Impact of Trade Liberalization on India's Oilseed and Edible oils sector

P.V. Srinivasan*

Indira Gandhi Institute of Development Research (IGIDR)
General A. Vaidya Marg, Goregaon (East)
Mumbai 400 065, India
Email: pvs@igidr.ac.in

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Abstract

The edible oil and oilseeds sector in India faces many challenges in the new environment of liberalized trade. Government intervention is faced with the task of balancing the interests of different stakeholders in the oilseed complex. Providing benefits to some may be at the cost of others. This study analyzes the regional impacts on consumers and producers of liberalizing edible oil imports. It uses a multi-market, partial equilibrium computational model that takes into account regional patterns in the demand for edible oils and production of oilseeds. It obtains the impact of protecting oilseed growers, through three different alternative mechanisms, on different stakeholders. It also examines the relative effectiveness of these mechanisms in protecting farmers' prices under different market situations.

The results show that consumers are the main beneficiaries of trade liberalization in the edible oils sector. The gains to consumers are however substantial so that the marginal losses incurred by other agents can be compensated with an overall net gain. Prices of both oils and oilseeds are reduced. Consumption of palm and soy oil is increased but consumption of other oils decreases due to substitution effects. Since the production of soybeans is the most adversely affected, the states producing soybeans suffer most of the loss in producer welfare.

Three alternative mechanisms are considered to support prices received by oilseed farmers: import tariff on edible oils, import tariff on oilseeds and government subsidy. Import tariff on oilseeds is found to be an ineffective instrument in supporting farmers' prices. Between the other two mechanisms government subsidy turns out to be superior.

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1. Introduction

The oilseed complex in India is undergoing visible changes in the new environment of liberalized trade. Consumption patterns are changing, as consumers are beginning to accept oils other than those consumed traditionally. Changes in cropping patterns have also taken place with the help of technology missions and price support. Although India ranks among the largest producers of oilseeds in the world such as USA, China and Brazil, its productivity is quite low. The low and fluctuating yields are primarily due to a large part of the cultivation being on marginal lands lacking irrigation and with low levels of input usage. Three oilseeds: groundnut, soybean and rapeseed/mustard, together account for over 80 per cent of aggregate cultivated oilseeds output. The processing technology is a mix of the traditional and modern ranging from household crushing to expander/extruder technology in medium-scale factories. There has been a large growth in processing capacity partly due to de licensing of the vegetable oil industry in 1990-91 and partly due to tax incentives. Processing of oilseeds such as groundnuts and rapeseed however remained inefficient due to the existence of small-scale industry reservation policy that prevented efficient operations.

The edible oils/ oilseeds sector currently faces several challenges. Oilseed cultivation is becoming increasingly unattractive due to low and unstable yields. The technology mission on oilseeds had only limited success. Decreasing price of edible oils due to trade liberalization may result in low prices for oilseeds resulting in poor supply response. High import tariffs and non-tariff barriers such as sanitary and phyto sanitary (SPS) restrictions have made oilseed imports unattractive. Low domestic output of raw material combined with restricted import of oilseeds can lead to a high degree of under utilization of processing capacity.

The government's help to oilseed growers has been in the form of providing Minimum Support Prices (MSP)) through its stocking policy and by imposing customs duties on imports of edible oils and oilseeds. MSP policy does not appear to have worked as well in the case of oilseeds as it has been in the case of wheat and rice. Import tariffs on edible oils tend to impose a large burden on consumers and help processors more than oilseed farmers.

Government intervention needs to balance the interests of different stakeholders in the oilseed complex. Protecting the oilseed growers could make oil and meal products internationally uncompetitive. Low priced imported oils benefit the consumers but tend to reduce the margins on domestic oils affecting processors and oilseed farmers adversely. Thus, with trade liberalization several issues arise, including the choice between protecting the seed sector as opposed to the processing sector. Both consumption patterns and cropping patterns are likely to be influenced by the choice of customs duties and the price differences maintained among various oils. Imported oils account for close to fifty percent of the total edible oil consumption. For example, soy oil is competitive due to its low price and the low duty it faces. Refined Palm oil is also competitive due to its low price, even though it bears a high duty. This could affect the

prospects for other oils such as sunflower and rapeseed oils both of them being priced relatively high and bearing higher duties. The impact of such changes can have varying effects on consumers from different regions with varying tastes.

Thus, there are two major objectives of this study. One of them is to analyze the impacts on consumers and producers of liberalizing edible oil imports taking into account regional patterns in the demand for edible oils and production of oilseeds. The other is to evaluate the impacts of protecting oilseed growers, through alternative mechanisms (such as import tariffs on oilseeds, on edible oils and provision of MSP), on different stakeholders.

The plan of the report is as follows. Trends in the production of major oilseeds and the regional patterns are discussed in the next section. Section 3 deals with consumption patterns and trends for edible oils and the extent of import dependence. The structure of oilseed processing sector is discussed in section 4 and policy trends and issues in the next. Section 6 discusses the objectives and describes the methodological framework used. The results obtained from model simulations are given in section 7 and concluding remarks in section 8.

2. Trends in oilseeds production and regional patterns

India is one of the largest producers of oilseeds in the world. Its share in world production is as high as 27 percent for groundnut, 23 percent for sesame, 16 percent for rapeseed and 66 percent for castor seed. Groundnuts in shell form 11% of world exports and sesame forms 17%. India's productivity is however quite low, around fifty percent of the world average and even less in the case of soybean (Table 1). The comparatively lower yields are mainly due to the fact that the quality of the seed varieties is generally poor and oilseeds crops in India are mostly cultivated in unirrigated areas. Less than 25% of cropped area is under irrigation. For the same reason yields are more variable due to weather fluctuations. Other reasons include disease and pest damage, vulnerability to drought, poor dry farming practices, low access to inputs and poor soils.

Table 1: Productivity of oilseeds: India and the world (tonnes/ hectare)

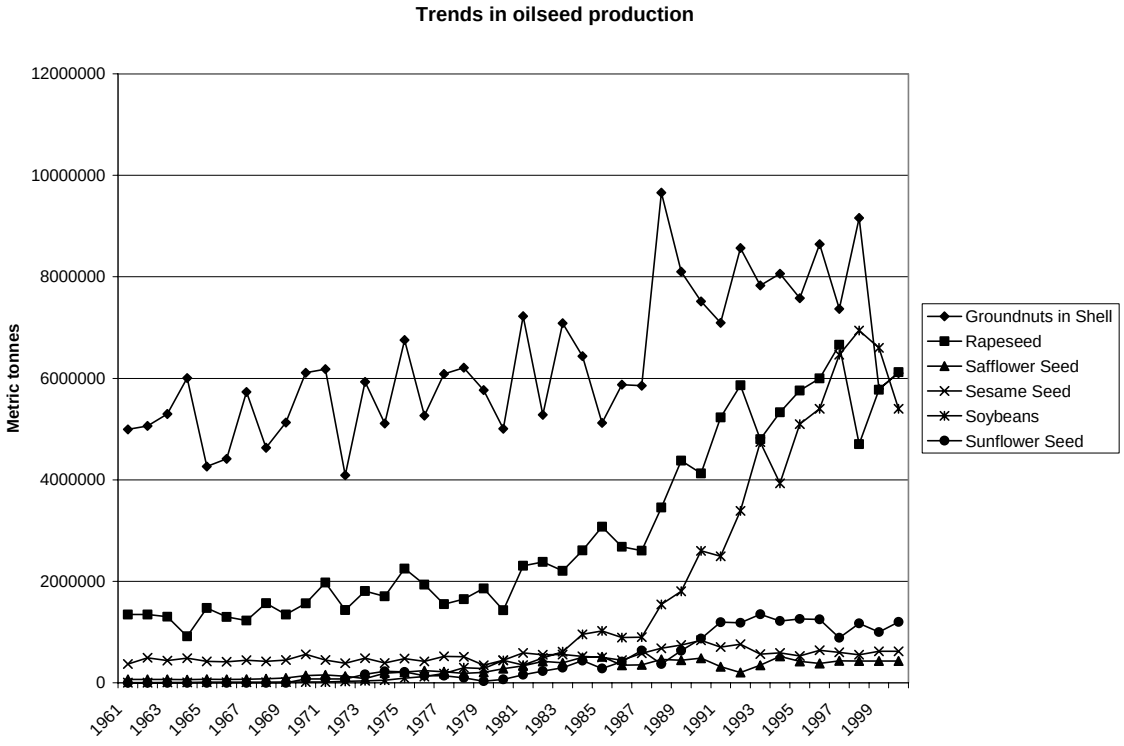
Oilseed	India	World Average	Highest
Soybean	0.85	2.29	3.28(EU-15)
Cottonseed	0.59	1.06	2.07(Australia)
Groundnut	0.59	1.02	2.13(China)
Sunflower	0.62	1.18	1.73(EU-15)
Rapeseed/ Mustard	0.75	1.49	2.96(EU-15)

Source: Oil World (31, August, 2001) as quoted in http://www.fcamin.nic.in/sugar_edbl.htm

A large number of oilseed crops are grown in different regions under different agro climatic conditions. These crops are among the most widespread in small farm systems throughout India. Groundnut, rapeseed-mustard, sesame and safflower are the traditionally cultivated oilseeds. In the recent years however soybean and sunflower have gained importance. Starting from the late seventies India depended heavily on imports to meet its edible oil demand. This prompted the setting up of the Technology Mission on Oilseeds in 1986, which gave a thrust to the production of oilseeds. Production of oilseeds went up from around 11 million tones to around 25 million tonnes towards the late nineties. There was almost a 2 percent growth in yields over the last fifteen years (Chand et. al., 2004). Most of this growth came from soybeans, rapeseed-mustard and groundnuts (Figure 1). In the recent years however there is stagnation in both area and production. The import substitution policies followed by the government until recently have provided incentives to farmers by raising oilseed prices relative to competing crops. Although, oilseeds have been opened up for trade recently the tariff rate of 30% appears to be high making imports unattractive. Other restrictions such as the SPS barriers also prevent imports. For example, the requirement that imported soybeans be split is a deal breaker, since no exporter is set up to do this. If oilseed imports have to be GMO free, sunflower seed is the most likely choice since it can be certified GMO free if imported from Australia. In the case of soybeans and rapeseed there is no origin that can certify a GM free shipment.

