Canada	260.00	264.80	264.90	0.74
14	Chile	266.90	235.50	231.70	0.65
15	China	62.95	154.58	231.60	0.65
16	Colombia	206.00	218.90	225.30	0.63
17	Costa Rica	223.50	225.30	217.90	0.61
18	Croatia	213.47	215.45	216.13	0.60
19	Cuba	151.36	167.10	175.64	0.49
20	Czech Republic	185.30	209.50	175.60	0.49
21	Democratic People's Republic of Korea	173.90	170.40	165.10	0.46
22	Denmark	192.40	198.90	142.80	0.40
23	Dominican Republic	120.20	101.80	124.80	0.35
24	Ecuador	61.20	53.50	102.00	0.28
25	Egypt	61.90	64.50	93.60	0.26
26	Finland	95.66	86.26	86.26	0.24
27	France	30.10	39.39	82.27	0.23
28	Gabon	68.80	74.00	70.50	0.20
29	Germany	52.40	69.70	66.50	0.19
30	Greece	65.70	62.85	62.17	0.17
31	Guatemala	55.30	52.80	57.50	0.16
32	Honduras	77.20	55.90	54.00	0.15
33	Hungary	77.50	89.60	49.60	0.14
34	India	45.10	46.80	48.30	0.13
35	Indonesia	179.10	21.60	41.80	0.12
36	Iran (Islamic Republic of)	45.40	34.70	36.20	0.10
37	Iraq	29.19	31.81	35.93	0.10

Contd…

Annexure Table-IX

Country-wise Production of Soyabean Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production (%)
38	Ireland	33.80	27.40	32.90	0.09
39	Israel	21.30	23.60	25.40	0.07
40	Italy	32.00	24.30	24.60	0.07
41	Jamaica	95.40	37.80	24.00	0.07
42	Japan	22.20	20.80	22.20	0.06
43	Kazakhstan	15.50	16.70	19.10	0.05
44	Kuwait	9.61	11.16	19.01	0.05
45	Lao People's Democratic Republic	16.00	16.90	16.90	0.05
46	Latvia	25.70	20.82	15.70	0.04
47	Lebanon	15.40	8.80	12.40	0.03
48	Libya	11.10	14.30	12.20	0.03
49	Luxembourg	6.52	5.46	12.10	0.03
50	Malaysia	1.42	6.16	10.88	0.03
51	Mexico	12.10	9.70	10.70	0.03
52	Morocco	20.19	9.26	9.23	0.03
53	Myanmar	9.20	9.50	8.40	0.02
54	Nepal	7.56	7.56	7.56	0.02
55	Netherlands	7.70	8.00	7.30	0.02
56	Nicaragua	48.14	29.70	6.38	0.02
57	Nigeria	7.80	7.30	5.80	0.02
58	Norway	6.80	5.70	4.90	0.01
59	Paraguay	2.80	5.50	4.30	0.01
60	Peru	6.67	7.58	4.06	0.01
61	Philippines	4.07	4.79	3.79	0.01
62	Poland	3.23	3.29	3.35	0.01
63	Portugal	3.09	3.21	3.21	0.01
64	Republic of Korea	2.40	4.40	2.80	0.01
65	Republic of Moldova	2.75	4.79	2.69	0.01
66	Romania	0.33	3.44	2.38	0.01
67	Russian Federation	4.73	1.85	1.85	0.01
68	Serbia	2.52	1.80	1.80	0.01
69	Singapore	0.79	0.79	1.54	0.00
70	Slovakia	1.08	1.44	1.44	0.00
71	South Africa	0.83	0.85	0.97	0.00
72	Spain	0.93	2.20	0.95	0.00
73	Sri Lanka	1.30	1.10	0.80	0.00
74	Sweden	2.40	0.90	0.80	0.00

Contd…

Annexure Table-IX

Country-wise Production of Soyabean Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production (%)
75	Switzerland	0.79	0.79	0.79	0.00
76	Syrian Arab Republic	0.54	0.54	0.54	0.00
77	Thailand	0.55	0.50	0.50	0.00
78	Trinidad and Tobago	0.38	0.54	0.38	0.00
79	Turkey	0.27	0.27	0.32	0.00
80	Uganda	0.05	0.20	0.24	0.00
81	Ukraine	0.06	0.09	0.07	0.00
82	United Arab Emirates	0.05	0.05	0.03	0.00
83	United Kingdom	0.01	0.02	0.02	0.00
84	United States of America	0.01	0.01	0.01	0.00
85	Uruguay	0.01	0.01	0.01	0.00
86	Uzbekistan	0.07	0.00	0.00	0.00
87	Venezuela (Bolivarian Republic of)	0.01	0.00	0.00	0.00
88	Viet Nam	0.00	0.00	0.00	0.00
89	Zambia	32.01	21.37	0.00	0.00
90	Zimbabwe	0.30	2.41	0.00	0
	World's Total Production	**37278.88**	**36632.95**	**35873.46**	**100.00**

Source: http://faostat.fao.org accessed on 11.11.2011
Note: Countries have been arranged in descending order of their respective shares of production in 2009 in total world production.

Annexure Table-X

Country-wise Production of Rapeseed Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production (%)
1	China	4359.40	4527.00	5211.40	24.61
2	Germany	2582.13	2765.93	2936.47	13.87
3	India	2305.00	1808.00	2284.00	10.79
4	Canada	1610.57	1782.28	1810.80	8.55
5	France	1047.50	1494.30	1742.60	8.23
6	Japan	942.47	950.53	928.98	4.39
7	Poland	664.40	733.20	870.80	4.11
8	United Kingdom	717.00	747.50	779.00	3.68
9	Mexico	500.20	539.50	514.90	2.43
10	United States of America	393.70	420.30	481.20	2.27
11	Belgium	238.10	336.30	440.70	2.08
12	Netherlands	227.40	336.00	419.20	1.98
13	Pakistan	350.00	350.00	350.00	1.65
14	Czech Republic	303.60	277.50	278.00	1.31
15	Australia	171.60	235.60	260.00	1.23
16	Denmark	175.10	181.20	178.10	0.84
17	Iran (Islamic Republic of)	137.20	149.40	148.40	0.70
18	Russian Federation	101.76	147.94	144.55	0.68
19	Belarus	48.29	81.53	138.42	0.65
20	Austria	107.16	136.70	132.20	0.62
21	Sweden	110.80	99.60	114.80	0.54
22	Finland	97.88	112.79	112.59	0.53
23	Turkey	92.93	101.91	112.07	0.53
24	Slovakia	66.10	77.40	105.50	0.50
25	Bangladesh	94.39	100.43	102.13	0.48
26	Portugal	35.96	33.07	59.14	0.28
27	Hungary	15.70	44.40	54.80	0.26
28	Romania	16.26	88.56	51.90	0.25
29	Italy	17.20	29.50	41.90	0.20
30	Spain	28.70	37.30	41.90	0.20
31	Ukraine	46.90	83.50	41.40	0.20
32	Switzerland	28.60	27.20	29.70	0.14
33	Kazakhstan	22.92	20.67	23.20	0.11
34	Estonia	25.28	30.43	23.14	0.11
35	Chile	24.00	21.70	19.80	0.09
36	Greece	4.20	22.50	19.80	0.09
37	Serbia	12.03	20.49	17.65	0.08
38	Israel	16.90	9.80	15.20	0.07
39	Paraguay	18.60	13.70	14.80	0.07
40	South Africa	14.60	13.80	13.50	0.06
41	Latvia	17.10	29.15	13.50	0.06
42	Ethiopia	10.30	13.80	11.70	0.06

