

S.K. Gupta *Editor*

Technological Innovations in Major World Oil Crops, Volume 1

Breeding

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Preface

Over the past decades, the production and the trade of the major world oil crops has increased tremendously in response to growing world population and rising living standard. Technological innovations in breeding major oil crops have led to higher yield and nutritionally superior edible oil. Despite of the fact that recent technological advances made in all the major oil crops, the need and opportunities to increase the production and oil yield are as great today as they have ever been. Realizing the importance of these crops in India, Canada, China, USA, Germany, Poland, Spain, Sweden, France, Australia and rest of the countries of the world, there is urgent need to upto date the knowledge of the recent technologies developed so far in enhancing the production at global level. The objective of editing this volume is to provide the latest references for those interested or involved in the genetic manipulation of these crops. This volume covers 13 chapters which have been well prepared by the leading scientists of the world with long experience and intensive knowledge of the subjects. It also contains the technological innovations not only related to breeding but also to nutritionists, biotechnologists and industrialists as well.

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Chapter 1

Production and Trade of Major World Oil Crops

Manmohan Sharma, S.K. Gupta, and A.K. Mondal

Abstract Oilseeds are an important group of crop plants whose oil can be used for human consumption. There are about 40 different oil seeds whose oil can be consumed but only a few are significant in the total world trade. Oil crops are grown world over under varied agroclimatic situations and are vital commodities in the trade and commerce of many economies. The increase in production has occurred mainly due to rising demand for oilseed products and it has been possible mainly due to increase in area under the crop, as well as due to breeding of high yielding varieties. This has been supplemented with the advanced scientific production technologies which have resulted in high levels of per unit productivity, particularly in countries with high standards of agricultural production. Among the oilseed crops, soybean is the major contributor in world oilseed economy followed by rapeseed mustard, cotton, peanut and sunflower. The most important tropical oilseeds are the coconut, palm kernels and groundnut. The major oilseed producing areas are in the temperate zones. America and Europe together account for more than 60% of the world production of oil seeds whereas substantially small production (<5%) comes from tropical areas such as Africa, Malaysia and Indonesia. Both oilseed and oil production have consistently increased over the years to meet the ever increasing demand of vegetable oils. Among the oil seeds, soybean is the chief oil seed crop. *Brassica* species are the second largest oilseed crop after soybean (*Glycine max* (L.) Merr.) in the world oilseed production, surpassing peanut (*Arachis hypogaea* L.), sunflower (*Helianthus annuus* L.) and cottonseed (*Gossypium hirsutum* L.) during the last two decades (FAO (2010) Agricultural Outlook 2010–19). Palms are grown predominantly in the tropical areas of the world as perennial trees and are an important source of vegetable oil. About two-thirds of the total fat oil production is supplied by oilseeds, with palm oil having maximum share of 33%. Copra, cotton, palm, peanut, rapeseed, soybean and sunflower are the oilseed

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crops which dominate the international markets for trade purpose. Both imports and exports of oilseeds and their oils have shown a rising trend due to increased demand and supply of these commodities. China is a dominant importer for oilseeds as well as vegetable oils while the USA is a major exporter for oilseeds, and Indonesia and Malaysia for vegetable oils.

Keywords Oil crops • Agricultural production • World production • Vegetable oils • International markets • Imports and exports

1 Introduction

Plants are useful to human beings in a variety of ways. The crop plants are particularly useful for human consumption. These include cereals, pulses, oilseeds, vegetables, condiments, spices, medicinal and aromatic plants, etc. They are important because they are vital for sustaining human life, besides a variety of animals, birds, insects and many other living creatures. Oilseeds are an important group of crop plants whose oil can be used for human consumption. There are about 40 different oil seeds whose oil can be consumed (Lennerts 1983), but only a few are significant in the total world trade and supply of oilseeds. Oil crops are grown world over under varied agroclimatic situations and are vital commodities in the trade and commerce of many economies. Oil seed crops are of three distinct categories: the annual or biennial group which includes soybeans, sunflower, groundnuts and rapeseed; the perennial tree crops include coconuts and oil palms. Cotton and corn germ belong to third group in which embryo is a by-product. Other oilseeds are of minor importance in the world trade but they do play a significant role in local markets or serve as raw materials for special products. These include castor, safflower, linseed, tung nut, etc. Besides consumption in the form of oils as ingredients of human food, many of the oilseeds are used unprocessed in animal feed as well as in processed form as cakes or meals which are an important source of dietary proteins for animals.