In the simulation exercises using our model, “trade liberalization” scenarios assume away the existence of non-tariff barriers. Such a scenario would obviously affect the production structure of oilseeds depending on the comparative advantages in domestic production for given world market situations.

Figure 1: Trends in production of various oilseeds



Groundnuts

India ranks second in the world (after China) in groundnut production. The three southern states of Andhra Pradesh, Tamil Nadu, Karnataka and the western state of Gujarat together account for close to 80% of the annual output in India. About 70-75% of the crop is Kharif, grown during summer rainy season (planted during May-July and harvested in September-mid December). In the Rabi (winter) season planting is during mid September to November and harvesting during March and April. Crop failures occur periodically due to inadequate or excessive rain or unfavorable rainfall distribution.

Groundnut ranks among oilseeds with high oil recovery (40%).[1] Around 40 to 50% of the output is used in oil production the rest being used as seed and feed.[2] Regional trends in groundnut production indicate that the recent increase in groundnut yields has mainly occurred in Tamil Nadu due to increased irrigation (Figure 2). Although Tamil Nadu accounts for 12% of the total area under groundnuts, it contributes to 22% of the total production (Table 2).

[1] Oil recovery in the case sesame is 45% and 42% in the case of castor seed.

[2] This is according to the Ministry of Agriculture, Government of India data as given in the 32nd Annual report of the Solvent Extractors' Association of India, a premier association of vegetable oil industry and trade. USDA data however indicates that about 75% of the groundnut crop is crushed.

Figure 2: Trends in productivity of groundnuts

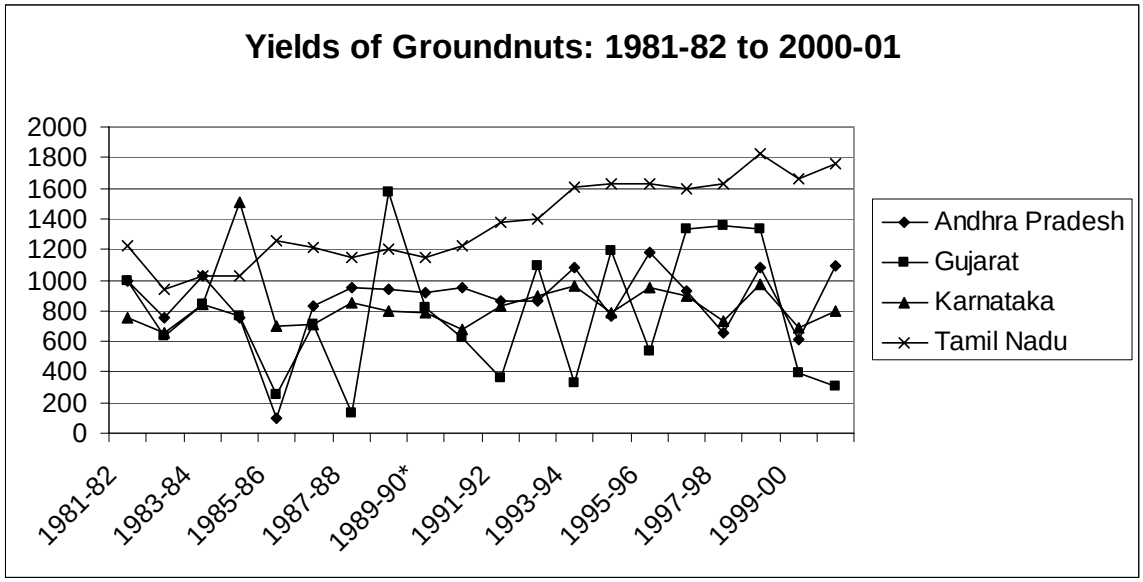


Table 2: Regional pattern of oilseed production: 1998-99 to 2000-01

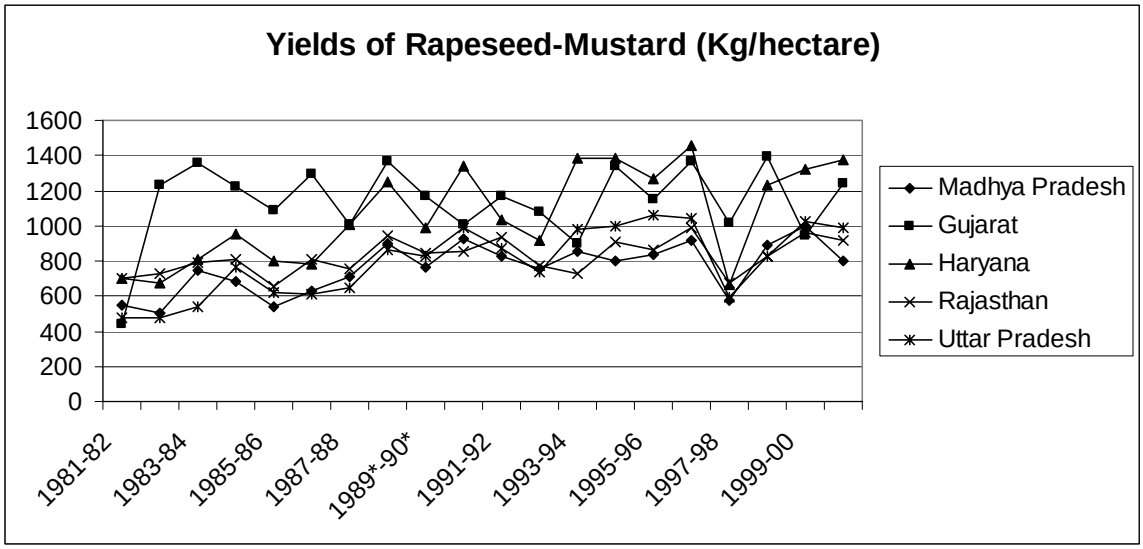
Oilseed	Major producers	Percent of total	
		Area	Production
Groundnut	Andhra Pradesh	27	25
	Gujarat	26	19
	Karnataka	17	14
	Tamil Nadu	12	22
Soybean	Madhya Pradesh	70	66
	Maharashtra	18	22
	Rajasthan	10	10
Rapeseed-Mustard	Rajasthan	45	40
	Uttar Pradesh	17	18
	Madhya Pradesh	10	10
	Haryana	8	11

Source: Ministry of Agriculture, Government of India

Rapeseed-Mustard

India ranks fourth (after China, EU and Canada) in the world in the production of Rapeseed. In the case of Rapeseed mustard there is 33% oil recovery. Almost the entire output (97%) is used in oil production is used in oil production with only 3% used for seed and feed purposes. Almost 40 percent of the rapeseed output comes from the state of Rajasthan (Table 2). Other major states include Uttar Pradesh (18%), Madhya Pradesh (10%) and Haryana (11%). Yield improvements have taken place in all the major states although Haryana shows the maximum growth in yields in the last two decades (Figure 3). However, variability in yields is also higher for this state. Area under rapeseed-mustard crop gained substantially from the expansion of irrigation (Gulati and Kelley, 1999). Import of rapeseed/mustard oil peaked during the late 1980s (with imports of around 0.19 million tonnes in 1988-89 (Chand, 2001). These imports reduced drastically with the increase in domestic production of rapeseed/mustard and also due higher world prices of rape oil in recent years as compared to the availability of cheaper imported oils like palm.

Figure 3: Trends in productivity of Rapeseed-Mustard

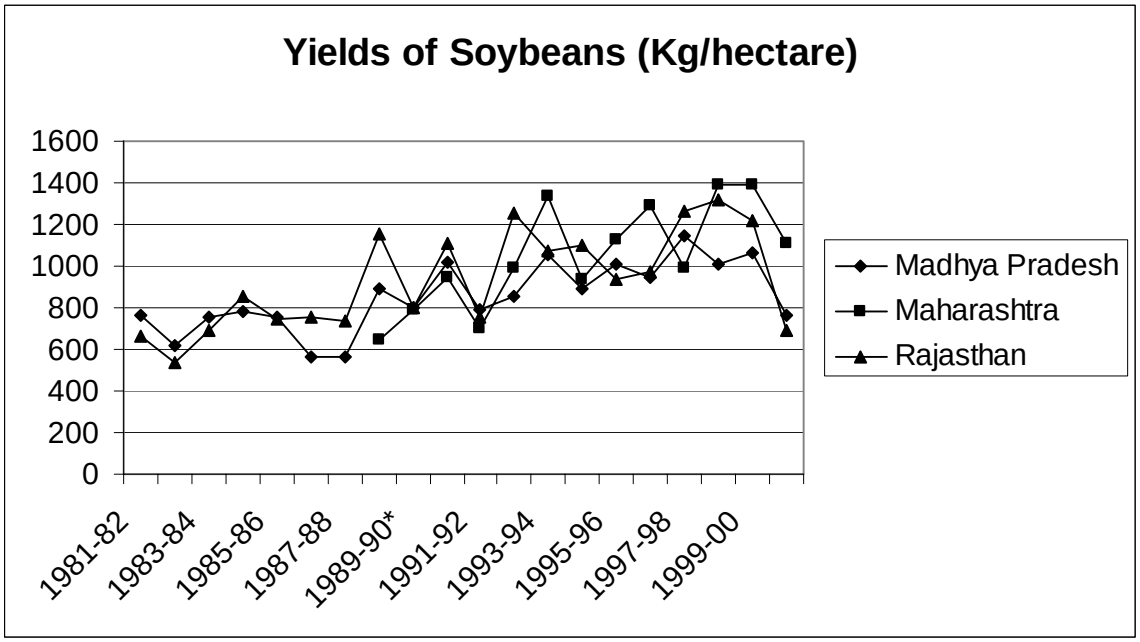


Soybeans

Soybean is predominantly grown in the states of Madhya Pradesh, Maharashtra and Rajasthan. Madhya Pradesh grows around 66 percent of the country's soybean output occupying around 70% of the total area under the crop (Table 2). It is generally grown as a rainy season crop under rainfed situation (sown in June and July and harvested in November and December). Since soybean is cultivated as a rainfed crop, yields are highly variable. Higher and more stable yields are possible through assured minimum irrigation and drought resistance brought about by genetic improvement. Weeds and pests also contribute to yield losses. The crop has exhibited a vast potential as 'Kharif' (monsoon season) crop mainly in the Central India, and is extending its coverage in the Southern parts of the country. Normal period of monsoon for Maharashtra, Madhya Pradesh and Gujarat is around mid June.