Contd…

Annexure Table-X

Country-wise Production of Rapeseed Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production (%)
43	Brazil	28.50	22.50	11.60	0.05
44	Algeria	9.15	11.08	11.45	0.05
45	Croatia	8.60	6.90	11.20	0.05
46	Nepal	10.23	11.07	11.07	0.05
47	Lithuania	7.60	7.60	7.60	0.04
48	Norway	7.90	9.40	7.40	0.03
49	Argentina	3.00	6.00	7.30	0.03
50	Ireland	14.62	7.47	7.05	0.03
51	Bosnia and Herzegovina	7.12	10.66	4.27	0.02
52	Morocco	0.38	2.85	2.42	0.01
53	Slovenia	4.21	3.65	1.65	0.01
54	Republic of Moldova	0.86	7.74	0.86	0.00
55	Uzbekistan	0.64	0.66	0.56	0.00
56	Republic of Korea	0.25	0.42	0.34	0.00
57	Yugoslav Republic of Macedonia	0.00	0.00	0.32	0.00
58	Kyrgyzstan	0.05	0.10	0.15	0.00
59	Colombia	0.36	0.25	0.09	0.00
60	Malaysia	0.00	0.01	0.01	0.00
61	Bulgaria	8.51	20.46	0.00	0.00
62	Luxembourg	2.03	3.07	0.00	0.00
	World's Total Production	**17913.93**	**19164.28**	**21175.17**	**100.00**

Source: http://faostat.fao.org accessed on 11.11.2011

Note: Countries have been arranged in descending order of their respective shares of production in 2009 in total world production.

Annexure Table-XI

Country-wise Production of Groundnut Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
1	China	1871.20	1803.90	1910.40	34.35
2	India	2112.00	1688.00	1433.00	25.77
3	Nigeria	623.00	765.00	785.00	14.12
4	Myanmar	179.35	198.94	211.94	3.81
5	Sudan	33.77	80.75	151.94	2.73
6	Senegal	94.10	53.80	125.40	2.25
7	Argentina	47.40	61.90	80.60	1.45
8	Guinea	70.40	73.04	78.49	1.41
9	Netherlands	30.24	88.18	72.57	1.30
10	Ghana	32.41	63.44	65.66	1.18
11	United States of America	79.50	72.20	65.20	1.17
12	Brazil	25.20	37.00	39.10	0.70
13	Central African Republic	36.73	37.50	38.31	0.69
14	Viet Nam	31.03	32.83	32.70	0.59
15	Indonesia	31.33	31.94	32.11	0.58
16	Chad	29.00	32.00	32.00	0.58
17	Niger	22.30	22.00	22.90	0.41
18	Algeria	14.78	9.56	22.33	0.40
19	Egypt	20.00	21.00	22.00	0.40
20	Malawi	21.60	21.60	21.60	0.39
21	Mali	28.65	30.50	21.20	0.38
22	Thailand	11.41	16.30	21.09	0.38
23	Democratic Republic of the Congo	17.72	17.78	17.62	0.32
24	Cameroon	17.40	17.50	17.30	0.31
25	Nicaragua	13.10	14.00	15.00	0.27
26	Gambia	13.50	16.00	13.60	0.24
27	Madagascar	13.03	13.00	13.00	0.23
28	Angola	7.23	10.06	12.32	0.22
29	South Africa	8.78	7.95	11.48	0.21
30	Bangladesh	11.21	10.72	11.46	0.21
31	Morocco	14.88	13.23	11.45	0.21
32	Pakistan	18.88	19.61	11.35	0.20
33	United Republic of Tanzania	4.24	5.65	10.04	0.18
34	Burkina Faso	7.24	10.24	9.78	0.18

Contd…

Annexure Table-XI

Country-wise Production of Groundnut Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
35	Sierra Leone	8.82	9.16	9.55	0.17
36	Benin	10.12	9.20	9.20	0.17
37	Zimbabwe	7.50	10.50	8.50	0.15
38	Uganda	3.90	5.90	7.50	0.13
39	Guinea-Bissau	5.38	6.62	7.19	0.13
40	Mozambique	10.11	12.06	7.03	0.13
41	Lebanon	5.23	4.44	4.92	0.09
42	Poland	4.64	4.64	4.64	0.08
43	Rwanda	1.89	4.23	4.23	0.08
44	Lao People's Democratic Republic	5.27	4.58	4.03	0.07
45	Italy	4.00	4.00	4.00	0.07
46	Greece	3.07	3.60	3.56	0.06
47	Norway	2.74	3.55	3.55	0.06
48	Bulgaria	4.65	5.15	3.50	0.06
49	Congo	3.19	3.40	3.39	0.06
50	Belgium	3.15	2.70	2.70	0.05
51	Mexico	2.70	2.90	2.50	0.04
52	Ethiopia	2.25	2.25	2.25	0.04
53	Venezuela (Bolivarian Republic of)	2.25	2.25	2.25	0.04
54	Paraguay	1.44	1.07	2.08	0.04
55	Iraq	1.16	2.04	2.05	0.04
56	Zambia	2.00	2.00	2.00	0.04
57	Denmark	1.69	1.82	1.85	0.03
58	Singapore	1.82	1.68	1.68	0.03
59	Togo	1.35	1.35	1.35	0.02
60	Czech Republic	1.30	1.30	1.30	0.02
61	Portugal	1.62	0.75	1.28	0.02
62	Switzerland	1.05	0.99	1.10	0.02
63	Dominican Republic	0.91	0.68	1.08	0.02
64	Côte d'Ivoire	1.76	1.21	1.06	0.02
65	Republic of Korea	1.04	0.95	0.95	0.02
66	Uzbekistan	0.00	0.37	0.85	0.02
67	Australia	1.45	1.05	0.85	0.02
68	Burundi	1.31	1.04	0.81	0.01
69	Cambodia	0.78	0.65	0.78	0.01

