The size of the premium on peanut oil as compared with other vegetable oils changes with fluctuations in the price of peanut oil and/or in the prices of other oils. That is, the higher the premium on peanut oil becomes relative to other oils, the less will be the demand for peanut oil, as a result of substitution of other oils. Inversely, the lower the former, the higher the latter.

According to the price correlation coefficient between edible vegetable oils as quoted in the part of General Description on Oilseeds and Oils, oils with a strong correlation to peanut oil are soybean oil and rapeseed oil. In terms of uses, these two oils can generally be substituted for peanut oil as materials for shortening and margarine. Though peanut oil possibly maintains a strong position as a salad oil owing to its unique flavor, other high-quality oils, e.g., sunflower and cottonseed oils, may take the place of peanut oil in this area of use.

III. Concluding Remarks

Though the previously mentioned strong correlations between peanut oil and other oils make it difficult to project the future demand for peanut oil alone, the following projection may be made based on the characteristics of peanut oil:

In India and China, which are two major producing countries, it is projected that production will continue to gradually increase, but little surplus for export will occur because the surplus of production will be absorbed into domestic consumption, which per capita remains low compared with developed countries. It may also be considered that the production of peanut may decrease as a result of the fall in its domestic market price, if low-cost palm oil is imported as a substitute for peanut oil as a material for vanaspati (an indispensable food in India), as already mentioned, or if such policies as importing cheap palm oil and exporting the more expensive peanut oil are adopted. In the latter case, however, the problem is the competitive power of Indian peanut oil in the international market.

As shown in Appendix Table 5, Brazil, Argentina and Senegal have a large share in the export of peanut oil and high export ratios, though production is low. Argentina in particular exports nearly all the oil produced. These countries are all developing countries and may increase their oil consumption as a result of future economic development and increases in national income, but in Argentina and Senegal, it does not seem that the increase in domestic oil consumption will cause exports to sharply decrease because these countries are sparsely populated.

In Southeast Asian countries, as represented by Burma and Indonesia, peanut is widely cultivated as a food. Both Burma and Indonesia produce more peanut than Brazil or Argentina. If these countries increase their production, they may emerge as exporters of nuts or oil. In recent years, these countries have attached importance to peanut as a crop for agricultural development, especially as second crop after paddy and in the development of farm industries (e.g., oil extraction).

On the other hand, from the point of view of importing countries, the West European countries are overwhelmingly important markets, as previously stated. Peanut oil, the so-called premium oil, is the highest-quality edible oil, and maintains that premium position, especially as a salad oil. In applications such as for shortening and margarine, however, since other vegetable oils may easily substitute for peanut oil, peanut oil consumption will fall if the premium on peanut oil is too high.

Appendix Table 1 Areas under Cultivation, Yield and Production of Peanut (quantity of non-shelled nut)