There has been a rapid growth in soybean cultivation over the last two decades (0.5 million tones in 1981-82 to 6.9 million tonnes in 2003-04) placing India on the world map of soybean. Yield growth was the highest in the case of Maharashtra, growing from close to 600 kg per hectare in 1989-90 to 1100 kg per hectare in 2000-01 (Figure 4). India ranks fifth in the world in area and production after USA, Brazil, China and Argentina. In recent years it has become the second most produced oilseed in India. The phenomenal growth in cultivation of soybean can be attributed to the concurrent development of the soy-oil/meal industry, which provided remunerative market to the growers. Soybean processing capacity grew very fast with the establishment of the first solvent extraction plant for soybean in 1972 at Indore (Madhya Pradesh). Roughly 85% of the output goes into oil extraction, the rest being used for food feed and seed purposes. Recovery of oil is about 18% and that of soy meal is about 82%. Since the domestic consumption of soy meal is limited most of it is exported in the form of deoiled cake. Soybean meal produced in the relatively modern solvent-extraction plants was of acceptable quality for export and found a ready market. There was no Small Scale Industry reservation policy for soy meal as opposed to other meals produced in small-scale crush facilities. The export earnings have been quite significant. India earned Rs. 19 billion exporting 2.5 million tones of soy meal in 2001-2002. South Korea was the largest importer of Indian soy meal, followed by Indonesia and Japan.

Figure 4: Trends in productivity of Soybeans



3. Edible oil demand in India and import dependence

Edible oil consumption in India has been growing steadily over the years. Aggregate consumption increased from around six million tonnes in the early nineties to around than 11 million tonnes in recent years. However, per capita consumption of fats and oils in India is far below the world average (Table 3). Groundnut, Rapeseed/mustard and Soy oil together form around 60% of edible oils consumed in the country. Trends at the disaggregated level indicate that palm and soy oil, the two major imported oils, contributed the maximum to the growth in consumption (Figure 5). Increasing per capita incomes and availability of cheaper imports due to trade liberalization are some of the important factors behind this increase in demand. India's imports of palm and soy oil form 17% and 6% respectively of world imports of palm and soy oil.

Figure 5: Consumption of edible oils in India

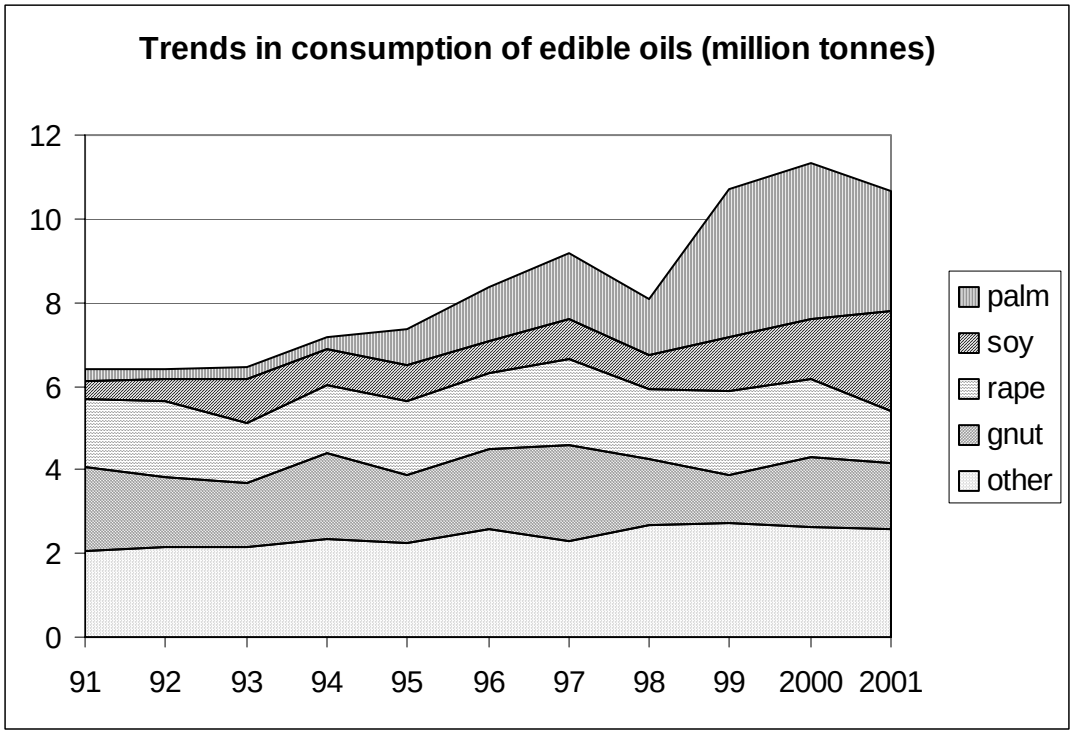


Figure 6.

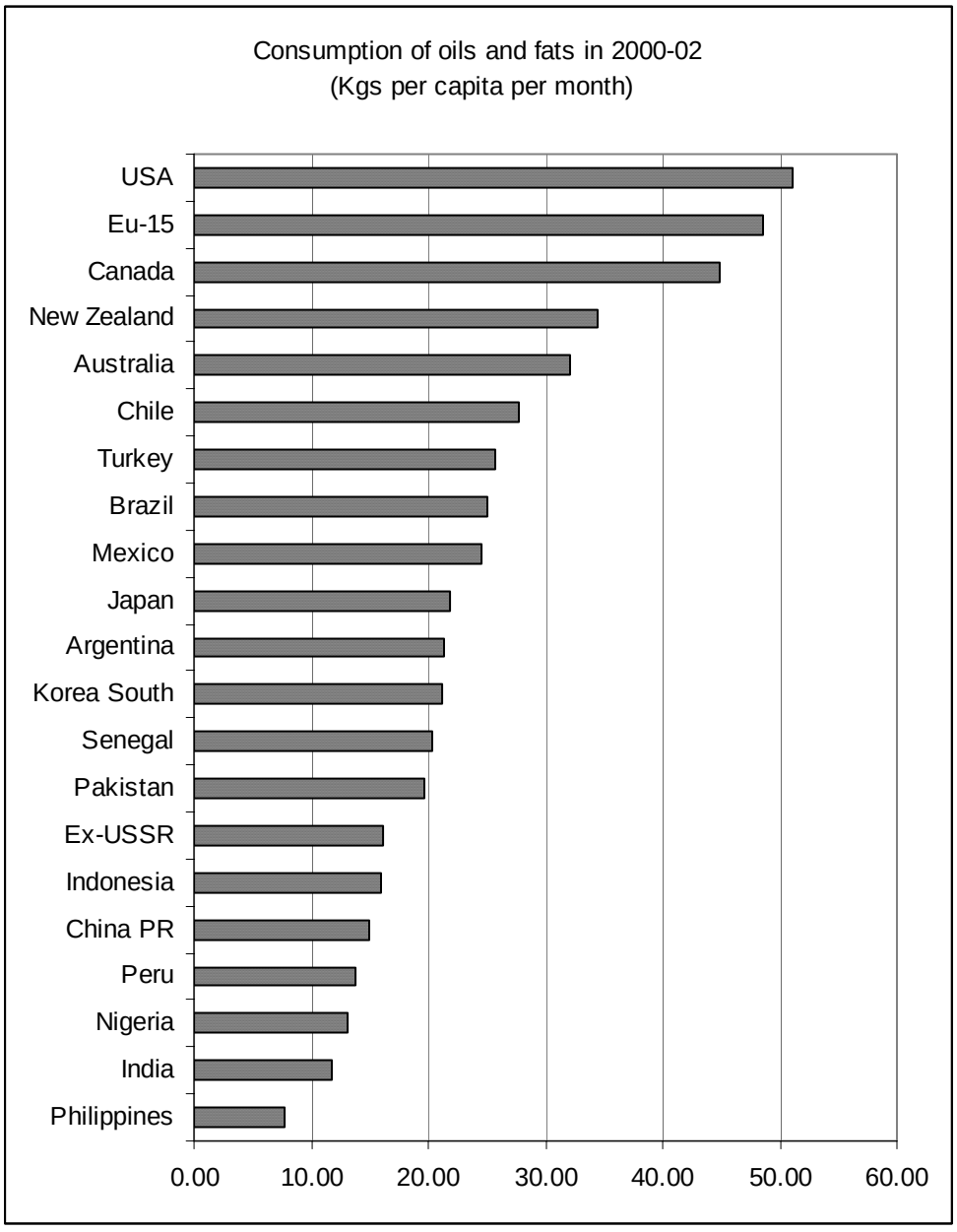

Consumption of oils and fats in 2000-02
(Kgs per capita per month)
USA
Eu-15
Canada
New Zealand
Australia
Chile
Turkey
Brazil
Mexico
Japan
Argentina
Korea South
Senegal
Pakistan
Ex-USSR
Indonesia
China PR
Peru
Nigeria
India
Philippines
0.00
10.00
20.00
30.00
40.00
50.00
60.00

Table 3: Comparing India's consumption of oils and fats with major countries

(Kgs percapita per annum)