2 Production Trends

There has been an increasing trend in average annual production of oilseed over years from 244.35 million metric ton (mmt) in 1997 to 395.13 mmt in 2008–2009 registering about 38% increase during this period. The increase in production has occurred mainly due to the rising demand for oilseed products and it has been possible mainly due to the increase in area under the crop, as well as due to the breeding of high yielding varieties. This has been supplemented with the advanced scientific production technologies which have resulted in high levels of per unit productivity, particularly in countries with high standards of agricultural production. Among the oilseed crops, soybean is the major contributor in world oilseed economy with production of 210.86 mmt in 2008–2009 accounting for 55–60% of the total oilseed

Table 1.1 Average annual production of major world oilseeds

Oilseed crop	Year wise production (mmt)			
	2005–2006	2006–2007	2007–2008	2008–2009
Copra	5.60	5.27	5.72	5.88
Cotton	43.47	46.00	45.91	41.26
Palm kernel	9.97	10.18	11.10	11.74
Peanut	33.22	30.72	32.29	34.15
Rapeseed	48.50	45.09	48.52	58.21
Soybean	220.67	237.12	221.14	210.86
Sunflower	30.04	29.84	27.02	33.03
Total	391.45	404.18	391.79	395.13

Source: FAO (2010)

Table 1.2 Average annual production of major world vegetable oils

Oilseed crop	Year wise production (mmt)			
	2005–2006	2006–2007	2007–2008	2008–2009
Coconut	3.46	3.22	3.53	3.63
Cotton	4.90	5.13	5.22	4.84
Olive	2.66	2.91	2.84	2.97
Palm	35.83	37.23	40.94	42.41
Peanut	4.97	4.51	4.90	4.97
Rapeseed	17.30	17.01	18.33	20.37
Soybean	34.62	36.36	37.54	36.09
Sunflower	10.60	10.61	9.85	11.73
Total	118.72	121.45	128.05	132.14

Source: FAO (2010)

production (Table 1.1). It is followed by rapeseed mustard (14.73%), cotton (10.44%), peanut (8.64%) and sunflower (8.34%). The most important tropical oilseeds are the coconut, palm kernels and groundnut.

However, with respect to oil production, palm oil dominates the world vegetable oil economy with production touching 42.41 mmt during 2008–2009 (Table 1.2). It contributes about 36% of the total world oil production. It is followed by soybeans and rapeseed which have a share about 29 and 15%, respectively, to the total vegetable oil production.

3 Supply and Distribution

The major oilseed producing areas are in the temperate zones. America and Europe together account for more than 60% of the world production of oil seeds whereas substantially small production (<5%) comes from tropical acres such as Africa, Malaysia and Indonesia. Table 1.3 indicates that the USA is a major contributing country in world oil seed production which contributes 20–25% of share to the total oil seed production. Brazil, Argentina, China and India are the other major contributors. These five countries produce 70% of the total oilseed production.

Table 1.3 Major oilseeds: world production and distribution (FAO 2010)

Country	Year wise production (mmt)			
	2005–2006	2006–2007	2007–2008	2008–2009
USA	95.97	96.84	82.45	89.20
Brazil	59.13	62.02	64.18	59.47
Argentina	45.03	53.16	51.71	35.69
China	56.80	55.23	53.35	57.79
India	30.70	29.92	33.95	33.70
Others	104.12	107.01	106.15	119.28
Total	391.45	404.18	391.79	395.13

Table 1.4 Major vegetable oils: world production and distribution

Country	Production trends (mmt)			
	2005–2006	2006–2007	2007–2008	2008–2009
Indonesia	18.25	19.37	20.98	22.73
Malaysia	17.50	17.20	19.73	19.41
China	14.76	14.27	14.69	16.02
EU-27	12.80	13.66	14.28	15.42
USA	10.38	10.41	10.53	9.65
Argentina	7.63	7.71	8.48	7.65
India	6.85	6.43	7.01	6.80
Others	30.55	32.42	32.36	34.48
Total	118.72	121.45	128.14	132.14

Source: FAO (2010)

Both oilseed and oil production have consistently increased over the years to meet the ever increasing demand of vegetable oils. With respect to oil production, Indonesia ranks first with production of around 22.73 mmt during 2008–2009. It is followed by Malaysia, China, EU, USA, Argentina and India. These countries together account for 70–75% of the total vegetable oil production (Table 1.4).