	Area under Cultivation (1,000 ha)				Yield (kg/ha)				Production (1,000 tons)			
	1969-71	1979	1980	1981	1969-71	1979	1980	1981	1969-71	1979	1980	1981
WORLD	19481	18793	18673	19329	916	976	917	1002	17850	18333	17131	19369
AFRICA	7200	6359	6386	6470	787	737	714	804	5667	4688	4558	5202
ANGOLA	37	40F	40F	40F	536	500	500	500	20	20F	20F	20F
BENIN	90	97	95F	95F	514	680	632	632	47	66	60F	60F
BOTSWANA	5	3	4	4F	994	95	368	395	5		1	2F
BURUNDI	16	28	30F	32F	1323	1271	1267	1250	21	36	38F	40F
CAMEROON	244	358	350F	350F	845	303	314	343	206	108	110F	120F
CAPE VERDE					366							
CENT AFR REP	106	122	122	125F	647	926	1010	967	68	122	123	125F
CHAD	143	160F	132*	133F	668	594	640	639	95	95F	110F	110F
CONGO	21	30F	30F	30F	819	500	407	467	17	15F	12*	14F
EGYPT	23	18	18*	20F	1760	1457	1769	1700	40	27	32*	34F
ETHIOPIA	41	38F	38F	38F	592	526	526	526	24	20*	20*	22F
GABON	2	1F	1F	1F	1000	1000	1000	1000	2	1F	1F	1F
GAMBIA	89	100F	100F	100F	1446	1000	830	1300	129	100F	80F	130F
GHANA	90	52	90F	90F	978	1163	1111	1000	88	107	100F	90F
GUINEA	115	127	127F	127F	644	650	650	654	74	82	83F	83F
GUIN BISSAU	81	85F	85F	85F	412	412	353	353	36	35F	30F	30F
IVORY COAST	52	61	63	64F	800	848	847	844	42	52	53	54F
KENYA	4	14F	14F	14F	634	589	578	571	3	8F	8F	8F
LIBERIA	3	5F	5F	5F	610	622	622	622	2	3F	3F	3F
LIBYA	5	1F	1F	1F	2089	1926	1899	1886	11	13F	13F	13F
MADAGASCAR	41	46	31	47	1021	944	882	800	42	43	28	38
MALAWI	233	250F	250F	250F	781	700	708	720	182	175*	177*	180F
MALI	257	200F	200F	207F	561	893	650	917	144	179	130F	190F
MAURITANIA	4	5F	5F	5F	504	720	703	700	2	4F	4F	4F
MAURITIUS					2519	3878	3719	3753	1	1	1	2F
MOROCCO	4	26	30F	30F	688	1036	1214	1213	3	27	36F	36F
MOZAMBIQUE	220	170F	180F	170F	636	471	500	471	140	80F	90F	80F
NIGER	353	153	169	170F	623	530	590	593	223	81	100	100F
NIGERIA	1846	600*	600*	600F	900	900	950	967	1660	540*	570*	580F
REUNION					1000	750	941	941				
RWANDA	8	17F	18F	18F	869	941	943	960	7	16	17F	17F
SENEGAL	1006	1069	1057*	1000*	785	632	463	500	794	676	489*	500F
SIERRA LEONE	17	18F	18F	18F	1129	1111	1111	1111	20	20*	20F	22F
SOMALIA	10	11F	11F	11F	933	900	900	893	9	10F	10F	10F
SOUTH AFRICA	370	213	280	280F	984	939	1342	1335	364	200	375	374
SUDAN	490	580*	960F	950F	756	898	844	842	370	880*	810*	800F
SWAZILAND	5	3F	3	3F	553	519	464	481	3	1F	1	1F
TANZANIA	49	88F	92F	94F	662	591	537	596	32	52F	54F	56F
TOGO	36	35F	35F	35F	553	1000	1309	1000	20	35	35	35F
UGANDA	263	260F	230F	233F	786	873	957	643	207	227*	220*	150F
UPPER VOLTA	140	170F	170F	170F	487	441	453	453	68	75F	77F	77F
ZAIRE	377	460F	465*	460F	703	674	674	667	265	310F	313*	322F
ZAMBIA	110	43	26	53F	616	602	626	600	68	26F	16F	32F
ZIMBABWE	183	150F	160F	240F	623	753	507	995	114	113	81	239
N C AMERICA	740	909	757	795	1981	2448	1611	2493	1466	1991	1220	1983
CUBA	15	15F	15F	15F	1000	1000	1000	1000	15	15*	15*	15F
DOMINICAN RP	68	48*	50F	50F	1113	788	773	772	76	38	46	39F
EL SALVADOR		1			1125	1103	1031	1033		1		
GUATEMALA					1825	2327	1975	1949	1	1	1F	1F
HAITI	4	47	47F	47F	506	720	681	702	2	34	32F	33F
HONDURAS					1100	1250	1250	1250				
JAMAICA	1	2F	1F	1F	990	1039	1164	1214	1	2	2	2F
MEXICO	59	76	62	76	1367	1084	1110	1237	81	83	69	93
NICARAGUA	1	4F	4F	4F	1666	1707	1714	1714	1	7F	7F	7F
ST KITTS ETC					2214	1380	1400	1385				
ST VINCENT					573	1020	967	1009				
USA	591	615	566	602	2182	2927	1849	2976	1359	1900	1047	1791
SOUTH AMERIC	978	766	678	533	1231	1693	1297	1314	1204	1228	880	702
ARGENTINA	255	393	279	200	1099	1710	1068	1195	280	671	293	239
BOLIVIA	6	16	15	16	1362	985	1128	1000	8	15	17	16
BRAZIL	670	289	311	242	1307	1599	1554	1464	876	462	483	355
COLOMBIA		3*	2*	2*	1381	962	1200	1158	1	3*	2*	2F
ECUADOR	8	13	12	13*	893	1304	1135	856	7	17	14	11F
GUYANA		1F	1F	1F	600	750	775	759		1F	1F	1F
PARAGUAY	22	24	25	25	788	950	1003	1000	17	23	25	25
PERU	4	4	4F	4F	1359	1906	1892	1825	5	7*	7*	7F
SURINAME					1000	1004	1010	1000				
URUGUAY	3	2	2*	2	707	804	810	701	2	2	2*	1
VENEZUELA	11	22	28	28*	764	1209	1304	1540	8	27	37	43*