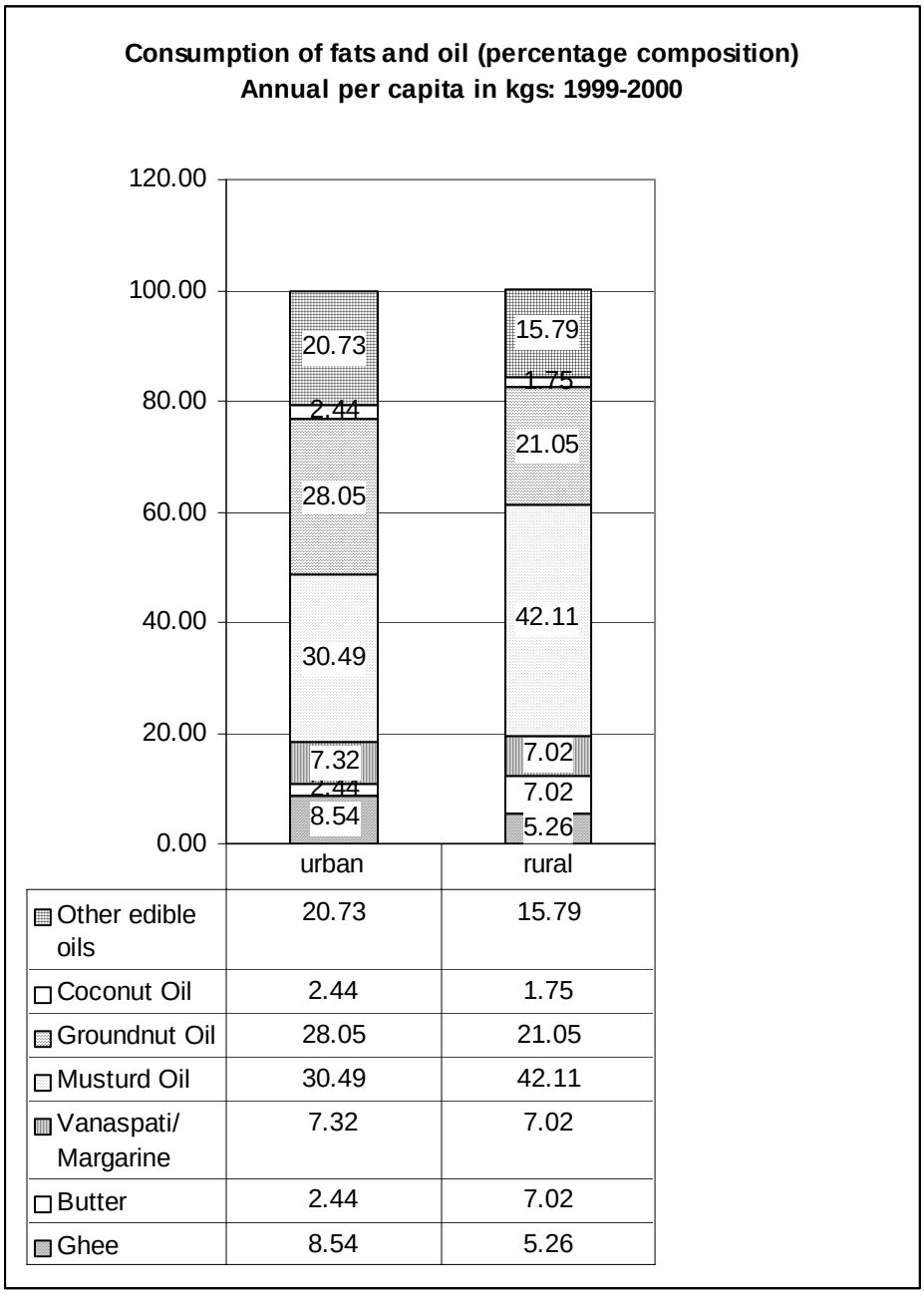
	1997	1998	1999	2000	2001	2002
Eu-15	43.6	44.8	45.8	47.1	49	49.7
Senegal	20.6	20.6	20.3	18.8	20.5	21.5
Peru	14.4	14.1	14.1	13.6	13.6	14.1
Ex-USSR	12.8	13.2	14.1	14.9	16.3	17
Nigeria	12.1	12.2	12.6	13	13.1	13.3
Chile	24.3	25	25.1	27.8	27.8	27.6
Canada	44.2	45.6	45.5	45.4	45	44.3
USA	46.5	46.8	49.8	50.3	51.7	51.3
Mexico	22.4	23.3	23.8	23.9	24.4	25.2
Argentina	23.6	23.7	23.3	23.1	21.3	19.8
Brazil	22.9	24.5	23.8	25.8	24.7	24.4
China PR	12	12.5	12.9	14	15	15.9
India	**9.9**	**10.1**	**11.2**	**11.6**	**11.8**	**11.8**
Indonesia	15.7	15.3	15.2	15.6	16	16.1
Japan	21.3	20.8	21.2	21.6	21.8	22
Korea South	18.9	17.1	19.7	20.6	21.1	21.8
Pakistan	18.7	19.1	19.3	19.7	19.5	19.6
Philippines	7.5	6.7	7.8	7.6	7.6	7.8
Turkey	26.7	27.3	26.5	26.7	24.5	26
Australia	33.8	32	32.6	32.5	31.9	31.7
New Zealand	27.3	29	29.3	31.9	34.1	37.5
World Average	**17.3**	**17.47**	**18.12**	**18.69**	**19.23**	**19.52**

Source: Annual Report 2002-03, IVPA (as given in http:// www.indiastat.com)

Consumption preferences for different oils vary across different regions in India and also between rural and urban areas. Groundnut and mustard oil together account for 59% and 67% of total edible oil consumption in urban and rural areas respectively (Figures 6 and 7). Consumer preferences are influenced by the crops grown in their regions. For example, in most of the southern and western states there is a strong preference for groundnut oil, whereas in the east and

the north it is mustard oil (Figures 8 and 9). The northern states also consume Vanaspati, a partially hydrogenated edible oil mixture. Oils that are generally not consumed directly for taste reasons (e.g. soybean, rice bran and cotton seed) are used in the manufacture of vanaspati. Newer oils such as soy oil and palm oil are finding their way into direct consumption mainly because of the cheaper price even with high tariffs. Market shares of raw oil, refined oil and vanaspati are respectively 42%, 43% and 13% respectively. About 60-70% of groundnut and mustard seeds are used to make non-refined or filtered oils as consumers have a liking for their distinct flavor. Non-refined oils are also mostly bought in loose form (unpackaged). However, consumers, at least in the urban areas are beginning to shift to packaged/branded oil due to growing heath consciousness. The available estimates of demand show that edible oil consumption is highly price and income elastic (Tables 4a and 4b). It is to be noted that aggregate national level consumption of estimated based on NSS data are underestimates compared to the supply and use data published by sources such as Oil World, Solvent Extractors Association and USDA. One of the reasons for this is that some of the intermediate consumption of edible oils is not reflected in the household survey data. For example, a large part of palm oil goes into the manufacture of 'Vanaspati', which is mostly used in commercial establishments such as restaurants, bakeries, sweet shops etc. The indirect consumption of vanaspati through foods purchased at these outlets is not however reflected in the NSS data. This is reflected in the fact that Vanaspati consumption is confined mainly to four states, Haryana, Punjab, Uttar Pradesh and Himachal Pradesh according to the NSS data.

Figure 6: Consumption pattern of fats and oils



	urban	rural
Other edible oils	20.73	15.79
Coconut Oil	2.44	1.75
Groundnut Oil	28.05	21.05
Musturd Oil	30.49	42.11
Vanaspati/ Margarine	7.32	7.02
Butter	2.44	7.02
Ghee	8.54	5.26

Figure 8: Regional variations in edible oil consumption- Rural India

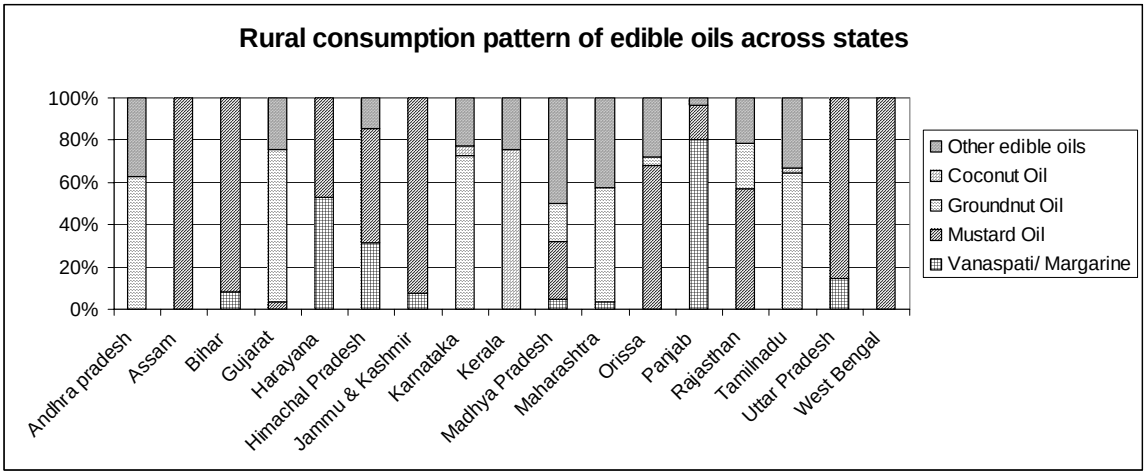


Figure 9: Regional variations in edible oil consumption- Urban India

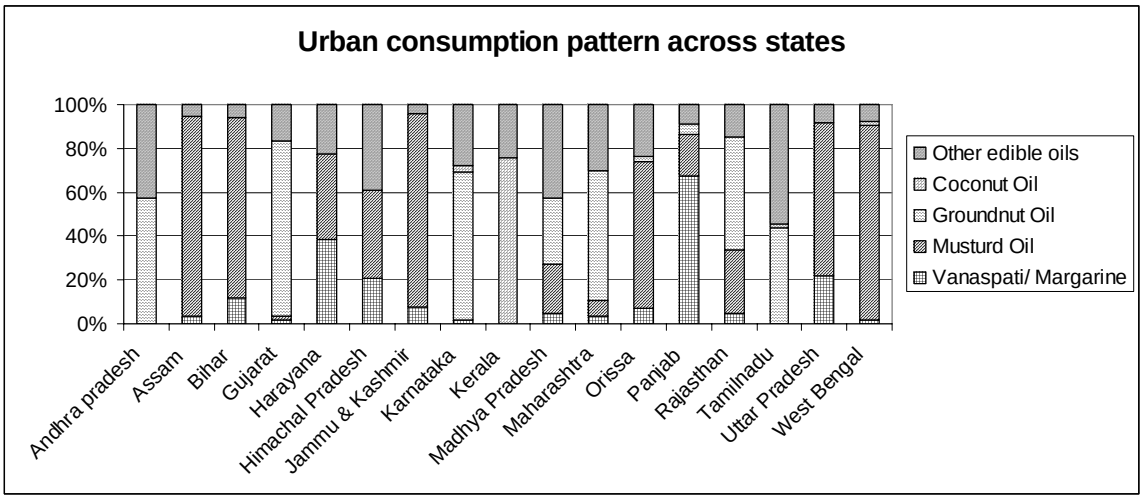


Table 4a: Income and own price elasticities of demand for edible oils

(Based on NSS data for 93-94, 50th round)

State	Income elasticity		Own price elasticity	
	Rural	Urban	Rural	Urban
Andhra Pradesh	1.1	1.12	-0.91	-0.91
Gujarat	1.11	1.12	-0.94	-0.95
Haryana	1.16	0.98	-1.08	-0.66
Karnataka	1.13	1.14	-0.53	-0.95
Madhya Pradesh	1.14	1.16	-0.72	-0.85
Maharashtra	1.08	1.09	-0.68	-0.92
Punjab	1.12	0.85	-0.61	-0.35
Rajasthan	1.24	1.07	-0.66	-0.45
Tamil Nadu	1.05	1.08	-0.93	-0.94
Uttar Pradesh	1.05	1.07	-0.74	-0.79
All India	1.17	1.14	-0.68	-0.85

Source: KN Murthy (2001).