Contd…

Annexure Table-XI

Country-wise Production of Groundnut Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
70	Sri Lanka	0.50	0.65	0.77	0.01
71	Cuba	1.18	1.01	0.73	0.01
72	Bolivia (Plurinational State of)	0.28	0.39	0.65	0.01
73	Nepal	0.42	0.65	0.65	0.01
74	Uruguay	0.52	0.42	0.52	0.01
75	Ukraine	0.46	0.46	0.46	0.01
76	Trinidad and Tobago	0.40	0.37	0.39	0.01
77	Kuwait	0.25	0.36	0.36	0.01
78	Japan	0.56	0.33	0.33	0.01
79	Tonga	0.25	0.24	0.24	0.00
80	Mauritania	0.23	0.20	0.22	0.00
81	Slovakia	0.20	0.20	0.20	0.00
82	Réunion	0.19	0.18	0.19	0.00
83	Botswana	0.14	0.14	0.15	0.00
84	Saint Vincent and the Grenadines	0.09	0.08	0.09	0.00
85	Turkey	0.01	0.01	0.01	0.00
86	Saint Kitts and Nevis	0.01	0.01	0.01	0.00
	World's Total Production	**5709.79**	**5522.88**	**5561.43**	**100.00**

Source: http://faostat.fao.org accessed on 11.11.2011
Note: Countries have been arranged in descending order of their respective shares of production in 2009 in total world production.

Annexure Table-XII

Country-wise Production of Coconut (copra) Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
1	Philippines	1539.71	1278.14	1322.94	37.78
2	Indonesia	958.40	861.80	908.40	25.94
3	India	440.00	463.00	447.00	12.77
4	Vietnam	157.43	157.38	157.38	4.49
5	Mexico	135.50	140.80	142.40	4.07
6	Germany	51.24	42.62	65.71	1.88
7	Papua New Guinea	53.40	57.20	53.40	1.52
8	Malaysia	47.30	43.00	43.80	1.25
9	Thailand	41.40	41.50	42.00	1.20
10	Sri Lanka	32.20	36.30	40.30	1.15
11	Côte d'Ivoire	11.86	29.26	29.26	0.84
12	Mozambique	30.55	30.55	28.16	0.80
13	Bangladesh	15.93	20.29	19.26	0.55
14	Nigeria	9.00	11.00	17.50	0.50
15	United Republic of Tanzania	18.04	18.30	17.30	0.49
16	Fiji	9.66	9.07	13.00	0.37
17	Vanuatu	6.12	22.66	12.83	0.37
18	Venezuela (Bolivarian Republic of)	11.19	11.28	11.88	0.34
19	Jamaica	10.56	10.56	10.56	0.30
20	Pakistan	10.75	9.71	9.70	0.28
21	Cambodia	7.16	7.16	7.16	0.20
22	Belgium	2.15	0.00	7.08	0.20
23	Ghana	7.00	7.00	7.00	0.20
24	Kiribati	4.10	5.94	6.83	0.19
25	Dominican Republic	6.90	6.60	6.60	0.19
26	French Polynesia	5.29	6.00	6.08	0.17
27	Kenya	6.84	6.40	6.05	0.17
28	Guinea-Bissau	5.89	5.89	5.92	0.17
29	Madagascar	6.10	6.10	5.66	0.16
30	Australia	5.47	5.43	5.57	0.16
31	Comoros	5.16	5.16	5.16	0.15
32	Samoa	4.50	4.80	5.10	0.15
33	Solomon Islands	5.10	4.50	5.10	0.15
34	Guyana	2.97	3.00	3.20	0.09
35	Micronesia (Federated States of)	2.95	2.60	2.65	0.08
36	El Salvador	2.30	2.30	2.30	0.07
37	Ecuador	1.82	1.85	1.88	0.05
38	New Zealand	0.00	1.83	1.83	0.05
39	Honduras	1.68	1.68	1.68	0.05
40	Benin	1.60	1.59	1.55	0.04

Contd…

Annexure Table-XII

Country-wise Production of Coconut (copra) Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
41	Trinidad and Tobago	1.45	1.39	1.46	0.04
42	Togo	1.42	1.42	1.44	0.04
43	Guinea	1.34	1.34	1.34	0.04
44	Guam	1.21	1.21	1.21	0.03
45	Brazil	1.90	1.50	1.20	0.03
46	Tonga	1.10	1.14	1.20	0.03
47	Nepal	0.84	0.89	0.87	0.02
48	Suriname	0.73	0.87	0.63	0.02
49	Cameroon	0.69	0.60	0.60	0.02
50	Saint Lucia	0.70	0.54	0.56	0.02
51	Dominica	0.50	0.48	0.51	0.01
52	Saint Vincent and the Grenadines	0.46	0.47	0.47	0.01
53	Puerto Rico	0.53	0.48	0.39	0.01
54	Grenada	0.35	0.35	0.35	0.01
55	China	0.36	0.37	0.34	0.01
56	Sao Tome and Principe	0.35	0.28	0.28	0.01
57	Costa Rica	0.25	0.25	0.25	0.01
58	Myanmar	0.02	0.24	0.24	0.01
59	Saint Kitts and Nevis	0.18	0.18	0.18	0.01
60	Wallis and Futuna Islands	0.17	0.16	0.16	0.00
61	Republic of Korea	0.02	0.15	0.15	0.00
62	Timor-Leste	0.13	0.13	0.13	0.00
63	Mauritius	0.18	0.12	0.12	0.00
64	American Samoa	0.06	0.07	0.07	0.00
65	New Caledonia	0.06	0.06	0.06	0.00
66	Nicaragua	0.04	0.06	0.06	0.00
67	South Africa	0.82	0.03	0.06	0.00
68	Denmark	0.05	0.12	0.05	0.00
69	Tokelau	0.03	0.03	0.03	0.00
70	Italy	0.04	0.02	0.02	0.00
71	Seychelles	0.02	0.02	0.02	0.00
72	Tuvalu	0.02	0.02	0.02	0.00
73	Panama	0.02	0.02	0.02	0.00
74	Ireland	0.04	0.00	0.00	0.00
75	Maldives	0.12	0.00	0.00	0.00
76	Netherlands	0.02	0.00	0.00	0.00
	World's Total Production	**3691.40**	**3395.26**	**3501.66**	**100.00**

Source: http://faostat.fao.org accessed on 11.11.2011
Note: Countries have been arranged in descending order of their respective shares of production in 2009 in total world production.