Appendix Table 1 (cont'd.)

	Area under Cultivation (1,000 ha)				Yield (kg/ha)				Production (1,000 tons)			
	1969-71	1979	1980	1981	1969-71	1979	1980	1981	1969-71	1979	1980	1981
ASIA	10514	10802	10799	11478	900	957	963	994	9460	10342	10402	11408
BANGLADESH	28	23	24	24F	1601	1147	1010	1021	45	26	24	25F
BURMA	655	523	456	525	751	735	740	907	492	384	337	476
CHINA	1791F	2128	2453F	2456F	1191	1366	1503	1431	2134F	2908	3686	3513F
CYPRUS					2099	1894	2059	2167				
EAST TIMOR	1				1004				1			
GAZA STRIP						3000	2500	2500				
INDIA	7287	7238	6905	7500F	792	792	727	800	5807	5769	5020	6000F
INDONESIA	376	473	507	521	1235	1497	1564	1641	462	709	793	855
IRAN		2F	2F	2F		1500	1500	1500		3F	3F	3F
IRAQ					1175	1733	1867	1867		1F	1F	1F
ISRAEL	5	5	5	5F	3684	4020	4248	4184	17	21	20	21F
JAPAN	59	34	33	33*	2038	1985	1651	1818	120	67	55	60*
JORDAN												
KAMPUCHEA DM	20	10F	10F	10F	1070	1053	1300	1400	21	10F	13F	14F
KOREA REP	7	14	17	10	1171	1101	1058	2215	8	16	18	23
LAO	2	11	11	11	913	726	740	766	2	8	8	9
LEBANON	3	4*	4*	4F	1151	1000	1000	1000	4	4*	4*	4F
MALAYSIA	3	6	6	6	1873	3833	3833	3833	6	23F	23F	23F
PAKISTAN	38	41	47	50F	1433	1236	1232	1200	55	50	57	60F
PHILIPPINES	32	54	55	55F	534	920	908	909	17	50	50	50F
SRI LANKA	5	10	12	12F	983	616	590	592	5	6	7	7F
SYRIA	10	10	11	13	1836	1729	1727	1915	18	18	19	24
THAILAND	97	100F	120F	120F	1317	1316	1083	933	128	132	130*	112*
TURKEY	16	25	19	23F	2528	2300	2158	2174	40	58	41	50
VIET NAM	78	91	108	100F	1007	899	908	800	78	82	98	80F
EUROPE	10	12	12	14	1890	2135	2015	2079	19	25	24	29
BULGARIA	1	4	4	5	1157	1267	1188	1451	2	5	5	7
GREECE	4	5	5	5F	2199	2561	2420	2460	9	13	12	12F
ITALY	1	1	1	1	2307	2745	2747	2843	3	2	2	2
SPAIN	3	2	2	3F	1810	2401	2611	2273	5	6	5	8F
YUGOSLAVIA	1				1149	1000	1000	1000	1			
OCEANIA	39	44	40	38	851	1567	1176	1281	33	69	47	48
AUSTRALIA	35	37	32	29	873	1689	1230	1374	30	62	39	40
FIJI	1	4F	4F	4F	432	972	976	976		4F	4F	4F
PAPUA N GUIN	2	1F	1F	1F	771	750	750	750	2	1F	1F	1F
TONGA		1F	1F	1F	875	1087	1077	1071		1F	1F	2F
VANUATU	1	2F	2F	2F	606	938	970	944	1	2F	2F	2F
USSR		1	1	1	428	1200	1300	1200		1F	1F	1F
DEV.PEO M E	1068	912	923	958	1721	2380	1684	2408	1838	2170	1554	2307
N AMERICA	591	615	586	602	2182	2927	1849	2974	1289	1800	1047	1791
W EUROPE	9	8	8	9	2015	2514	2476	2407	17	21	19	22
OCEANIA	35	37	32	29	873	1689	1230	1374	30	62	39	40
OTH DEV.PEO	434	252	317	318	1157	1141	1417	1429	502	287	450	454
DEV.PING M E	16523	15648	15174	15800	834	841	776	851	13777	13158	11773	13445
AFRICA	6312	5141	5121	5213	774	694	650	763	4883	3568	3328	3980
LAT AMERICA	1127	960	869	726	1225	1467	1211	1225	1381	1408	1052	889
NEAR EAST	546	1047	1022	1019	883	959	904	912	483	1004	924	929
FAR EAST	8532	8492	8153	8834	824	844	792	865	7028	7171	6462	7639
OTH DV.PING	5	7	8	8	684	952	963	958	3	7	8	8
CENTR PLANNO	1891	2233	2577	2570	1182	1346	1476	1407	2235	3005	3804	3615
ASIAN CPE	1889	2229	2572	2564	1182	1346	1477	1407	2233	3000	3798	3607
E EUR+USSR	2	5	5	6	980	1252	1209	1408	2	6	6	8
DEV.PEO ALL	1070	916	928	984	1720	2375	1682	2402	1840	2176	1561	2316
DEV.PING ALL	18412	17877	17745	18364	870	904	877	929	16010	16157	15571	17052