4 Oilseed Crops

4.1 Soybean

Among the oil seeds, soybean (*Glycine max* (L.) Merr.) is the chief oil seed crop. Increased demand for soybean has occurred due to the rising consumption of soya oil, and rapid growth in meal demand. Worldwide it was grown over an area of 96.66 mha with production of 210.86 mmt during 2008–2009 (Table 1.5). The USA is a major contributor (38%) of soybeans in world oilseed economy. It is followed by Brazil, Argentina, China, India, Paraguay and Canada. These countries together contributed about 96% to the total soybean production during 2008–2009. Turkey (35.71 q/ha), Italy (34.45 q/ha) and Egypt (30.26 q/ha) too contribute

Table 1.5 Soybean seed: production and distribution

Country	2006–2007		2007–2008		2008–2009	
	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)
USA	30.19	87.00	25.96	72.86	30.21	80.75
Brazil	22.05	59.00	20.57	61.00	21.27	57.00
Argentina	15.13	48.80	15.98	46.20	16.38	32.00
China	9.30	15.97	8.75	14.00	9.13	15.50
India	8.33	7.69	8.88	9.47	9.60	9.10
Paraguay	2.20	5.85	2.40	6.90	2.65	3.90
Canada	1.20	3.47	1.17	2.70	1.20	3.33
Others	6.62	9.34	6.18	8.01	6.22	9.28
Total	95.02	237.12	89.89	221.14	96.66	210.86

Table 1.6 Soybean oil: production and distribution

Country	Year wise production (mmt)			
	2005–2006	2006–2007	2007–2008	2008–2009
USA	9.25	9.29	9.33	8.50
China	6.15	6.41	7.04	7.31
Argentina	5.99	6.42	6.63	6.12
Brazil	5.43	5.97	6.16	6.24
EU-27	2.46	2.64	2.67	2.31
India	1.07	1.18	1.46	1.34
Mexico	0.67	0.68	0.64	0.61
Others	3.59	3.76	3.61	3.64
Total	34.61	36.35	37.54	36.07

substantially because of higher levels of productivity. Table 1.6 indicates that of total world soybean oil production, which amounted to 36.08 mmt, 30.48 mmt (84.50%) was contributed by USA (23.56%), China (20.27%), Argentina (16.96%), Brazil (17.30%) and EU (6.40%).

4.2 Rapeseed Mustard

Brassica species are the second largest oilseed crop after soybean (*G. max* (L.) Merr.) in the world oilseed production, surpassing peanut (*Arachis hypogaea* L.), sunflower (*Helianthus annuus* L.) and cottonseed (*Gossypium hirsutum* L.) during the last two decades (FAO 2010; Raymer 2002). Of the 37 species in the *Brassica* genus, the four most widely cultivated species for oilseed and vegetable production are *Brassica rapa* L., *Brassica juncea* (L.) Czernj and Cosson, *Brassica napus* L. and *Brassica carinata* A. Braun (Raymer 2002; Rakow 2004; Sovero 1993). The world's *Brassica* commerce consists mainly of seed produced from the two species *B. napus* and *B. rapa* in Canada and Australia (Rakow 2004; Raymer 2002). Rapeseed is the most favoured vegetable oil, in Europe for the manufacture of biodiesel and is

Table 1.7 Rapeseed mustard area and production in world

Country	2006		2007		2008	
	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)
Canada	5.24	9.00	6.33	9.60	6.49	12.64
China	5.98	10.97	5.64	10.57	6.59	12.10
India	7.28	8.13	6.79	7.44	5.75	5.83
Germany	1.43	5.34	1.55	5.32	1.37	5.15
Ukraine	0.39	0.61	0.80	1.05	1.38	2.87
Poland	0.62	1.65	0.80	2.13	0.77	2.11
UK	0.58	1.89	0.68	2.11	0.60	1.97
Australia	1.05	0.57	1.06	1.07	1.17	1.62
Others	2.97	6.93	3.78	9.23	4.11	13.92
World total	25.54	45.09	27.43	48.52	28.23	58.21

Source: FAO (2010)

in great demand there. It is the third leading source of vegetable oil in the world after soy and palm and is also the world's second leading source of protein meal. In Europe, rapeseed is primarily cultivated for animal feed due to its very high lipidic and medium proteinic content, and for the production of vegetable oil for biodiesel. Canola is a specific variety of rapeseed bred to have a low erucic acid content. Processing of rape seed for oil production provides a rapeseed animal meal as a by-product. The by-product is a high-protein animal feed.