Annexure Table-XIII

Country-wise Production of Olive Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
1	Spain	1185.92	1044.69	1199.20	41.19
2	Italy	574.26	563.90	587.70	20.19
3	Greece	318.20	328.27	332.60	11.43
4	Syrian Arab Republic	98.29	156.34	168.16	5.78
5	Tunisia	200.00	160.00	150.00	5.15
6	Turkey	142.70	99.50	143.60	4.93
7	Morocco	75.00	75.00	95.30	3.27
8	Algeria	21.80	35.60	56.00	1.92
9	Portugal	35.26	43.80	53.30	1.83
10	Argentina	20.00	25.70	22.70	0.78
11	Lebanon	7.50	15.10	19.70	0.68
12	Jordan	18.36	11.29	16.76	0.58
13	Libya	11.70	13.70	15.00	0.52
14	Egypt	6.80	8.00	7.30	0.25
15	France	3.70	5.50	6.30	0.22
16	Israel	7.00	5.00	6.00	0.21
17	Croatia	4.50	5.00	5.80	0.20
18	Australia	2.57	5.30	5.64	0.19
19	Occupied Palestinian Territory	17.50	5.00	5.00	0.17
20	Chile	2.70	2.90	4.05	0.14
21	United States of America	1.00	2.50	2.70	0.09
22	Cyprus	1.96	1.81	2.01	0.07
23	The former Yugoslav Republic of Macedonia	1.70	1.70	1.70	0.06
24	Albania	0.80	1.20	1.20	0.04
25	El Salvador	0.54	1.45	1.18	0.04
26	Iran (Islamic Republic of)	0.86	0.80	0.85	0.03
27	Peru	0.40	0.41	0.41	0.01
28	Slovenia	0.30	0.30	0.30	0.01
29	Mexico	0.24	0.25	0.24	0.01
30	Montenegro	0.19	0.19	0.19	0.01
31	Afghanistan	0.13	0.13	0.12	0.00
32	Azerbaijan	0.11	0.01	0.11	0.00
33	Malta	0.00	0.00	0.00	0.00
	World's Total Production	**2762.00**	**2620.34**	**2911.12**	**100.00**

Source: http://faostat.fao.org accessed on 11.11.2011

Note: Countries have been arranged in descending order of their respective shares of production in 2009 in total world production.

Annexure Table-XIV

Country-wise Production of Cottonseed Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
1	China	1775.60	1835.90	1746.40	37.48
2	India	800.00	780.00	820.00	17.60
3	Pakistan	453.20	403.00	424.30	9.11
4	Uzbekistan	308.30	325.50	295.70	6.35
5	United States of America	387.40	368.90	285.70	6.13
6	Brazil	259.90	272.80	229.50	4.93
7	Turkey	225.80	186.57	176.75	3.79
8	Turkmenistan	61.00	63.30	69.50	1.49
9	Australia	58.89	28.00	61.69	1.32
10	Burkina Faso	48.95	54.16	46.54	1.00
11	Kazakhstan	27.91	27.34	34.22	0.73
12	Syrian Arab Republic	30.44	31.58	33.44	0.72
13	Mexico	51.30	40.60	23.60	0.51
14	United Republic of Tanzania	7.38	24.00	22.70	0.49
15	Egypt	47.50	36.90	22.50	0.48
16	Italy	21.20	19.30	22.30	0.48
17	Iran (Islamic Republic of)	17.20	22.30	19.20	0.41
18	Myanmar	18.14	18.76	18.76	0.40
19	Mali	36.90	21.60	18.30	0.39
20	Benin	21.80	18.90	16.50	0.35
21	Greece	26.50	21.60	15.80	0.34
22	Republic of Korea	23.00	15.80	14.90	0.32
23	Nigeria	17.20	20.20	14.00	0.30
24	Spain	7.64	3.46	13.90	0.30
25	Zimbabwe	24.80	16.90	13.60	0.29
26	Cameroon	14.40	11.30	13.00	0.28
27	Tajikistan	23.70	17.30	13.00	0.28
28	Peru	14.70	14.80	12.30	0.26
29	Saudi Arabia	6.93	11.52	11.52	0.25
30	Zambia	4.94	15.73	11.25	0.24
31	South Africa	12.10	9.60	10.90	0.23
32	Kyrgyzstan	8.30	8.50	9.50	0.20
33	Mozambique	10.75	13.72	8.82	0.19
34	Sudan	20.90	6.90	8.30	0.18

Contd…

Annexure Table-XIV

Country-wise Production of Cottonseed Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
35	Bolivia (Plurinational State of)	7.35	7.50	6.86	0.15
36	Malawi	0.64	6.96	6.56	0.14
37	Colombia	8.50	7.70	6.40	0.14
38	Afghanistan	6.34	6.34	6.34	0.14
39	Argentina	11.60	5.00	5.80	0.12
40	Chad	8.10	8.70	5.00	0.11
41	Côte d'Ivoire	8.87	5.24	4.88	0.10
42	Uganda	2.27	5.45	4.85	0.10
43	Japan	5.51	4.88	4.32	0.09
44	Indonesia	0.18	3.66	4.07	0.09
45	Togo	4.90	5.30	4.00	0.09
46	Ethiopia	3.90	3.90	3.80	0.08
47	Democratic People's Republic of Korea	4.42	4.34	3.67	0.08
48	Bangladesh	2.43	3.75	3.61	0.08
49	Democratic Republic of the Congo	2.59	2.60	3.06	0.07
50	Senegal	4.40	3.80	3.00	0.06
51	Yemen	2.54	2.59	2.68	0.06
52	Kenya	2.58	2.60	2.67	0.06
53	Iraq	3.32	1.21	2.65	0.06
54	Azerbaijan	2.77	3.53	2.50	0.05
55	Paraguay	8.50	8.00	2.00	0.04
56	Madagascar	1.20	1.40	1.40	0.03
57	Venezuela (Bolivarian Republic of)	1.20	1.25	1.30	0.03
58	Lao People's Democratic Republic	0.90	1.06	1.08	0.02
59	Namibia	1.00	0.91	1.04	0.02
60	Viet Nam	0.80	0.90	0.94	0.02
61	Thailand	0.98	0.98	0.94	0.02
62	Chile	1.00	0.92	0.88	0.02
63	Portugal	0.83	0.51	0.73	0.02
64	Somalia	0.50	0.60	0.61	0.01
65	Niger	1.00	0.67	0.35	0.01
66	Ecuador	0.31	0.32	0.35	0.01
67	Nicaragua	0.30	0.30	0.33	0.01
68	Israel	0.32	0.32	0.32	0.01

Contd…

Annexure Table-XIV

Country-wise Production of Cottonseed Oil in the World during 2007 to 2009

(000' tonnes)

S.No.	Countries	2007	2008	2009	Share of Production(%)
69	Uruguay	0.30	0.30	0.30	0.01
70	Guatemala	0.32	0.28	0.24	0.01
71	Hungary	0.65	0.56	0.23	0.00
72	Botswana	0.47	0.24	0.21	0.00
73	France	0.18	0.31	0.12	0.00
74	Honduras	0.24	0.10	0.12	0.00
75	Burundi	0.14	0.13	0.11	0.00
76	Angola	0.13	0.15	0.11	0.00
77	Swaziland	0.12	0.11	0.09	0.00
78	Haiti	0.14	0.10	0.08	0.00
79	Bulgaria	0.20	0.08	0.06	0.00
80	Albania	0.08	0.06	0.05	0.00
81	Central African Republic	0.04	0.03	0.03	0.00
82	El Salvador	0.00	0.03	0.02	0.00
83	Philippines	0.15	0.08	0.01	0.00
84	Morocco	0.01	0.01	0.01	0.00
85	Nepal	0.01	0.01	0.01	0.00
86	Romania	0.01	0.01	0.01	0.00
87	Antigua and Barbuda	0.01	0.01	0.00	0.00
88	Grenada	0.01	0.01	0.00	0.00
89	Montserrat	0.00	0.00	0.00	0.00
90	Poland	0.00	0.00	0.00	0.00
	World's Total Production	**4989.91**	**4882.55**	**4659.15**	**100.00**

Source: http://faostat.fao.org accessed on 11.11.2011
Note: Countries have been arranged in descending order of their respective shares of production in 2009 in total world production.