* Unofficial figures
F FAO estimates

Source: FAO, Production Yearbook, 1981

Appendix Table 2 Peanut Production (quantity of shelled nut)

Peanut Shelled (1): World Production, by Country

(1,000 tons)

	HARVEST(a)	81/82p	80/81p	79/80p	78/79	77/78	76/77
Benin.....	Nov-Jan	1*	-	1	1	3	8
Cameroon(b)....	Oct-Jan	26*	25*	25*	27*	29	46
Egypt.....	Oct-Dec(1)	30*	23	19	18	23	20
Equat Africa(c)	Nov-Jan	158*	158*	160*	160*	156*	160*
Gambia.....	Oct-Nov(1)	100	45	80*	84*	70*	87
Ivory Coast....	Dec-Feb	40*	38*	36*	35	35	34
Madagascar.....	Feb-Jly(2)	25*	24	28	17	20	33
Malawi(b).....	May-Aug(1)	21*	23*	19*	8*	14	28
Mali(b).....	Nov-Dec(1)	25*	22*	20*	18*	29	56
Niger(b).....	Nov-Dec(1)	2*	2	2	9	15	7
Nigeria(b).....	Oct-Dec(1)	10*	8*	10*	14*	21*	63*
Senegal(d).....	Nov-Dec(1)	390p	136	278	550	314	679
South Africa(e)	May-Jly(1)	249	250	133	218	168	102
Sudan.....	Nov-Dec(1)	640*	559	596	563	715	517
Togo.....	Nov-Jan	1*	-	2	1	1	-
Uganda.....	Dec-Jan	130*	135*	150*	145*	146	139
Upper Volta(b).	Oct-Dec(1)	1*	-	1	1	2	5
Zaire.....	Feb-May(2)	215*	215*	220*	220*	215	224
Zimbabwe.....	Apr-Jly(2)	80*	58*	80*	90*	85*	85*
U.S.A.(f).....	Jly-Dec(1)	1343	785	1350	1345	1264	1272
Dominican Rep..	May-Dec(1)	27*	32*	33*	35*	42*	34
Mexico.....	Sep-Dec(1)	49*	43*	58	77	43	39
Argentina(g)...	Mar-Apr(2)	180*	167	237*	485*	260	420
Brazil(h).....	Jan-Jly(2)	250*	238	360*	310	218	215
Burma.....	Aug-Jan	330*	346	259	320	291	296
China,PR.....	Jly-Dec(1)	2450*	2520	1975	1664	1442*	1620*
India.....	Sep-Jan	4300*	3770	4040	4346	4261	3685
Indonesia.....	Feb-Jly(2)	513	476	424	418	446	409
Israel.....	Sep-Oct(1)	15*	15*	15	15	16	17
Japan.....	Oct-Nov(1)	41*	41*	47	43	48	46
Korea,South....	Oct-Dec(1)	20*	18	22	22	16	6
Pakistan.....	Sep-Dec(1)	40	32	35	32	31	45
Taiwan.....	May-Nov(1)	60*	62*	60*	64	54	62
Thailand.....	Aug-Nov(1)	95*	95*	85*	90	74	106
Turkey.....	Sep-Oct(1)	57	41	41	36	35	39
Australia.....	Apr-Jun(2)	32	28	27	43	27	22
Oth countries		554*	550*	542*	506*	471*	489*
WORLD.....		12480	10980	11480	12030	11120	11115