Rapeseed was cultivated over an area of 28.23 mha with production of about 58.21 mmt making it the third most important oil plant in the world after palm oil and soybean. The leading producers in 2008 were Canada, China, India, Germany and Ukraine having production of 12.64, 12.10, 5.83, 5.15, 2.87 mmt and estimated areas of 6.49, 6.59, 5.75, 1.37 and 1.38 ma, respectively (FAO 2010). These countries along with Poland, UK and Australia contributed about 77% of the total rapeseed mustard production of the world during 2008 with Canada as the largest producer contributing 22% (Table 1.7). Germany has the highest productivity of rapeseed (37.60 q/ha) followed by United Kingdom (32.98 q/ha) and Czech Republic (29.38). Because of its high yields, European Union was the leading producer of rapeseed oil in 2008. Rapeseed mustard seems to be the fastest growing world source of edible oilseeds and is one of the few species with potential to meet the growing edible oil needs of many countries in Asia, Africa and America.

Winter type *B. napus* is the main rapeseed crop in most of Europe, in parts of China and also in the eastern United States. Spring type *B. napus* is produced in Canada, Northern Europe and China. Where winters are mild enough (e.g., southeastern United States) spring type *B. napus* can be grown. Spring type *B. rapa* occupies approximately 50% of the Canadian rapeseed area and is also grown in Northern Europe, China and India. Winter type *B. rapa* has largely been replaced by a more productive winter type *B. napus* and spring crops in its traditional production areas and has no significant impact on the world's rapeseed production at the present.

Only spring types exist in *B. juncea*. It is the leading *Brassica* oilseed in India and also produced in Canada and Europe but only for condiment use. Recently, low erucic acid, low glucosinolate types of *B. juncea* have been developed and it is

possible that in the future it will be an important oilseed crop for the more arid areas of Canada and the northern United States. The transition from high erucic to low erucic rapeseed, and the simultaneous rapid growth in the global rapeseed production began in Canada in 1968, with commercial release of single low cultivar “Oro” followed by several other single low cultivars and the first canola Cultivar “Tower” in 1974. In Europe, the transition started later with the release of the first single low cultivars in 1974. Almost all rapeseed produced in Canada and Europe is canola. The introduction of low erucic rapeseed is now underway in China and India. This change in crop quality has created a need for specialized production of industrial rapeseed. The oil cake is a better feed for cattle and poultry due to less quantity of glucosinolates (<30 $\mu\text{moles/g}$ oil free meal). It has been found to be at par with soybean meal with good potential of developing high value protein food and feed.

4.3 Cotton

Cotton (*Gossypium* spp.) is a major fibre crop of global importance and has high commercial value. Four out of 50 recognized cotton species in the world are cultivated. Two of them (*Gossypium arboreum* and *Gossypium herbaceum*) are diploid and the remaining two (*G. hirsutum* and *Gossypium barbadense*) are tetraploids. More than 80% of the world cotton area is covered by *G. hirsutum* and *G. barbadense*. However, diploid cottons are also in cultivation in Asia and Middle East. In India, all cultivated species and some of their hybrid combinations are commercially grown.

Cotton is cultivated in 70 countries worldwide with total coverage of about 34 mha and production of around 41.26 mmt of cotton seed and 4.72 mmt of cotton seed oil in 2008–2009 (FAO 2010). Over a quarter of the world cotton area is in India, followed by USA (16%), China (14%) and Pakistan (8%). The remaining production comes from Turkey, Australia, Greece, Brazil and Egypt.

The cotton is a dual purpose crop, producing both seed and fibre as valuable primary agriculture products. In the process of ginning the cotton boll, the fibre is separated from the seed and used in textile industry. The separated cotton seed is fuzzy at this stage and can be directly used as cattle feed or processed to obtain the cotton seed oil.