Annexure Table-XV

District-wise Water Tables in Andhra Pradesh (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Adilabad	44	3.27	11.56	5 to 10	0.00	29.55	61.36	9.09	0.00	0.00	100.00
Anantapur	34	0.85	17.40	5 to 10	14.71	23.52	41.18	20.59	0.00	0.00	100.00
Chittoor	36	1.32	17.80	5 to 10	5.56	16.67	58.33	19.44	0.00	0.00	100.00
Cuddapah	25	2.80	17.00	10 to 20	0.00	16.00	56.00	28.00	0.00	0.00	100.00
East Godavari	38	0.89	16.03	2 to 5	34.21	44.74	18.42	2.63	0.00	0.00	100.00
Guntur	38	0.05	15.91	2 to 5	31.58	50.00	15.79	2.63	0.00	0.00	100.00
Hyderabad	9	2.32	15.20	10 to 20	0.00	11.11	44.45	44.44	0.00	0.00	100.00
Karimnagar	30	2.94	12.97	5 to 10	0.00	26.67	60.00	13.33	0.00	0.00	100.00
Khammam	42	1.21	12.37	5 to 10	7.14	33.33	47.63	11.90	0.00	0.00	100.00
Krishna	27	0.28	22.00	2 to 5	29.63	44.44	18.53	3.70	3.70	0.00	100.00
Kurnool	32	0.85	12.03	5 to 10	12.50	37.50	37.50	12.50	0.00	0.00	100.00
Mahbubnagar	21	3.30	41.80	5 to 10	0.00	28.57	38.10	28.57	0.00	4.76	100.00
Medak	20	3.47	19.53	5 to 10	0.00	15.00	55.00	30.00	0.00	0.00	100.00
Nalgonda	38	1.64	26.10	2 to 5	2.63	47.37	36.84	10.53	2.63	0.00	100.00
Nellore	33	0.66	8.12	2 to 5	18.18	57.58	24.24	0.00	0.00	0.00	100.00
Prakasham	32	0.64	8.94	2 to 5	18.75	56.25	25.00	0.00	0.00	0.00	100.00
Rangareddy	24	1.46	16.44	10 to 20	4.17	4.17	37.50	54.16	0.00	0.00	100.00
Srikakulam	23	0.31	7.98	2 to 5	4.35	69.57	26.08	0.00	0.00	0.00	100.00
Vishakhapatanam	56	1.06	15.66	2 to 5	16.07	58.93	19.64	5.36	0.00	0.00	100.00
Viziyanagaram	25	1.03	8.71	2 to 5	24.00	48.00	28.00	0.00	0.00	0.00	100.00
Warangal	49	-0.59	20.92	5 to 10	6.12	28.57	44.90	18.37	2.04	0.00	100.00
West Godawari	20	0.75	12.95	2 to 5	30.00	35.00	30.00	5.00	0.00	0.00	100.00

* : Number of wells analysed.
Mbgl : Meter below ground level.
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XVI

District-wise Water Tables in Assam (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Barpeta	2	3.55	3.74	2 to 5	0.00	100.00	0.00	0.00	0.00	0.00	100.00
Bongaigaon	5	3.32	9.30	2 to 5	0.00	60.00	40.00	0.00	0.00	0.00	100.00
Cachar	14	0.84	9.62	2 to 5	21.43	50.00	28.57	0.00	0.00	0.00	100.00
Darrang	13	2.93	5.87	2 to 5	0.00	84.62	15.38	0.00	0.00	0.00	100.00
Dhemaji	10	1.14	9.73	2 to 5	20.00	60.00	20.00	0.00	0.00	0.00	100.00
Dhubri	8	3.50	16.64	2 to 5	0.00	62.50	12.50	25.00	0.00	0.00	100.00
Dibrugarh	7	0.83	6.11	2 to 5	14.29	57.14	28.57	0.00	0.00	0.00	100.00
Goalpara	10	2.26	8.33	2 to 5	0.00	90.00	10.00	0.00	0.00	0.00	100.00
golaghat	4	1.49	7.22	5 to 10	25.00	25.00	50.00	0.00	0.00	0.00	100.00
Hailakandi	1	4.20	4.20	2 to 5	0.00	100.00	0.00	0.00	0.00	0.00	100.00
Jorhat	9	1.06	3.20	2 to 5	44.44	55.56	0.00	0.00	0.00	0.00	100.00
Kamrup	23	0.57	9.01	2 to 5	26.09	60.87	13.04	0.00	0.00	0.00	100.00
karbi anglong	20	1.60	19.58	2 to 5	71.43	28.57	0.00	0.00	0.00	0.00	100.00
karimganj	7	0.05	4.38	0 to 2	71.43	28.57	0.00	0.00	0.00	0.00	100.00
Lakhimpur	16	1.53	5.22	2 to 5	25.00	56.25	18.75	0.00	0.00	0.00	100.00
Marigaon	5	1.46	3.83	2 to 5	40.00	60.00	0.00	0.00	0.00	0.00	100.00
Nagaon	17	1.20	10.80	2 to 5	17.65	41.18	35.29	5.88	0.00	0.00	100.00
Nalbari	1	2.12	2.12	2 to 5	0.00	100.00	0.00	0.00	0.00	0.00	100.00
Sibsagar	8	1.07	3.26	2 to 5	37.50	62.50	0.00	0.00	0.00	0.00	100.00
Sonitpur	15	1.97	8.70	2 to 5	6.67	60.00	33.33	0.00	0.00	0.00	100.00
Tinsukia	14	1.32	6.67	2 to 5	21.43	57.14	21.43	0.00	0.00	0.00	100.00

* : Number of wells analysed.
Mbgl : Meter below ground level.
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XVII