Note: The elasticities are for the middle-income groups. The elasticities have been estimated for aggregate consumption of all edible oils. However in the model it would be assumed that these numbers represent elasticities of the major oil consumed in any state.

Table 4b: Own and cross price elasticities of demand for edible oils

Commodity	ground oil	soy oil	rape oil	palm oil	sun oil
ground oil	-1.0262	*0.187818*	*0.403885*	*0.279664*	1E-14
soy oil	0.2689	-1.8565	1.6578	*0.15064*	1E-14
rape oil	0.35092	*0.783663*	-1.4327	*0.162997*	*0.206608*
palm oil	0.367407	*0.124466*	0.213923	-1.62	*-0.3378*
sun oil	1E-14	1E-14	1.1816	-0.9	-1.0284

Source: Suresh Persaud (personal communication)

4. Structure of India's oilseed processing sector

The edible oil processing sector in India is characterized by large unutilized capacities (Table 5). Capacity utilization is higher in the refining sector mainly due to import of oil in crude form. Inefficiencies in the processing sector are mainly due to highly fragmented nature of the industry. The small-scale industry (SSI) reservations applying on groundnut and rapeseed

expellers prevent vertical integration of expeller and solvent extraction units like in other countries. This limits the ability of the processing units in reaping economies of scale. There is also the problem of excess capacity creation and production inefficiency due to under underutilized capacity. Excess capacity in soybean crushing for example, could be attributed the "replenishment" scheme that gave import licenses to soy meal exporters to import any goods of equivalent value, and also due to expectations of rapid growth in soybean production. The reason for overinvestment was due to tax holidays and other incentives provided to build plants (e.g. for development of backward areas). These incentives led to a uniform geographic spread of capacity. However it did not match up with the availability of raw material in the different regions. Under utilization of capacities is therefore mostly due to lack of raw materials and the impossibility of import of oilseeds due to tariff and non-tariff barriers.

The processing sector is also characterized by low profit margins due to stiff competition including from imports. The SSI policies apply mainly to the expeller units and not the solvent extraction units. The traditional expeller units (Ghanis) operate at just 10 percent capacity utilization whereas the more modern ones operate at 30 percent. In the north there is a strong preference among consumers for oil from Ghanis due to the natural flavor. The share of solvent extracted and refined oils in the domestic edible oil supply is increasing however. Experts in the industry believe that solvent extraction and refining units are undergoing a phase of consolidation and becoming more concentrated. Currently around 25% of the turnover is in the hands of 10-12 players out of a total of 600 players. By 2010 this expected to grow to 50%. There is however a limit to the extent of concentration because of the wide variety of oils/oilseeds and regional difference in tastes across a large country. Solvent extraction is a method of extraction of oil using a chemical solvent which is ideal for oilseeds with low oil content, e.g. soybean and cotton seed (World Bank, 1997). This technology is however being used for rapeseed-mustard and groundnut in order to circumvent the SSI policy restriction. The expander-solvent plants have been more successful with rapeseed compared to groundnuts.

Table 5: Capacity utilization in the processing sector

Type of Vegetable Oil Industry	No. Of Units	Annual Capacity (Lakh MTs)	Capacity Utilization
Oilseed Crushing Units	1,50,000 (Approx.)	425 (In terms of Oil Seeds)	10 - 30 %
Solvent Extraction Units	785	337 (In terms of Oil-bearing material)	32 %
Refineries (Independent &Attached with Vanaspati, Solvent Extraction Plant)	950 (Approx.)	60 (In terms of Oil)	32 %
Vanaspati Units	222	48.76 (In terms of Vanaspati)	41 %

Source: Directorate of Vanspati, Vegetable Oils and Fats (as given in http://www.fcamin.nic.in/sugar_edbl.htm)

5. Policy trends and Issues

Until recently (1994) imports of edible oils were canalized through the State Trading Corporation. Restriction on imports and stagnant domestic production implied that consumers faced high prices for oils. In order to reduce dependence on imports and increase domestic production the technology mission on oilseeds was initiated in 1986. Market intervention operations were also initiated by the National Dairy Development Board (NDDB) to stabilize prices. Import substitution policies helped in providing favorable price incentives with higher prices relative to competing crops. Nominal protection coefficients calculated for the major oilseeds, groundnut, rapeseed, soybean and sunflower were very high in most of the years (Gulati et al, 1996). Due to the market access commitments under the WTO quantitative restrictions on imports had to be removed. In 1994, edible oils were placed under Open General License (OGL) so that private traders could import edible oils freely subject to a tariff that was initially set at 65 percent. As per the agreement under the WTO India fixed its bound rate of tariffs at a high level of 300 percent for most oils, with the exception of soy oil for which the bound rate was fixed at 45 percent. Despite this low bound rate, palm oil and not soy is the most imported oil in India. This is mainly due to the price sensitivity of the Indian consumers (Dohlman et. al, 2003). Not only are palm oil prices lower at the point of origin (Malaysia and Indonesia) but also the freight cost is cheaper compared to Soy oil supplied from USA or Argentina. With trade liberalization imports rose and the prices of edible oils dropped for consumers. Currently more than 40 percent of India's edible oil demand is met through imports. This was mostly due to the gradual reduction in applied tariffs on all oils. By 1998 the tariff rates were reduced to 15 percent. In 1997 a tariff surcharge and special additional duty were added to the basic duty bringing the rate to 16.5 percent. These rates were however applied uniformly across all commodities. Of late there have been frequent adjustments to tariffs to protect domestic oilseed producers and processors and to smooth the effect of fluctuation world prices on domestic consumers. Differentiated tariffs were applied to different oils such as palm and soy. Duty difference was also made between crude and refined imported oils. This policy helped value addition within the country and also prompted modernization and capacity addition in the processing industry. The difference was maintained at 27.4 percent until April 2003 when it was reduced to 5 percent due to reduction in duty on refined palm oil imports. The reduction in duty on refined palm oil prevent oil prices from rising too much due to the drought conditions experienced in many parts of the country. This change has however affected adversely the processing sector. Recently the government is also taking steps to divert land areas under cultivation from wheat-rice to oilseeds through the freezing of minimum support price (MSP) for wheat and paddy. Although the government has allowed the import of oilseeds, there has been no import of oilseeds due to quarantine and other safety measures imposed by the government. Imports are allowed only in devitalized form (e.g. splitting/cracking requirement of soybean at the port). 30 percent import duty on oilseeds is perceived to be too high.

6. Objectives and Methodological approach

A major objective of this study is to analyze the impact of liberalizing edible oil imports on prices and production of different oilseeds; prices, consumption, production and import of oils;

and the overall welfare impact. Consumption of edible oils is characterized by strong regional preferences for "first press" oils with natural flavor (e.g. mustard, groundnut and coconut oils). However, the rising dependence on imported oils to meet the demand-supply gap has led to a gradual acceptance of other oils (refined, blended) by the consumers. Per capita demand for edible oils has begun to rise gradually due to income growth and so has the diversity in consumption of edible oils. There is also a wide regional variation in the cultivation of oilseeds across the country. As trade liberalization influences prices of various oilseeds differently, the regional impact can be varying, affecting the producers in these regions differently.

Another objective is to examine the issue of providing price protection to oilseed growers through alternative means and their relative efficiencies in achieving this goal. The alternatives include tariffs on import of edible oils; tariffs on import of oilseeds and government subsidy. The impact of each of these alternatives on producers, consumers and processors, under different scenarios would be obtained. The attractiveness of each of the alternative mechanisms in ensuring a minimum price to oilseed farmers depends on the actual domestic and international market situation. In a situation where imports of oilseeds are attractive, import tariffs can be varied (a *variable levy system*), based on the domestic output scenario and the level of international prices so that imported oilseeds are not priced lower than the MSP. Alternatively, in a situation where international prices are such that neither imports nor exports are attractive, price support can be provided through government storage. Or, export subsidies (referred to as *export refunds or restitution*) can be given to traders to dispose of surplus stocks. This latter option is however irrelevant for India as it is currently heavily dependent on imports to meet its edible oil demand.

A partial equilibrium model that takes into account the regional patterns in the demand for edible oils and production of oilseeds is used to analyze the impact of different specifications of import tariffs and support price policy on the edible oil economy. The relationship between oil and oilseed prices is built into the model to analyze the extent to which the protection to processing sector is transmitted to the oilseed growers. In order to incorporate the “large country” effect import prices are made responsive to the magnitude of imports. If the volume of edible oils imported by India is a substantial proportion of world trade then world prices would respond to the magnitude of imports by India and cannot be taken as given.

Once market equilibrium values of prices and other variables are determined for each of the alternative scenarios depicting different ways of protecting domestic oilseed growers, the welfare impact including the regional welfare effects on consumers, producers and processors is obtained. The impact on prices and consumption of different oils is also obtained for the alternative scenarios considered.

Description of the model:

The model used is a multi commodity, partial equilibrium model that solves simultaneously prices and quantities in markets for five oils, four oilseeds and four oil meals. Equilibrium values of price, output etc, are computed by formulating the market equilibrium problem as a Mixed Complementarity Problem (MCP). This approach is convenient in handling simultaneously both equality and inequality restrictions on the endogenous variables of the model. Below is a brief description of the model with greater details provided in an appendix.

For each type of oil considered market clearance is achieved for all the three products oilseeds, oil and meal simultaneously. Four oils, groundnut, soybean, rapeseed/mustard and palm oil are considered separately while the rest of the oils are combined and specified as 'other' oils in the empirical implementation of the model. All these edible oils are considered to be importable in the model. Though in reality there are possibilities of groundnut oil being exported depending on the domestic supply situation and external market price levels. Palm oil currently forms around 78% of edible oil imports by India, soy oil forms around 17% and Rapeseed Mustard around 5%. Three of the oilseeds, groundnuts, soybeans and rape/mustard seeds, together accounting for over 80% of oilseeds grown in the country are treated separately and the rest of the oilseeds grouped under 'other' oilseeds. With the exception of groundnuts, all oilseeds are treated as importable and all and oil meals exportable.