4.4 Palms

Palms are grown predominantly in the tropical areas of the world as perennial trees and are an important source of vegetable oil having utility as cooking oil besides a variety of uses in food and allied industries. Production of palm kernel was around 11.74 mmt; however, with respect to oil production, palm oil dominates the world vegetable oil economy with production touching 42.41 mmt during 2008–2009. It contributes about 36% of the total world oil production. The major palm oil producing countries are Indonesia, Malaysia, Thailand, Nigeria and Colombia which together contributed about 93% of total world palm oil production in 2008–2009 (Table 1.8).

Table 1.8 Palm oil: production and distribution

Country	Production (mmt)			
	2005–2006	2006–2007	2007–2008	2008–2009
Indonesia	15.56	16.60	18.00	19.50
Malaysia	15.49	15.29	17.57	17.26
Thailand	0.78	1.17	1.05	1.20
Nigeria	0.80	0.81	0.82	0.82
Colombia	0.69	0.77	0.83	0.76
Others	2.51	2.59	2.67	2.87
Total	35.83	37.23	40.94	42.41

Table 1.9 Groundnut: production and distribution

Country	2006		2007		2008	
	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)
China	3.98	12.81	3.97	13.08	4.62	14.34
India	5.62	4.86	6.29	9.18	6.85	7.34
Nigeria	2.22	3.83	2.23	3.84	2.30	3.90
USA	0.49	1.58	0.48	1.70	0.61	2.34
Myanmar	0.73	1.02	0.65	1.00	0.65	1.00
Others	8.43	6.62	7.68	3.59	9.49	5.23
World	21.45	30.72	22.30	32.39	24.52	34.15
Average world productivity		14.32		14.52		13.92

4.5 Groundnut

Groundnut (*A. hypogaea* L.) is the most important oilseed and a highly explored agricultural commodity. Groundnut is grown in about 84 countries on an area of 24.52 mha with the production of 34.15 mmt and average productivity of 13.92 q/ha. Among the groundnut producing nations, India sows the highest area (around 28% of total world area) under this crop and is the second largest producer, next only to China. In India, groundnut occupies about 6.85 mha area with a production of about 7.34 mmt (Table 1.9). China, India, Nigeria, USA and Myanmar contributed about 85% of the total world production of groundnut in 2008 (Table 1.8). China (31.02 q/ha), USA (38.29 q/ha), Nicaragua (36.10 q/ha), Turkey (34.33 q/ha), Egypt (33.99 q/ha) and Syrian Arab Republic (31.87 q/ha) are the countries having very high average yields and thus contribute significantly to the world pool of groundnut.

4.6 Sunflower

Among the oilseed crops, sunflower (*H. annuus* L.) occupies fourth position in area and production in the world after soybean, rape seed mustard and groundnut. World harvest of sunflower was 33.03 mmt from an area of 18.98 mha during 2008 (Table 1.10).

Table 1.10 Sunflower: production and distribution

Country	2006		2007		2008	
	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)
Russian Federation	5.94	6.74	5.00	5.67	5.98	7.35
Ukraine	3.91	5.32	3.41	4.17	4.28	6.53
Argentina	2.17	3.76	2.35	3.50	2.58	4.65
India	2.12	1.23	1.88	1.46	2.05	1.11
China	0.99	1.80	0.72	1.19	1.04	1.85
Others	2.98	10.95	2.67	11.03	3.05	11.54
World	18.11	29.8	16.03	27.02	18.98	33.03

Table 1.11 Olive: production and distribution

Country	2006		2007		2008	
	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)	Area (mha)	Production (mmt)
Spain	2.48	5.68	2.60	6.22	2.60	6.22
Italy	1.17	3.42	1.16	3.43	1.21	3.51
Greece	0.80	2.43	0.80	2.44	0.80	2.44
Turkey	0.65	1.77	0.62	1.08	0.77	1.46
Tunisia	3.00	1.22	2.50	1.00	3.00	1.18
Others	2.37	4.21	2.42	3.37	2.45	3.51
World	10.47	18.73	10.10	17.54	10.83	18.32
Average world productivity (q/ha)		22.36		23.35		22.32

World sunflower production has remained almost stable over the last decade. Russian Federation, Ukraine, Argentina, India and China are the top five countries in the world with respect to production (21.49 mmt) and area under crop (15.93 mha). Europe alone accounts for about 50% of world area and total production. Asia and Africa share about 21 and 6% of the total sunflower area in the world, respectively. Average yield of the crop is significantly very high in countries like Croatia (31.03 q/ha), Austria (29.73 q/ha) and Switzerland (29.00 q/ha). USA, Romania, Bulgaria and Hungary are the other countries which have high potential for this crop.