District-wise Water Tables in Chhattisgarh (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Bastar	7	3.55	9.70	5 to 10	0.00	42.86	57.14	0.00	0.00	0.00	100.00
Bilaspur	41	1.02	19.00	5 to 10	2.44	19.51	56.10	21.95	0.00	0.00	100.00
Dhamtari	16	1.47	9.78	5 to 10	6.25	25.00	68.75	0.00	0.00	0.00	100.00
Durg	36	1.52	24.90	5 to 10	5.56	33.33	38.89	19.44	2.78	0.00	100.00
Janjgir-Champa	17	1.29	11.84	5 to 10	7.41	22.22	51.85	18.52	0.00	0.00	100.00
Jashpur	30	2.55	15.24	5 to 10	0.00	23.33	66.67	10.00	0.00	0.00	100.00
Kanker	2	8.88	9.60	5 to 10	0.00	0.00	100.00	0.00	0.00	0.00	100.00
Kawardha	10	4.54	13.88	5 to 10	0.00	20.00	70.00	10.00	0.00	0.00	100.00
Korba	18	2.62	13.47	5 to 10	0.00	16.67	50.00	33.33	0.00	0.00	100.00
Korya	20	0.53	15.20	5 to 10	5.00	25.00	40.00	30.00	0.00	0.00	100.00
Mahasamund	17	2.03	11.74	5 to 10	0.00	23.53	58.82	17.65	0.00	0.00	100.00
Raigarh	33	1.30	13.90	5 to 10	6.06	21.21	60.61	12.12	0.00	0.00	100.00
Raipur	35	1.27	14.40	5 to 10	5.71	31.43	45.71	17.15	0.00	0.00	100.00
Rajnandgaon	18	1.58	11.71	5 to 10	5.56	16.67	55.56	22.21	0.00	0.00	100.00
Surguja	50	3.14	19.87	5 to 10	0.00	6.00	64.00	30.00	0.00	0.00	100.00

* : Number of wells analysed.
Mbgl : Meter below ground level.
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XVIII

District-wise Water Tables in Goa (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Goa	23	1.21	26.09	2 to 5	13.04	43.48	30.43	8.70	4.35	0.00	100.00
South Goa	21	2.39	18.64	2 to 5	0.00	47.62	33.33	19.05	0.00	0.00	100.00

* : Number of wells analysed.
Mbgl : Meter below ground level.
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XIX

District-wise Water Tables in Gujarat (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Ahmedabad	23	3.11	22.30	5 to 10	0.00	26.09	43.47	21.74	8.70	0.00	100.00
Amreli	43	1.31	35.37	10 to 20	4.65	11.63	25.58	37.21	20.93	0.00	100.00
Anand	12	2.54	25.99	5 to 10	0.00	16.67	41.67	25.00	16.66	0.00	100.00
Banaskantha	19	7.75	64.58	10 to 20	0.00	0.00	5.26	52.63	26.32	15.79	100.00
Bharuch	29	1.60	14.80	5 to 10	3.45	24.14	62.07	10.34	0.00	0.00	100.00
Bhavnagar	33	1.99	30.10	10 to 20	3.03	18.18	30.31	39.39	9.09	0.00	100.00
Daman	8	0.80	7.40	5 to 10	12.50	37.50	50.00	0.00	0.00	0.00	100.00
Dohad	20	2.88	14.09	10 to 20	0.00	5.00	30.00	65.00	0.00	0.00	100.00
Dui	3	3.26	9.54	5 to 10	0.00	33.33	66.67	0.00	0.00	0.00	100.00
Gandhinagar	2	13.08	13.20	10 to 20	0.00	0.00	0.00	100.00	0.00	0.00	100.00
Jamnagar	51	1.64	36.25	10 to 20	3.92	29.41	27.45	31.37	7.85	0.00	100.00
Junagarh	61	2.70	35.94	10 to 20	0.00	8.20	36.07	44.25	11.48	0.00	100.00
Kachchh	54	1.20	53.65	5 to 10	9.26	18.52	31.48	25.93	11.11	3.70	100.00
Kheda	20	0.34	42.10	5 to 10	10.00	15.00	60.00	5.00	5.00	5.00	100.00
Mahesana	14	3.82	15.45	10 to 20	0.00	14.29	35.71	50.00	0.00	0.00	100.00
Narmada	11	1.69	28.20	5 to 10	9.09	18.18	36.36	27.28	9.09	0.00	100.00
Navsari	11	2.43	25.34	5 to 10	0.00	45.45	45.46	0.00	9.09	0.00	100.00
Panchmahals	21	1.50	14.99	5 to 10	9.52	9.52	42.86	38.10	0.00	0.00	100.00
Patan	12	1.92	20.01	2 to 5	8.33	50.00	16.67	16.67	8.33	0.00	100.00
Porbandar	15	1.81	15.25	5 to 10	6.67	26.67	33.33	33.33	0.00	0.00	100.00
Rajkot	51	1.40	21.77	5 to 10	1.96	23.53	39.22	31.37	3.92	0.00	100.00
Sabarkantha	25	7.75	31.47	10 to 20	0.00	0.00	32.00	52.00	16.00	0.00	100.00
Surat	33	1.59	19.85	2 to 5	6.06	33.33	33.34	27.27	0.00	0.00	100.00
Surendranagar	32	1.90	20.75	2 to 5	3.13	53.12	25.00	15.62	3.13	0.00	100.00
The dangs	17	0.80	12.30	5 to 10	17.65	41.18	35.29	5.88	0.00	0.00	100.00
Vadodara	31	1.83	30.20	10 to 20	3.23	16.13	54.84	12.90	12.90	0.00	100.00
Valsad	14	3.50	18.00	10 to 20	0.00	28.57	50.00	21.43	0.00	0.00	100.00

* : Number of wells analyzed.
Mbgl : Meter below ground level.
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure XX