Equilibrium prices of oils, oilseeds and oil meals are defined as the prices at which the respective demands are equated to supplies.

Oilseeds market:

Demand: Total demand for seed is the sum of crush demand by processors and other demand (food, feed etc). The latter is specified exogenously and the former is a function of crushing margin and income.
Crushing margin depends on the prices of oil, meal and seed and the extraction rates of oil and meal from the seed. It is defined as
$cm = a\, p^{oil} + b\, p^{meal} - p^{seed}$
where 'a' and 'b' denote the technical extraction rates (amount of oil/meal by weight per unit weight of seed) of oil and meal respectively.

Oilseed crush demand is motivated by the size of the crush margin relative to the cost of crushing. Since processing of oilseeds is not modeled here it is implicitly assumed that average costs are constant. This specification is appropriate only for a short run analysis and the changes in crush demand would indicate movement along the demand curve and not shifts in the curve.[3]

Supply: Total supply of each oilseed is taken to be the aggregate of oilseed supply from all the producing states plus imports. Supply of oilseed in each of the producing states is a function of its own price, among other variables.

Imports: Oilseed imports are positive when domestic demand exceeds domestic supply at the import parity price. Market equilibrium price in such a case is equal to the import parity price. However, if at the import parity price there is excess supply then imports are zero and equilibrium price would be lower than import parity price. Thus, equilibrium domestic seed price is always lower than or equal to the import parity price.

[3] Currently most of the processing plants in India are operating at a low capacity. With a reduction or elimination of tariff barriers on oilseeds there would be increased availability of oilseeds allowing processing plants to operate at a higher level. This would reduce unit costs and may lead to an outward shift in the crush demand schedule in the medium or long run. Thus, e.g. a reduction in the price of domestic oil due to decreases in oil tariffs need not reduce the prices for oilseed farmers if there is a compensating change in the crushing efficiency. For a given oil demand curve if the supply curve for shifts outward it increases the derived demand for oilseeds and hence their prices other things remaining constant.

Note that for domestically produced oilseeds the wholesale price is obtained as price at farm level plus wholesaler and marketing margins. In general, marketing margins account for the price difference between the wholesale market and the farm gate and consist of transport costs, taxes, insurance, interest charges, bagging, packing and handling charges, grading and storage. In the case of commodities that require processing, processing costs are also included. For imported oilseeds, import parity price (at domestic wholesale market level) is obtained by adding external trade and transport margins to the border (cif) price. External trade margins include foreign exchange brokerage, import registration fees, domestic freight, port charges, import taxes, VAT and other domestic taxes.

Price support to oilseed farmers

Equilibrium price of seed is influenced by government's price support policy. The government can support farmers' price at a particular level (MSP) through alternative mechanisms. Through tariffs on import of edible oils, through tariffs on import of oilseeds or through subsidies similar to the marketing loan program or loan deficiency payment scheme in the USA.[4] In the first alternative consumers subsidize farmers and processors. In the second alternative subsidy to farmers is borne by both processors and consumers. In the last alternative the cost of subsidy to farmers is borne by the government.

Edible oils market:

Demand for each of the oils at the all India level is obtained as the aggregate of state-wise demands. In each state, demand for oil is a function of own and substitute oil prices and income.
Since India is a net importer of edible oils, supply consists of domestic production and imports. Domestic production of oil is determined from the crush demand for seeds, using the technical extraction coefficients. As in the case of seeds, net imports are equal to the excess demand (demand less domestic supply) for oil at the import parity price and in general domestic market equilibrium price is less than or equal to the import parity price.
In the model import parity prices are made responsive to the magnitude of imports ('large country' assumption). For example, in the case of palm oil the volume of imports by India is a substantial proportion of world trade (17%). World prices in this case may respond to the magnitude of imports by India and cannot be taken as given.

Oil Meal market:

India is a net exporter of oil meal and hence supply of meal oil consists of only domestically produced meal. As in the case of oil, meal output is determined from the crush demand for seeds using the technical extraction coefficients. Total demand for meal consists of domestic

[4] See, e.g. Young and Westcott (2000) for a description of these programs.

consumption and exports since oil meal is a net exported commodity. Export of meal is equal to the excess supply of meal at the export parity price.

Alternative scenarios:

Based on the issues to be analyzed different scenarios are constructed.

Two sets of issues are considered in this study.

1. What is the impact of trade liberalization? More specifically, what is the impact of eliminating import tariffs on edible oil imports? The answer to this is obtained by comparing two scenarios, a reference scenario (scenario A) where positive tariff rates apply on oil imports and another scenario (scenario B) where tariff rates are set to zero. The positive oil import tariffs in the reference scenario are set at currently observed levels. In both A and B import tariffs on oilseeds are set at zero.
2. What is the impact of providing price support to oilseed farmers using alternative methods? Various scenarios are constructed to answer this question. A reference scenario (scenario C) where there is no direct or indirect price support to oilseed farmers is compared with scenarios that provide alternative forms of price support to farmers. Import tariffs on oils and oilseeds are kept at zero in this scenario. We consider three alternative ways of providing price support. The first mechanism is indirect, through import tariffs on edible oils (scenario D). Here there are no explicit lower bounds placed on oilseed prices. Price support to oilseed farmers is indirect, through higher oil prices due to import tariffs and hence higher oilseed prices. That is, the equilibrium oilseed prices obtained in this scenario can be treated as the implicit MSPs obtained from import tariffs on oils. In the next two alternatives price support is provided by explicitly specifying lower bounds on the prices (MSP)) received by oilseed farmers. In the second alternative (scenario E) import tariffs on oilseeds are chosen so that equilibrium oilseed prices do not fall below MSP. In the third alternative (scenario F), farmers are compensated through cash subsidy the difference between MSP and market equilibrium price whenever the latter is lower than the former. For comparability, MSP levels in scenarios E and F are equal to the equilibrium oilseed prices obtained in scenario D.

Scenarios C – F are repeated for two different situations in which oilseed farmers are most likely to require price protection. 1. A situation when domestic output is high due to a good crop while international prices of oilseeds are at normal levels and 2. A situation when domestic crop output is normal, while international prices of oilseeds are at low levels.

Table 6. Scenarios to analyze trade liberalization

	Price support to oilseed farmers	Import tariff on oils	Import tariff on oilseeds
Scenario (A) (Reference scenario)	No	Positive	Positive
Scenario (B)	No	Zero	Positive

Table 7. Scenarios to analyze price support to oilseed farmers

	Price support to oilseed farmers	Import tariff on oils	Import tariff on oilseeds
Scenario (C) (Reference scenario))	No	Zero	Zero
Scenario (D)	Yes (implicitly through import tariff on oils)	Positive	Zero
Scenario (E)	Yes (MSP through import tariff on oilseeds)	Zero	Positive
Scenario (F)	Yes (MSP through government subsidy)	Zero	Zero

Note: For comparability of results the MSP, the minimum support price for each of the oilseeds is fixed at level equal to the equilibrium price of oilseed obtained in scenario D.

7. Results from model simulations

7.1. Impact of trade liberalization:

Trade liberalization is modeled as elimination of existing import tariffs on all edible oil imports. The overall welfare impact of this change is positive (Table 8). Consumers gain while the other agents lose. However, the substantial gain that accrues to consumers compensates producers, processors and government. Elimination of tariffs leads to a reduction in the domestic price of all oils (Table 9). It results in almost a 34 percent reduction in the average price of all oils. Price reduction is higher for imported oils. The percentage decreases in oilseed prices are much lower than those of edible oils as these are indirectly affected. Consumption/import of palm oil increases by 74% while consumption and import of other oils decrease due to cross price effects. Production of oilseeds and crushing margins also decrease as import tariff on palm oil is decreased. The decrease in production is greater in the case of soybeans. Percentage decrease in crush margin is largest for rapeseed. Although there is an overall increase in the consumption of edible oil due to decrease in import tariff on oils there is a large variation across oils in terms of percentage changes in consumption. While consumption of Soy and Palm oils increased that of the other oils decreased.

Regional impact of liberalization is obtained mainly in terms of changes in oilseed production and producer surplus across states. Obtaining state wise changes in consumption of edible oils was not possible in the absence of state wise price elasticities of demand. The impact on oilseed production due to trade liberalization varied due to variations in production patterns as well is price elasticities of supply (Table 10). As import tariffs on oils are reduced, there is a reduction in output of soybeans in Madhya Pradesh, Maharashtra and Rajasthan. The changes in producer surplus show that Gujarat, a major producer of groundnuts and Madhya Pradesh and Maharashtra (major producers of soybeans) are the top losers (Table 11).

Table 8: Welfare impact of reducing tariffs on edible oil imports

(Rupees crores)

Change in consumer surplus	8033.39
Change in producer surplus	-2695.63
Change in processor surplus	-4863.70
Change in government surplus	-4.49
Total change in surplus	469.58

Source: Author's computations

Table 9: Impact on trade liberalization on prices, production consumption, imports and other variables.

	With tariffs	Without tariffs
Oilseed prices (Rupees/quintal)		
Groundnut	1438.08	1438.08
Soybean	1132.26	968.93
Rapeseed	1215.00	1215.00
Others	1512.00	1039.30
Edible oil prices (Rupees/quintal)		
Groundnut oil	3770.30	3338.23
Soy oil	3417.24	2397.59
Rapeseed oil	4122.97	3022.48
Palm oil	4535.47	2597.61
Other oils	4601.29	2576.39
All oils (avg)	4127.49	2725.76
Crush demand for seed (Million tonnes)		
Groundnut	5.288	4.772
Soybean	6.082	5.129
Rapeseed	5.879	4.117
Others	3.253	2.209
Edible oil consumption (million tonnes)		
Groundnut oil	2.189	1.753
Soy oil	1.336	1.373
Rapeseed oil	2.215	2.033
Palm oil	1.862	3.236
Other oils	2.569	1.960
All oils	10.171	10.355
Oilseed production (million tonnes)		
Groundnut	6.358	6.358
Soybean	7.761	6.808
Rapeseed	4.137	4.137
Others	2.702	2.499

Table 9 (contd.): Impact on trade liberalization on prices, production consumption, imports and other variables.