4.7 Olive

The olive tree is the sixth most important oil crop in the world. World olive oil production is around 2.9 mmt, the Mediterranean countries being the major contributors (International Olive Council 2009, http://www.internationaloliveoil.org/downloads/production1_ang.PDF). Spain has largest area (2.60 mha) and highest production (6.22 mmt) followed in production by Italy, Greece, Turkey, Tunisia and Greece. These five countries accounted for 80.84% of the total world production (18.32 mmt) in 2008 (Table 1.11). Egypt has the highest productivity (63.60 q/ha) followed by

Peru (55.46 q/ha) and Australia (54.40 q/ha). USA, Chile, Mexico, Argentina and Slovenia are some of the other countries having higher productivity levels.

5 Trade and Supplies

The two important products obtained from oilseeds are oils/fats and meal/cake. Both the products are of great commercial value and hence the oilseeds are the commodities of great economic value. The proceeds from the sale of oil and cake cover the price of seed, which the miller has to pay, plus the processing costs. The profits obtained depend to a larger extent on the crushing capacities in relation to seed supply and product demand. Thus, oil and oilseed industry depends on commerce and business for three different types of markets, i.e. oil seed market, oil/fat markets and oilcake/meal markets. The government policies and laws, particularly with respect to import and export, are of great importance in day-to-day trading activities. The production of oilseeds is given in Table 1.1, but not all seeds are processed to obtain fat/oil. Part of oilseeds produced is used for sowing seed, fed unprocessed to animals or used directly for human consumption. Losses occur during storage and handling also. As a result 15–20% of seed produced remains unprocessed. About two-thirds of the total fat oil production is supplied by oilseeds, with palm oil having maximum share of 33%. In the production of vegetable oils, three annual crops, soybean, sunflower and rape and one tree crop, palm, predominate, accounting for 84% of all vegetable oils produced.

A review of Table 1.12 indicates that copra, cotton, palm, peanut, rapeseed, soybean and sunflower are the oilseed crops which dominate the international markets for trade purpose. Eighty to eighty-five percent of imports and exports are comprised of soybean trade alone. Both imports and exports of oilseeds have shown rising trends due to increased demand and supply of these commodities. The net import of oilseeds was 93.87 mmt during 2008 which was almost equivalent to the net export of 94.04 mmt during the same year. Oilseeds products such as protein cakes/meals for animals and specific by-products such as fatty acids increase the commercial value of these crops. A further perusal of Table 1.13 indicates that vegetable oil trade is dominated by palm oil accounting for 60–70% of total exports and imports. It is followed by soybean for its contribution in trade. The net import of oilseeds was 54.29 mmt and net export being 55.32 mmt during 2009–2009.

Among the major importers of oilseeds, China ranks first with net import of 44.14 mmt accounting for 47% of the total imports during 2008–2009 (Table 1.14). The other major importers of oilseeds include EU, Japan, Mexico, Taiwan, Turkey, Indonesia, Thailand, Egypt and South Korea. They along with China account for 85–90% of the total world imports of oilseeds. On export front, USA is the dominant player having share of 35–38% in total world exports. The other major exporters of oil seeds are Brazil, Canada, Argentina, Paraguay, Ukraine and Uruguay.