(a)Bulk of harvesting time, i.e. (first of the split years in the case of (1) and second in the case of (2). (b)Commercial output. (c)Chad, Congo and Central African Empire. (d)"Commercialisation amont", 71 % of unshelled. (e)Excluding output from non-white areas (about 12 000 T p.a.) (f)75 % of unshelled. (g)The official crop estimates of 470 for 1979 and 206 for 1980 are incomplete. (h)67 % of unshelled. (i)General note: Shelled=70% of unshelled ,except Senegal (71%), U.S.A. (75%), and Brazil (67%).

* Estimate

Source: Oil World Statistics Update, Mar. 1982

Appendix Table 3 Peanut Export (quantity of shelled nut)

Shelled Basis: Total World Exports

(1,000 tons)

	Oct Sept 81/82F	Oct Sept 80/81	Oct Sept 79/80	Oct Sept 78/79	Oct Sept 77/78	Oct Sept 76/77
Belgium-Lux(a)	0.7*	0.3	0.1	0.2	.	0.3
Denmark(b)....	- *	. *	.	.	.	.
France(a).....	2.0*	1.9	0.9	0.9	1.2	1.0
Italy(a).....	. *	.	0.5	.	.	0.1
Netherlands(a)	20.0*	14.8	11.6	9.1	18.7	12.6
U.K.(a).....	2.0*	2.5*	1.9	2.2	5.5	4.4
Germany, FR (a)	4.7*	3.6	2.9	2.0	2.8	1.8
EC	28.7	23.1	17.9	14.5	28.5	20.2
Austria(b)....	0.1*	0.1	0.1	.	.	.
Finland(a)....	. *	.	0.1	.	.	.
Spain(b).....	. *	.	0.2	0.1	0.2	0.6
Sweden(a).....	. *	0.1	0.1	0.1	.	.
West Europe...	28.9	23.4	18.4	14.6	28.6	20.9
Cameroon(a)...	0.7*	0.9*	0.5*	2.3*	4.2	1.1
Egypt(a).....	12.0*	11.2*	8.6*	5.7*	12.4	11.8
Gambia(a).....	50.0*	18.2*	38.5*	46.1	26.3	40.4
Guinea-Bissau(a)	5.0*	4.7*	7.4*	5.0*	7.1*	15.2*
Malawi(a).....	18.0*	20.9*	17.2	8.3	11.8	23.1
Mali(a).....	2.0*	2.5*	3.5*	7.9*	14.0*	30.0*
Mozambique(a).	1.5*	1.5*	2.4*	3.8*	2.5*	4.2*
Niger(a).....	- *	- *	- *	- *	- *	. *
Senegal(a)....	1.0*	0.2*	4.0*	12.2	10.8*	102.7*
South Africa(a)	30.8*	51.0	20.8r	60.3r	35.9	16.7
Sudan(a).....	67.0*	58.0*	50.2*	77.0*	179.9	178.2
U.S.A.(a).....	260.0*	139.4r	341.1	370.1	347.1	269.3
Mexico(a).....	1.0*	0.8*	1.4*	1.6*	2.6*	0.8*
Nicaragua.....	0.7*	1.2*	0.6*	1.0*	0.8*	0.8*
Argentina(b)..	47.0*	61.6	79.2	62.9	40.5	14.1
Brazil(b).....	25.0*	37.0r	27.3	22.0	19.5	26.9*
Paraguay.....	7.0*	9.3*	3.9	1.9	1.6	0.3
China,PR(c)...	120.0*	204.5*	51.9*	30.9*	21.1*	17.5*
Hong Kong(a)..	24.5*	37.5	9.0	1.2	1.4	2.0
India(a).....	43.0*	53.5*	14.8*	22.5	4.4	53.3
Indonesia(a)..	1.2*	2.0*	1.0*	1.5	2.5	2.4
Israel(a).....	5.2*	6.1*	5.6*	8.2*	9.1*	8.0*
West Malaysia(a)	0.4*	0.5	0.3	0.4	0.5	0.1
Singapore(a)..	13.5*	24.0	11.2	3.3	3.3	3.2
Thailand(a)...	6.0*	6.5*	2.9	13.4	13.4r	8.8r
Turkey(a).....	3.0*	2.7*	1.8*	3.0*	3.1*	3.3*
Australia.....	5.0*	6.7	11.4	4.3	1.6	2.5
Other ctrs....	16.0*	19.0*	14.0*	11.0*	12.5*	26.2*
Total.....	797.3	804.8	749.0	802.4	818.2	888.0