	With tariffs	Without tariffs
Domestic production of oil (million tonnes)		
Groundnut	2.189	1.976
Soybean	1.070	0.903
Rapeseed	2.193	1.536
Others	1.148	0.780
Import of Oilseeds (million tonnes)		
Groundnut	0.556	0.040
Rapeseed	2.768	1.006
Import of edible oils (million tonnes)		
Soy oil	0.265	0.470
Rapeseed oil	0.023	0.497
Palm oil	1.862	3.236
Other oils	1.421	1.180
Revenue to oilseed producers (Rupees Crores)		
Groundnut	9143.95	9143.95
Soybean	8787.67	6596.65
Rapeseed	5026.26	5026.26
Others	4086.07	2597.50
All oilseeds	27043.95	23364.35
Crush margins (Rupees/quintal)		
Groundnut	612.01	494.72
Soybean	62.14	46.01
Rapeseed	765.71	409.05
Others	473.76	231.68

Source: Author's computations

Table 10: State-wise impact on oilseed production due to trade liberalization

Percentage changes in oilseed production due to elimination of import tariffs on edible oils				
	Groundnut	Soy	Rape	Total
Andhra Pradesh	0.00			0.00
Assam			0.00	0.00
Bihar			0.00	0.00
Gujarat	0.00		0.00	0.00
Haryana			0.00	0.00
Himachal Pradesh				
Karnataka	0.00			0.00
Kerala				
Madhya Pradesh	0.00	-12.28	0.00	-10.78
Maharashtra	0.00	-12.29		-9.54
Orissa				
Punjab				
Rajasthan	0.00	-12.24	0.00	-3.55
Tamil Nadu	0.00			0.00
Uttar Pradesh			0.00	0.00
West Bengal			0.00	0.00
Total of 16 states	0.00	-12.28	0.00	-5.22

Note: Blank cells indicate that crop is not grown or insignificant amount of production in the state.

Source: Author's computations

Table 11: State-wise impact on producer welfare due to trade liberalization

	Change in Producer surplus
Andhra Pradesh	-146.78
Assam	-0.49
Bihar	-26.60
Gujarat	-373.83
Haryana	-42.28
Himachal Pradesh	-0.49
Karnataka	-200.46
Kerala	-0.49
Madhya Pradesh	-976.23
Maharashtra	-539.56
Orissa	-39.90
Punjab	-26.60
Rajasthan	-175.64
Tamil Nadu	-53.19
Uttar Pradesh	-53.19
West Bengal	-39.90
Total of 16 states	-2695.63

Note: Producer welfare is affected even in the non soybean producing states due to the changes in prices of other oilseed crops.

Source: Author's computations

7.2. Impacts of protecting oilseed growers:

Three alternative ways of support to oilseed farmers' prices are considered in the model simulations. Price received by the farmers can be increased either through import tariff on edible oils or more directly tariff on import of oilseeds themselves (if oilseeds are imported) or alternatively through government cash subsidy program. The impact of the first alternative is obtained by comparing equilibrium oilseed prices in scenarios with and without oil tariffs. For meaningful comparison prices of oilseeds, in the other two alternatives, have to be supported at the same levels as those obtained in the case of tariffs on oil imports. That is, in the second alternative, the model would determine import tariffs on oilseeds endogenously so that prices are supported at these levels. This of course is possible only if the oilseeds are all imported. In the third alternative the government fixes Minimum Support Prices (MSP) at levels corresponding to the prices obtained in scenario with oil tariffs. It provides a cash subsidy to the farmer equal to the difference between the equilibrium market price and MSP whenever the former goes below the latter. That is, while buyers face the market equilibrium prices of seeds, farmers receive the higher of MSP and market equilibrium price. The 'effective' price that enters the oilseed supply response function is therefore the greater of the two: MSP and the equilibrium price. Government subsidy in this case is computed as the product of oilseed output and the difference between the 'effective' price and market equilibrium price.

Comparison of welfare impacts indicates that government cash subsidy is the most efficient alternative of protecting oilseed producers (Table 12). The alternative of imposing tariff on oilseed imports turns out to be an ineffective instrument to support farmers' prices. This is because import parity prices are such that imports are unattractive for most of the oils. The alternative of government subsidy results in a lower welfare loss compared to import tariff on oils. Funding of price support in the former alternative is from the general budget as opposed to an implicit tax on edible oil consumers in the latter case. Net welfare change in fact turns out to be positive with government subsidy when domestic oilseed output is normal and international oilseed prices are lower than normal (by 10%).

Table 12: Welfare impact of providing price protection to oilseed growers

	Changes in surplus				
	Consumers	Producers	Processors	Government	Total
Mechanism for price support					
	Scenario: High Domestic output and normal international prices of oilseeds				
Import tariff on edible oils	-7958.81	3448.59	4201.33	4.02	-304.86
Government subsidy in cash	89.57	3448.59	765.87	-4475.13	-171.10
	Scenario: Normal Domestic output and Low international prices of oilseeds				
Import tariff on edible oils	-7180.89	2286.51	4558.83	4.37	-331.18
Government subsidy in cash	68.57	2286.51	255.14	-2428.30	181.92

Source: Author's computations

The welfare impact on different agents indicates the following. Import tariff on oils benefits the processors as well as the oilseed producers. The benefits to the former are greater. These benefits however, come at the cost of consumer welfare. Price support through government cash subsidy yields positive welfare change to consumers, producers and processors. Benefits to oilseed producers are the maximum. The cost in this case is borne by the government. Government costs are higher in the case where domestic oilseed output is higher than normal.

Table 13 gives the impact on prices of oilseeds and oils and other variables due to the two alternative price support mechanisms. We discuss the results for the case where domestic output of oilseeds is high and international prices of oilseeds at their normal levels. The results are similar for the other case where domestic output is normal but international prices are low. It is seen that import tariffs on edible oils increase the prices of all the edible oils and prices of all oilseeds with the exception of rapeseed.

Table 13: Impact of providing price protection to oilseed farmers on prices, production, consumption, imports and other variables.

	No price support	Price support through tariff on oil imports	Percent change	Price support through government subsidy in cash	Percent change
Oilseed prices (Rupees/quintal)					
Groundnut	1319.92	1415.40	7.23	1415.40	7.23
Soybean	956.40	1117.80	16.88	1117.80	16.88
Rapeseed	1215.00	1215.00	0.00	1215.00	0.00
Others	983.28	1512.00	53.77	1512.00	53.77
Edible oil prices (Rupees/quintal)					
Groundnut oil	3338.23	3742.47	12.11	3338.23	0.00
Soy oil	2384.03	3400.90	42.65	2360.64	-0.98
Rapeseed oil	3016.87	4116.50	36.45	3007.82	-0.30
Palm oil	2597.04	4535.04	74.62	2596.25	-0.03
Other oils	2561.26	4600.42	79.62	2543.24	-0.70
All oils (average)	2719.19	4118.58	51.46	2709.38	-0.36
Crush demand for seed (Million tonnes)					
Groundnut	5.11	5.32	4.05	5.32	4.05
Soybean	5.73	6.77	18.14	6.77	18.14
Rapeseed	4.11	5.87	42.71	4.10	-0.22
Others	2.43	3.25	33.94	2.68	10.50
All seeds	17.38	21.21	22.01	18.87	8.58
Edible oil consumption (million tonnes)					
Groundnut oil	1.75	2.20	25.89	1.74	-0.34
Soy oil	1.38	1.34	-2.96	1.40	1.37
Rapeseed oil	2.03	2.21	8.83	2.02	-0.49
Palm oil	3.23	1.86	-42.53	3.22	-0.37
Other oils	1.97	2.56	30.35	1.97	0.36
All oils	10.35	10.17	-1.78	10.35	-0.02

Table 13 (contd.): Impact of providing price protection to oilseed farmers on prices, production, consumption, imports and other variables.

	No price support	Price support through tariff on oil imports	Percent change	Price support through government subsidy in cash	Percent change
Oilseed production (million tonnes)					
Groundnut	6.74	6.95	3.07	6.95	3.07
Soybean	7.41	8.45	14.03	8.45	14.03
Rapeseed	4.55	4.55	0.00	4.55	0.00
Others	2.72	2.97	9.38	2.97	9.38
All seeds	21.42	22.92	7.01	22.92	7.01
Domestic production of oil (million tonnes)					
Groundnut oil	2.12	2.20	4.06	2.20	4.06
Soy oil	1.01	1.19	18.15	1.19	18.15
Rape oil	1.53	2.19	42.63	1.53	-0.26
Other oils	0.86	1.15	33.96	0.95	10.50
All oils	5.52	6.73	22.01	5.87	6.44
Import of Oilseeds (million tonnes)					
Rapeseed	0.59	2.34	298.98	0.58	-1.53
Import of edible oils (million tonnes)					
Soy oil	0.38	0.15	-59.73	0.21	-43.73
Rapeseed oil	0.49	0.02	-96.35	0.49	-1.42
Palm oil	3.23	1.86	-42.53	3.22	-0.37
Other oils	1.11	1.42	27.66	1.03	-7.48
All oils	5.21	3.44	-33.90	4.94	-5.11

Table 13 (contd.): Impact of providing price protection to oilseed farmers on prices, production, consumption, imports and other variables.

	No price support	Price support through tariff on oil imports	Percent change	Price support through government subsidy in cash	Percent change
Revenue to oilseed producers (Rupees Crores)					
Groundnut	8894.84	9831.52	10.53	8669.05	-2.54
Soybean	7084.51	9440.44	33.25	7894.19	11.43
Rapeseed	5528.88	5528.88	0.00	5528.88	0.00
Others	2672.30	4494.68	68.20	2728.29	2.09
All	24180.53	29295.53	21.15	24820.40	2.65
Crush margins (Rupees/quintal)					
Groundnut	572.20	619.33	8.24	619.33	8.24
Soybean	56.15	73.72	31.29	73.72	31.29
Rapeseed	407.91	763.30	87.12	406.08	-0.45
Others	282.35	473.46	67.68	341.49	20.94

Source: Author's computations

Note: These results correspond to the case of high domestic output of oilseeds and normal (trend) level of international prices of oilseeds.