With respect to trade of vegetable oils (Table 1.15), China is again the net importer while Indonesia is the net exporter due to surplus production of palm oil in

Table 1.12 Major oilseeds: trade

Crop	Quantities traded									
	Imports (mmt)					Exports (mmt)				
	2005–2006	2006–2007	2007–2008	2008–2009		2005–2006	2006–2007	2007–2008	2008–2009	
Copra	0.07	0.09	0.11	0.10		0.10	0.13	0.13	0.11	
Cotton	1.10	0.84	0.75	0.55		0.96	0.84	0.84	0.48	
Palm	0.15	0.13	0.14	0.13		0.18	0.15	0.10	0.15	
Peanut	1.94	1.98	2.07	1.93		2.25	2.43	2.37	2.25	
Rapeseed	6.68	7.01	7.57	12.2		6.98	6.63	8.13	12.06	
Soybean	64.13	69.06	78.12	77.17		63.8	71.31	79.53	76.79	
Sunflower	1.39	1.75	1.25	1.80		1.52	1.88	1.41	2.2	
Total	75.45	80.86	90.00	93.87		75.79	83.36	92.51	94.04	

Source: USDA (2010)

Table 1.13 Major vegetable oils: trade
Quantities traded (mmt)

Crop	Imports					Exports				
	2005–2006	2006–2007	2007–2008	2008–2009	2008–2009	2005–2006	2006–2007	2007–2008	2008–2009	2008–2009
Coconut	1.99	1.88	1.93	1.61	1.61	2.08	1.74	1.93	1.52	1.52
Cotton	0.07	0.08	0.09	0.07	0.07	0.18	0.19	0.21	0.19	0.19
Olive	0.58	0.65	0.59	0.55	0.55	0.61	0.71	0.65	0.68	0.68
Palm	28.15	29.70	32.90	36.63	36.63	29.08	29.62	34.79	36.79	36.79
Peanut	0.16	0.18	0.15	0.14	0.14	0.20	0.16	0.15	0.20	0.20
Rapeseed	1.47	2.2	2.02	2.44	2.44	1.67	2.00	1.93	2.38	2.38
Soybean	9.09	9.93	10.4	8.85	8.85	9.84	10.57	10.87	9.06	9.06
Sunflower	3.23	3.39	2.66	3.99	3.99	3.95	3.96	3.36	4.50	4.50
Total	44.74	48.01	50.73	54.29	54.29	47.60	48.94	53.88	55.32	55.32

Source: USDA (2010)

Table 1.14 Oilseeds: major trading partners

Imports (mmt)		Exports (mmt)					
Country	2006-2007	2007-2008	2008-2009	Country	2006-2007	2007-2008	2008-2009
China	29.7	38.64	44.14	USA	31.65	33.05	35.80
EU-27	17.16	17.03	18.01	Brazil	23.54	25.44	30.06
Japan	6.55	6.52	5.77	Canada	7.26	7.64	10.00
Mexico	5.43	5.29	4.77	Argentina	10.23	14.40	6.14
Taiwan	2.44	2.16	2.22	Paraguay	4.40	5.53	2.54
Turkey	1.94	2.14	1.65	Ukraine	1.24	1.17	3.68
Indonesia	1.51	1.42	1.62	Uruguay	0.78	0.84	1.00
Thailand	1.58	1.82	1.57				
Egypt	1.34	1.08	1.59				
South Korea	1.41	1.38	1.31				
Others	11.79	12.54	11.22	Others	4.27	4.44	4.81
Total	80.86	90.00	93.87	Total	83.36	92.51	94.04

Source: USDA (2010)

Table 1.15 Vegetable oils: major trading partners

Imports		Exports					
		2006–2007	2007–2008	2008–2009	Countries		
China	8.50	8.76	9.77	13.39	Indonesia	16.07	16.78
EU-27	9.11	8.80	8.84	13.73	Malaysia	15.73	17.02
India	5.44	5.93	8.76	6.87	Argentina	7.05	5.76
USA	2.53	3.11	3.23	1.89	Ukraine	1.35	2.16
Pakistan	2.25	2.28	2.24	1.33	USA	1.68	1.46
Egypt	1.20	1.27	1.58	1.30	Canada	1.36	1.57
Malaysia	0.85	1.17	1.27	2.50	Brazil	2.44	1.96
Iran	1.21	1.28	1.10	-	-	-	-
Bangladesh	1.23	1.13	1.00	-	-	-	-
Turkey	0.61	0.84	0.82	-	-	-	-
Others	15.1	16.16	15.67	7.94	Others	8.21	8.62
Total	48.01	50.73	54.29	48.94	Total	53.88	55.32

Source: USDA (2010)

the country. China along with India and EU accounted for 50% of total imports while Indonesia, Malaysia and Argentina accounted for 40% of total world exports of vegetable oils in 2008.

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