(a)Shelled basis. (b)Shelled and unshelled, fat equi

(c)Imports into known importing countries, considering one month shipping time.

* Estimate

Source: Same as Appendix Table 2

Appendix Table 4 Peanut Oil Production

(Unit 1,000 tons, crude oil)

	81/82	80/81	79/80	78/79	77/78	1976/77
Belgium-Lux...	- *	-	-	-	.	-
Denmark.....	- *	-	-	-	-	-
France.....	39*	28	48	51	71	83
Ireland.....	- *	- *	-	-	-	-
Italy.....	19*	11*	16*	22*	20*	33*
Netherlands...	- *	-	-	-	-	-
U.K.....	- *	-	-	-	-	-
Germany, FR .	- *	-	-	-	.	.
EC	58	39	63	74	92	116
Portugal.....	5*	1	6	18	22	45
Spain.....	7*	4*	9*	9*	6*	5*
Switzerland(c)	7*	4*	9*	13*	10*	24*
West Europe...	78	48	87	113	129	191
Czechoslovak..	2*	1*	1*	2*	2*	1*
Yugoslavia....	2*	1*	1*	4*	4*	3*
U.S.S.R.....	. *	1*	. *	1*	5*	7*
Senegal.....	157*	72*	159*	178*	165*	271*
South Africa..	52*	50*	32	36	39	39
Sudan,.....	176*	154*	172*	171*	132*	135*
U.S.A.....	83*	55	87	70	65	142
Mexico.....	6*	5*	7*	9*	5*	6*
Argentina(d)..	38*	32*	96*	126*	106*	119
Brazil.....	77*	76*	120*	92*	71*	71*
China,PR(e)...	460*	473*	416*	327*	264*	298*
India.....	1180*	1044*	1208*	1309*	1219*	1104*
Japan.....	. *	.	.	.	.	.
Taiwan.....	12*	9*	14*	12*	10*	14*
Oth countries.	299*	282*	280*	291*	281*	298*
Total.....	2622	2303	2661	2741	2498	2700

* Estimate

Source: Same as Appendix Table 2

Appendix Table 5 Peanut Oil Exports

(1,000 tons)