District-wise Water Tables in Odisha (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Anugul	44	2.12	16.38	5 to 10	0.00	18.18	72.73	9.09	0.00	0.00	100.00
Balangir	35	1.98	8.37	2 to 5	2.86	54.29	42.86	0.00	0.00	0.00	100.00
Baleshwar	30	0.46	6.80	2 to 5	10.00	53.33	36.67	0.00	0.00	0.00	100.00
Bargarh	42	0.44	8.57	5 to 10	38.10	23.81	38.10	0.00	0.00	0.00	100.00
Baudh	26	4.16	11.26	5 to 10	0.00	15.38	80.77	3.85	0.00	0.00	100.00
Bhadrak	12	0.51	6.12	2 to 5	8.33	58.33	33.33	0.00	0.00	0.00	100.00
Cuttack	34	1.52	11.69	2 to 5	5.88	67.65	23.53	2.94	0.00	0.00	100.00
Debagarh	6	3.87	7.95	5 to 10	0.00	33.33	66.67	0.00	0.00	0.00	100.00
Dhenkanal	44	0.97	11.91	5 to 10	2.27	18.18	75.00	4.55	0.00	0.00	100.00
Gajapati	9	2.11	9.42	5 to 10	0.00	44.44	55.56	0.00	0.00	0.00	100.00
Ganjam	85	-0.07	9.51	2 to 5	16.47	57.65	25.88	0.00	0.00	0.00	100.00
Jagatsinghapur	11	1.30	3.55	2 to 5	18.18	81.82	0.00	0.00	0.00	0.00	100.00
Jajapur	38	2.11	11.36	2 to 5	0.00	68.42	23.68	7.89	0.00	0.00	100.00
Jharsuguda	9	2.30	8.46	5 to 10	0.00	22.22	77.78	0.00	0.00	0.00	100.00
Kalahandi	46	-0.70	9.90	2 to 5	23.91	43.48	32.61	0.00	0.00	0.00	100.00
Kendrapara	9	1.49	5.18	2 to 5	22.22	66.67	11.11	0.00	0.00	0.00	100.00
Kendujhar	69	1.22	12.66	5 to 10	1.45	33.33	56.52	8.70	0.00	0.00	100.00
Khordha	21	1.51	11.25	5 to 10	19.05	28.57	42.86	9.52	0.00	0.00	100.00
Koraput	36	1.10	11.72	5 to 10	16.67	38.89	41.67	2.78	0.00	0.00	100.01
Malkangiri	12	2.09	9.67	2 to 5	0.00	66.67	33.33	0.00	0.00	0.00	100.00
Mayurbhanj	58	2.29	16.05	5 to 10	0.00	20.69	62.07	17.24	0.00	0.00	100.00
Nabarangapur	17	1.24	6.57	5 to 10	17.65	23.53	58.82	0.00	0.00	0.00	100.00
Nayagarh	16	0.86	9.43	2 to 5	6.25	56.25	37.50	0.00	0.00	0.00	100.00
Nuapada	14	1.97	9.92	5 to 10	7.14	35.71	57.15	0.00	0.00	0.00	100.00
Puri	39	1.00	6.23	2 to 5	15.38	76.92	7.70	0.00	0.00	0.00	100.00
Rayagada	13	1.30	11.80	2 to 5	15.38	46.16	30.77	7.69	0.00	0.00	100.00
Sambalpur	39	0.39	10.08	5 to 10	10.26	23.08	64.10	2.56	0.00	0.00	100.00
Sonapur	25	0.78	8.75	2 to 5	12.00	52.00	36.00	0.00	0.00	0.0	100.00
Sundargarh	34	0.47	16.55	5 to 10	2.94	20.59	55.88	20.59	0.00	0.00	100.00

* : Number of wells analysed. Mbgl : Meter below ground level. Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XXI

District-wise Water Tables in Karnataka (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Bagalkot	23	0.71	30.68	5 to 10	8.70	30.43	52.17	4.35	4.35	0.00	100.00
Banlgalore Rural	23	0.67	12.90	2 to 5	4.35	43.48	34.78	17.39	0.00	0.00	100.00
Bangalore Urban	8	2.00	7.32	2 to 5	12.50	62.50	25.00	0.00	0.00	0.00	100.00
Belgaum	70	0.89	18.35	5 to 10	5.71	27.15	48.57	18.57	0.00	0.00	100.00
Bellary	33	0.80	19.40	5 to 10	12.12	33.33	36.36	18.19	0.00	0.00	100.00
Bijapur	50	1.88	17.60	5 to 10	2.00	36.00	42.00	20.00	0.00	0.00	100.00
Chamarajanagar	21	1.20	19.00	5 to 10	9.52	28.57	33.33	28.58	0.00	0.00	100.00
Chikmagalur	36	1.69	16.02	5 to 10	8.33	19.44	61.11	11.12	0.00	0.00	100.00
Chitradurga	42	0.40	16.85	5 to 10	14.29	23.81	40.48	21.42	0.00	0.00	100.00
Dakshin Kannada	31	4.12	15.20	5 to 10	0.00	12.90	64.52	22.58	0.00	0.00	100.00
Davanagere	20	1.50	14.84	2 to 5	15.00	55.00	25.00	5.00	0.00	0.00	100.00
Dharwad	16	2.18	17.40	10 to20	0.00	25.00	31.25	43.75	0.00	0.00	100.00
Gadag	17	1.54	24.60	5 to 10	5.88	11.76	58.82	17.66	5.88	0.00	100.00
Gulbarga	74	1.15	16.75	5 to 10	6.76	37.84	39.19	16.21	0.00	0.00	100.00
Hassan	40	1.10	14.55	2 to 5	2.50	45.00	42.50	10.00	0.00	0.00	100.00
Haveri	22	0.81	16.30	10 to20	9.09	9.09	27.27	54.55	0.00	0.00	100.00
Kodagu	25	0.90	14.65	5 to 10	16.00	24.00	40.00	20.00	0.00	0.00	100.00
Kolar	55	0.47	19.89	10 to 20	5.45	25.45	32.74	36.36	0.00	0.00	100.00
Koppal	27	1.82	15.50	5 to 10	7.41	22.22	48.15	22.22	0.00	0.00	100.00
Mandya	27	0.38	14.77	5 to 10	29.63	33.33	33.34	3.70	0.00	0.00	100.00
Masore	35	1.19	15.11	5 to 10	5.71	40.00	42.86	11.43	0.00	0.00	100.00
Raichur	34	0.41	12.15	2 to 5	26.47	35.29	32.35	5.89	0.00	0.00	100.00
Shimoga	37	1.05	17.37	5 to 10	24.32	16.22	35.14	24.32	0.00	0.00	100.00
Tumkur	55	1.17	18.70	10 to 20	5.45	30.91	30.91	32.73	0.00	0.00	100.00
Udupi	14	2.80	14.44	5 to 10	0.00	14.29	50.00	35.71	0.00	0.00	100.00
Uttara Kannada	37	1.76	15.19	5 to 10	2.70	24.32	62.16	10.82	0.00	0.00	100.00

* : Number of wells analysed.

Mbgl : Meter below ground level.

Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XXII

District-wise Water Tables in Kerala (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Alappuzha	48	0.50	15.20	2 to 5	33.33	35.42	22.92	8.33	0.00	0.00	100.00
Ernakulam	55	0.78	13.41	5 to 10	18.18	36.36	40.00	5.46	0.00	0.00	100.00
Idukki	38	1.20	41.20	2 to 5	13.16	47.37	34.21	2.63	0.00	2.63	100.00
Kannur	50	1.46	21.68	5 to 10	6.00	24.00	42.00	26.00	2.00	0.00	100.00
Kasaragod	47	2.14	24.32	5 to 10	0.00	10.64	42.55	44.68	2.13	0.00	100.00
Kollam	52	0.12	29.02	5 to 10	5.77	15.38	55.77	17.31	5.77	0.00	100.00
Kottayam	48	0.30	13.55	5 to 10	10.42	31.25	45.83	12.50	0.00	0.00	100.00
Kozhikode	31	0.73	16.11	5 to 10	9.68	38.71	48.39	3.22	0.00		100.00
Malappuram	64	1.25	31.15	5 to 10	6.25	26.56	48.44	14.06	4.69	0.00	100.00
Palakkad	54	0.98	11.23	5 to 10	9.26	33.33	50.00	7.41	0.00	0.00	100.00
Pathanamthitt	33	1.00	9.95	2 to 5	11.43	45.71	42.86	0.00	0.00	0.00	100.00
Thiruvanantha	55	1.26	20.34	5 to 10	5.45	23.64	43.64	25.45	1.82	0.00	100.00
Thrissur	53	0.57	24.33	5 to 10	7.55	22.64	52.83	13.21	3.77	0.00	100.00
Wayanad	33	1.42	19.32	5 to 10	5.71	31.43	45.71	17.15	0.00	0.00	100.00