Tariff on oil imports increases edible oil prices (average of all oils) by 51%. However, total edible oil consumption decreases only by 2% approximately. Consumption of imported oils- soy and palm decreases but that of other oils increases. Oil imports decrease by 1.765 million tones. This however is compensated by an increase in domestic production of oils by 1.214 million tones. Total domestic oilseed production increases by 7%. There is an increase in crush demand and crush margins for all seeds. Model simulations reveal that import of rapeseeds increases when tariffs are imposed on edible oil imports. In reality, we do not see this happen due to the existence of non-tariff barriers such as sanitary and phyto sanitary restrictions.

In the second alternative where producer price is supported through government cash subsidy we see that there is not much change in domestic edible oil consumption. This is due to the way the price support mechanism operates. Since cash subsidy is provided to farmers to protect their prices at a higher than the level determined by market mechanism the prices faced by processors for the seeds purchased remains the same as in the base scenario. Hence there is not much change in prices faced by domestic edible oil consumers. Domestic production of oilseeds however increase by the same percentage as in the case of price support through tariff on oils since the level at which the prices are supported is the same in both the alternatives. However, the increase in domestic production of oilseeds leads to only a 5% decrease in oil imports, as the absence of tariffs makes imports attractive. The crush demand for seed and the domestic production of oil both increase by a lower percentage (8.5% and 6.4% respectively) compared to the first alternative.

Since the price support mechanisms are centrally administered there are no regional variations in producer welfare changes under the two alternatives.

8. Concluding Remarks

There has been an impressive 2 percent growth in the yields of oilseeds in India in the last 15 years. However, a large demand-supply gap persists due to rising demand. Annual per capita demand for edible oils increased from 6.5 kg in the 1990s to over 10 kg in the early 2000s. The edible oil and oilseeds sector faces many challenges in the new environment of liberalized trade. Government intervention is faced with the task of balancing the interests of different stakeholders in the oilseed complex. Providing benefits to some may be at the cost of others. Import of low priced oils for example benefit the consumers but tend to reduce the margins on domestic oils for the processors. Similarly protection to oilseed farmers growers can make oil and meal products internationally uncompetitive. This study analyzes the impact on producers and consumers due to trade liberalization of edible oils as well as due to alternative price support policies for oilseed growers.

Consumption of edible oils is characterized by strong regional preferences for traditional oils though rising dependence on imported oils and the price factor has led to a gradual acceptance of other oils (soy and palm) by the consumers. Price changes in edible oils due to trade liberalization and other policies can have different implications for consumers in different regions. These regional impacts, however, could not be captured due to the lack of region wise own and cross price elasticities of demand. Nevertheless, with the help of available supply elasticities at the state level, the regional impacts on producer surplus due to liberalization of

edible oil imports could be obtained. As trade liberalization influences prices of various oilseeds differently, the impact on oilseed producers in different regions can be varying.

A partial equilibrium model that takes into account spatial variation in the production of oilseeds is used for the analysis. The relationship between oil and oilseed prices is built into the model to analyze the extent to which the protection to processing sector is transmitted to the oilseed growers. In order to capture the "large country" effect import prices are made responsive to the magnitude of imports. Equilibrium values of price, output etc, are computed simultaneously for all the oilseeds/oils/meals using a multi commodity model. The following are the main results from the model simulations.

Reducing tariffs on edible oil imports:

There is a substantial benefit to consumers due to tariff reduction on edible oil imports. The gains are large enough to compensate for the losses incurred by other agents with an overall net welfare gain. Prices of both oils and oilseeds are reduced. Consumption of palm and soy oil is increased but consumption of other oils decreases due to substitution effects. The total edible oil consumption is however higher, but only by 2%. Reduction in import tariffs leads to maximum increase in the imports of palm and soy oils with very small increases in the import of other oils Crush demand for oilseeds decreases due to a decrease in crush margins leading to a reduction in domestic production of edible oils. The regional impact on producer welfare shows that the states producing soybeans are the worst affected by trade liberalization.

Supporting the price of oilseed farmers:

The results from model simulations show clearly that import tariff on oilseeds cannot be a reliable mechanism to support farmers' prices, as most of the oilseeds are not imported at the existing import parity prices. Between the other two alternatives import tariff on edible oil and government subsidy in cash, the latter turns out to be more attractive.

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Appendix Tables

Table A1: Own price elasticity of supply of oilseeds

Oilseed	Major producers	Own price elasticity
Groundnut	Andhra Pradesh	0.404
	Gujarat	0.681
	Karnataka	0.288
	Tamil Nadu	0.530
Soybean	Madhya Pradesh	0.841
	Maharashtra	
	Rajasthan	
Rapeseed-Mustard	Rajasthan	1.493
	Uttar Pradesh	0.767
	Madhya Pradesh	0.942
	Haryana	2.532

Source: Author's computations

Table A2: Other elasticity parameters used in the model

Elasticity	Value
Elasticity of crush demand w. r. t. crush margins for all seeds	+0.5 [short run elasticity estimates available for several countries fall in the range of 0.2 to 0.5]
Price elasticity of demand for all meals	-0.5
Income elasticity of meals	+0.5
Import price elasticity of all oils	+0.1

Table A3: State wise urban edible oil consumption- 1999-2000 (monthly per capita in Kgs)

State	Ghee (1)	Butter (2)	Vanaspati/ Margarine (3)	Mustard Oil (4)	Groundnut Oil (5)	Coconut Oil (6)	Other edible oils (7)	Sum Total (3 to 7)
Andhra Pradesh	0.02				0.34		0.25	0.60
Assam	0.01	0.15	0.02	0.49			0.03	0.55
Bihar	0.02		0.06	0.42			0.03	0.52
Gujarat	0.19		0.02	0.02	0.83		0.17	1.05
Haryana	0.17		0.24	0.24			0.14	0.63
Himachal Pradesh	0.15	0.03	0.15	0.29			0.28	0.73
Karnataka	0.03	0.01	0.01		0.39	0.02	0.16	0.59
Kerala	0.01					0.34	0.11	0.46
Madhya Pradesh	0.07		0.03	0.14	0.19		0.27	0.64
Maharashtra	0.03	0.01	0.03	0.06	0.49		0.25	0.84
Orissa	0.01		0.03	0.28	0.01		0.10	0.43
Panjab	0.11	0.00	0.45	0.13	0.03		0.06	0.67
Rajasthan	0.28		0.03	0.18	0.32		0.09	0.62
Tamilnadu	0.02	0.02			0.25	0.01	0.31	0.58
Uttar Pradesh	0.10		0.13	0.42			0.05	0.60
West Bengal	0.04	0.06	0.01	0.58	0.01		0.05	0.68
India	**0.07**	**0.02**	**0.06**	**0.25**	**0.23**	**0.02**	**0.17**	**0.72**

Source: NSS report no. 461: Consumption of some important commodities in India, 1999-2000 (55th Round), National Sample Survey Organization, Government of India (July 2001)

Table A4: State wise rural edible oil consumption- 1999-2000 (monthly per capita in Kgs)

State/U.T.	Ghee (1)	Butter (2)	Vanaspati/ Margarine (3)	Mustard Oil (4)	Groundnut Oil (5)	Coconut Oil (6)	Other edible oils (7)	Sum Total (3 to 7)
Andhra Pradesh					0.29		0.17	0.46
Assam				0.34				0.35
Bihar	0.01		0.03	0.35				0.40
Gujarat	0.07			0.03	0.58		0.20	0.82
Haryana	0.14	0.01	0.20	0.18				0.39
Himachal Pradesh	0.09		0.19	0.33			0.09	0.61
Karnataka	0.01				0.32	0.02	0.10	0.44
Kerala						0.31	0.10	0.42
Madhya Pradesh	0.06		0.02	0.12	0.08		0.22	0.43
Maharashtra	0.01		0.02		0.32		0.25	0.59
Orissa				0.17	0.01		0.07	0.26
Panjab	0.09		0.45	0.09			0.02	0.56
Rajasthan	0.10			0.24	0.09		0.09	0.43
Tamilnadu					0.27	0.01	0.14	0.43
Uttar Pradesh	0.02		0.07	0.41				0.50
West Bengal				0.41				0.43
India	**0.03**		**0.04**	**0.24**	**0.12**	**0.01**	**0.09**	**0.50**

Source: same as above

Table A5: Estimates of supply response equations for Rapeseed-Mustard

	HARYANA	UTTAR PRADESH	RAJASTHAN	MADHYA PRADESH
Independent variables				
Rainfall (mm)	0.2854	0.515	-0.0208	0.626
	(-1.09)	(1.95)	(-0.17)	(1.48)
Percent area irrigated	1.532	0.042	1.762	0.72
	(1.86)	(0.45)	(2.9)	(1.69)
Lagged own price	2.532	0.767	1.493	0.942
	(2.26)	(1.54)	(4.17)	(1.87)
Lagged alternative crop price	-1.061	-0.389	-0.238	-0.205
	(-1.18)	(-1.04)	(-0.96)	(-0.74)
constant	12.38	-0.126	-8.435	-6.33
DW- stat	1.822	1.571	1.909	1.97
R-bar square	0.7034	0.4327	0.9148	0.824
no of observations	15	15	15	15

Source: Author's computations

Note: Dependent variable is output of rapeseed-mustard. Wheat and pulses (Tur) are taken as alternative crops.

Table A6: Estimates of supply response equations for Groundnuts

	Andhra Pradesh	Gujarat	Karnataka	Tamil Nadu
Lagged own price	0.4044	0.6814	0.2881	0.5303
	(2.96)	(1.79)	(2.33)	(5.26)
Percent area irrigated (lagged once)	0.3600	-0.4622	0.1237	-0.0381
	(0.45)	(0.78)	(1.1)	(-0.36)
Percent area irrigated (lagged twice)	1.1516	1.5449	0.0972	-0.0469
	(1.53)	(2.62)	(0.90)	(-0.21)
Const.	0.4232	0.3902	4.2829	3.8080
DW stat (4,17)	2.0003	1.8828	2.1731	1.4170
R-bar square.	0.3013	0.3036	0.3448	0.7292
No. of observations.	17	17	17	17

Source: Author's computations

Table A7: Estimates of supply response equations for Soybeans

	Madhya Pradesh
Rainfall (mm)	-0.03973
	(-0.25)
Lagged own price	0.8411857
	(1.7)
Lagged alternative crop price	0.2647818
	(0.92)
constant	1.054619
DW stat	2.65
R-bar square	0.1894
No. of observations	8

Source: Author's computations