	Oct Sept 80/81F	Oct Sept 79/80	Oct Sept 78/79	Oct Sept 77/78	Oct Sept 76/77
Belgium-Lux.....	15.6*	22.8	14.9	11.9	13.8
Denmark.....	0.1*	0.1*	.	0.1	0.1
France.....	8.0*	16.5	16.4	18.8	21.4
Ireland.....	. *	.	. *	.	.
Italy.....	3.0*	2.6	4.6	2.8	.
Netherlands.....	15.0*	26.7	13.7	6.5	5.3
U.K.....	0.3*	0.3	0.3	0.2	0.6
Germany, FR	5.4*	6.7	5.5	4.0	3.1
EC	47.3	75.7	55.4	44.2	44.2
Sweden.....	0.4*	0.8	0.6	0.7	0.3
West Europe.....	47.8	76.6	55.9	45.0	44.6
Gambia.....	14.0*	11.8*	9.0*	14.9*	16.1
Mali.....	0.5*	5.6*	5.5*	11.0*	7.0*
Niger(c).....	- *	- *	6.0*	- *	3.8*
Nigeria(c).....	- *	1.0*	- *	0.2*	0.9*
Senegal.....	25.0*	95.2*	116.2*	135.6	199.8r
South Africa.....	19.0*	14.3*	21.2*	23.9*	14.2*
Sudan.....	27.0*	26.5*	35.0*	39.0*	17.2
U.S.A.....	14.5*	9.2	13.5	45.4	33.0
Argentina(d).....	56.0*	100.9*	100.3	111.9	124.3
Brazil.....	89.0*	110.9	78.4	60.0	54.5
China,PR(c).....	25.0*	12.7*	21.3*	6.9*	5.5*
Hong Kong.....	1.8*	1.6	1.5	1.1	1.2
India(c).....	- *	- *	13.5*	. *	.
West Malaysia.....	1.4*	1.7	5.3	3.2	1.3
Singapore.....	2.5*	2.6	2.0	2.9	3.7
Thailand.....	0.1*	. *	0.1*	0.1	0.8
Total.....	323.5	470.6	484.7	501.0	527.9

* Estimate

Source: Oil World

Appendix Table 6 Peanut Oil Imports

(1,000 tons)

Groundnut oil Imports	Oct Sept 80/81F	Oct Sept 79/80	Oct Sept 78/79	Oct Sept 77/78	Oct Sept 76/77
Belgium-Lux.....	26.0*	40.8	29.3r	26.6r	30.5r
Denmark.....	0.3*	0.5*	0.5	0.6	0.7
France.....	180.0*	231.7	208.0r	200.2	210.2
Ireland.....	0.2*	0.7	0.5	0.3	0.5
Italy.....	22.0*	39.7	43.8	35.2	23.4
Netherlands.....	18.0*	32.8	18.2	9.8	7.5
U.K.....	12.0*	16.4	14.2	15.5	15.8r
Germany, FR	29.0*	39.3	40.7	37.4	38.4
EC	287.6	401.9	355.1	325.6	327.0
Austria.....	2.0*	2.6	2.2	2.3	2.5
Finland..... ..	0.2*	0.2	0.4	0.2	0.1
Norway.....	0.7*	1.3	1.5	1.9	2.2
Spain.....	0.1*	0.6	2.4	0.1	0.4
Sweden..... ..	0.6*	0.9	1.0	0.7	1.0
Switzerland.....	9.0*	17.6*	16.5*	15.0*	6.8*
West Europe.....	300.2	425.1	379.2	345.7	340.0
Czechoslovak(c)...	0.8*	1.0*	1.3*	0.5*	1.1*
GDR/E Germany(c)..	0.6*	0.4*	0.3*	0.2*	0.3*
Poland.....	0.3*	0.3*	0.7*	0.7*	0.8*
Nigeria.....	3.0*	7.0*	5.3*	6.1*	13.4*
South Africa.....	0.7*	0.8*	0.5	0.9	4.2
Canada.....	3.0*	4.5	6.0	6.5r	7.5
U.S.A..... ...	0.1*	.	.	.	.
Dominican Rep.....	0.1*	0.1*	.	2.3	21.3*
Brazil(c).....	2.0*	- *	0.7*	-	-
Venezuela.....	5.0*	11.5*	44.0*	88.0*	100.0*
Hong Kong.....	19.0*	26.3	26.0	22.9	21.8
India(c).....	- *	- *	- *	9.2*	32.8
Japan.....	0.1*	0.1	0.3	0.1	0.1
West Malaysia.....	2.0*	2.3	1.6	4.1	1.5
Singapore.....	2.0*	3.0	1.9	2.4	2.6
Australia.....	0.3*	0.2	1.8	1.2	2.9
Total.....	339.0	482.5	470.0	490.7	550.2