* : Number of wells analysed.
Mbgl : Meter below ground level.
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XXIII

District-wise Water Tables in Tamil Nadu (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Kanyakumari	20	2.01	14.25	5 to 10	0.00	20.00	50.00	30.00	0.00	0.00	100.00
Chennai	12	1.05	6.47	2 to 5	25.00	50.00	25.00	0.00	0.00	0.00	100.00
Nilgiris	9	0.65	8.97	2 to 5	33.30	44.50	22.20	0.00	0.00	0.00	100.00
Namakkal	30	1.00	14.48	5 to 10	10.00	33.30	40.00	16.70	0.00	0.00	100.00
Nagapattinam	13	1.60	10.73	2 to 5	7.70	69.20		7.70	0.00	0.00	100.00
Madurai	50	1.60	30.40	5 to 10	6.00	38.00	48.00	6.00	2.00	0.00	100.00
Pondicherry	9	2.20	41.58	10 to 20	0.00	44.40	0.00	44.40	11.20	0.00	100.00
Karaikal	3	2.04	3.57	2 to 5	0.00	100.00	0.00	0.00	0.00	0.00	100.00
Pudukkottai	25	0.65	11.10	2 to 5	8.00	48.00	40.00	4.00	0.00	0.00	100.00
Kancheepuram	60	1.53	11.46	2 to 5	3.30	56.70	35.00	5.00	0.00	0.00	100.00
Erode	99	0.65	68.15	5 to 10	8.10	31.30	40.40	15.10	5.10	0.00	100.00
Dindigul	32	1.04	20.40	5 to 10	12.50	31.30	46.90	6.20	3.10	0.00	100.00
Dharmapuri	33	1.14	38.90	5 to 10	6.10	18.20	42.40	27.20	6.10	0.00	100.00
Cuddalore	30	1.17	100.40	> 40	3.30	30.00	16.70	10.00	40.00	0.00	100.00
Coimbatore	104	-0.40	50.40	10 to 20	10.60	21.20	21.20	30.80	16.30	0.00	100.10
Kaur	13	1.70	8.65	5 to 10	7.70	38.50	53.80	0.00	0.00	0.00	100.00
Tiruchchirappalli	19	1.55	14.98	2 to 5	5.30	42.10	36.80	15.80	0.00	0.00	100.00
Villupuram	43	1.00	32.45	2 to 5	14.00	60.50	23.20	0.00	2.30	0.00	100.00
Vellore	40	0.60	18.10	5 to 10	5.00	17.50	52.50	25.00	0.00	0.00	100.00
Tuticorin	30	0.80	13.93	2 to 5	20.00	43.30	30.00	6.70	0.00	0.00	100.00

Contd…

Annexure Table-XXIII

District-wise Water Tables in Tamil Nadu (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Tiruvarur	9	1.51	6.13	2 to 5	11.10	66.70	22.20	0.00	0.00	0.00	100.00
Tiruvannamalai	24	1.42	8.89	2 to 5	4.20	50.00	45.80	0.00	0.00	0.00	100.00
Perambalur	26	1.13	92.78	2 to 5	3.80	57.70	15.40	0.00	23.10	0.00	100.00
Tirunelveli	51	0.55	15.50	2 to 5	3.90	45.10	25.50	25.50	0.00	0.00	100.00
Virudhunagar	22	1.40	23.60	5 to 10	4.50	27.30	59.10	4.50	4.60	0.00	100.00
Thiruchirapalli	2	3.64	18.50	2 to 5	0.00	50.00	0.00	50.00	0.00	0.00	100.00
Theni	47	1.12	50.55	10 to 20	2.10	12.80	31.90	31.90	21.30	0.00	100.00
Thanjavur	22	2.15	16.95	2 to 5	0.00	50.00	36.40	13.60	0.00	0.00	100.00
Sivaganga	18	1.28	17.00	2 to 5	11.10	50.00	33.30	5.60	0.00	0.00	100.00
Salem	27	0.60	16.40	2 to 5	3.70	44.40	33.40	18.50	0.00	0.00	100.00
Ramanathapuram	24	1.40	37.10	2 to 5	37.50	41.70	12.50	4.20	4.20	0.00	100.10
Tiruvallur	38	1.03	17.90	5 to 10	15.80	36.90	36.80	10.50	0.00	0.00	100.00

* : Number of wells analysed.
Mbgl : Meter below ground level.
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XXIV

District-wise Water Tables in Tripura (March to May, 2011)

(mbgl, percent)

Districts	Sample Size*	Minimum	Maximum	Modal Band	Distribution of water tables in different bands of water levels (%)						
					0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	More than 40	Total
Dhalai	3	4.17	5.47	5 to 10	0.00	33.33	66.67	0.00	0.00	0.00	100.00
North Tripura	6	1.41	6.60	5 to10	16.67	33.33	50.00	0.00	0.00	0.00	100.00
South Tripura	6	1.39	6.15	2 to 5	16.67	66.67	16.67	0.00	0.00	0.00	100.01
West Tripura	12	1.57	5.93	2 to 5	8.33	75.00	16.67	0.00	0.00	0.00	100.00

* : Number of wells analysed.
Mbgl : Meter below ground level.
Source : Central Ground Water Board, Ministry of Water Resources, Faridabad.

Annexure Table-XXV

Import Duty on Crude and Refined Palm Oils during the period from 1994 to 2011

(Percent)

S.No.	Period	Crude Palm Oil	Refined Palm Oil
1.	1994 (April)	-	65
			(Import of RBD palmolein placed under OGL)
2.	1996-97 (Budget)	25	25
3.	1998 (July)	15	15
4.	1999-2000 (Budget)	16.5	16.5
5.	1999 (Dec)	16.5	28.6
6.	2000 (June)	27.5	44.1
7.	2000 (Nov)	55	71.6
8.	2001 (Apr)	75	92.2
9.	2001(Oct)	65	92.2
10.	2003 (Apr)	65	70
11.	2004 (July)	65	75
12.	2005 (Feb)	80	90
13.	2006 (Aug)	70	80
14.	2007 (Jan)	60	67.5
15.	2007 (Apr)	50	57.5
16.	2007 (July)	45	52.5
17.	2008 (March)	20	27.5
18.	2008 (Apr)	0	7.5
19.	2009	0	7.5
20.	2010	0	7.5
21.	2011	0	7.5