* Estimate

Source: Oil World

[1-2-4-2] SUNFLOWER

A. SUNFLOWER SEED PRODUCTION, EXPORTS AND IMPORTS

I. Production

The cultivation of sunflower is classified by use into two groups: ornamental flower cultivation and seed-collection cultivation. The former is economically negligible, while the latter has two applications: for oil extraction and for food. The sunflower seed used for the former application is the small-sized seed containing 42-50% oil, while the latter application uses the large-sized seed containing 25-35% oil. The vast majority of the sunflower cultivated throughout the world is used for oil extraction.

Sunflower can be cultivated in both the tropical and temperate zones because it is highly adaptable to natural conditions. While regular rain throughout the growing period is important, sunflower also has the ability to resist dryness by drawing water from under the ground with its extensive root system.

The harvesting period for sunflower seed is generally from September to October in the northern hemisphere and from March to July in the southern hemisphere (in Italy and Spain, from July to August).

Statistics for area under cultivation and production of sunflower seed by country (FAO, Production Yearbook) are shown in Appendix Table 1. According to this Table, sunflower seed is produced in about fifty countries; the USSR accounts for about one third of the total world production, followed by the United States with 17%, then by Argentina and China. These four major producing countries account for about 65% of the total world production. Since in Romania, Hungary and Bulgaria the production is also high, the East European bloc accounts for nearly half of world production.

From the point of view of trends in production in the 1970s, the total world production rose by 39% from 9.82 million tons (the annual average over the period 1969-1971) to 13.76 million tons in 1981, whereas the output in the largest producing country, the USSR, dropped from 6 million tons to 4.6 million tons. On the other hand, the

Table A-1 Harvesting Time for Sunflower Seed in Main Producing Countries

1. USSR	September	
2. USA	September	to October
3. Argentina	March	to April
4. Romania	August	to September
5. China	September	to November
6. Turkey	August	to September
7. Hungary	August	to September
8. Spain	July	to August
9. Bulgaria	August	to September
10. S. Africa	May	to July
11. France	September	to October
12. Canada	August	to October
13. India	October	to December
14. Australia	April	to May
15. Italy	July	to August

Source: Oil World

output in the United States increased by 17 times, from 120,000 to 2.1 million tons.

Trends in sunflower seed production since 1966 are shown in Appendix Tables 2 and 3 on the bases of area under cultivation and production for the main producing countries, respectively. According to these Tables, a large increase in the United States occurred in the second half of the 1970s, while the production in the USSR has continued to decline with some fluctuation since 1966.

In the USSR, both area under cultivation and yield have fallen, whereas in the United States, both have risen.

Though production in China has shown a remarkable increase since the middle of the 1970s, it is still far less than that of the USSR or the United States.

II. Exports and Imports

Sunflower seed production is used partly for subsequent sowing,

as a food, and as feed for small birds,[1] but mostly for crushing. The seed is mostly crushed in the producing countries, but is also exported as material for crushing. Amount and value of export of sunflower seed are shown in the Appendix Table 4.

As shown in this Table, the average total world exports over the last three years (1978 to 1980) were 1.79 million tons. Compared with the average total output in the same period, as shown in Appendix Table 3, about 13% of production was exported.[2] This figure, however, represents the ratio of exports to the total world production, and the proportion is very different in various countries. For example, aside from the USSR, of the main producing countries, China and Romania export none or almost none of their production, whereas the United States exports about 57% of its production, accounting for 77% of the total world exports (All calculations are based on the average over the above three-year period) (Appendix Table 4).

According to Appendix Table 5, which shows imports and corresponding exports, the main importing countries are concentrated in Europe, with the Federal Republic of Germany the largest importer, and Mexico the only main importing country outside Europe. In this regard, almost all of the imports of sunflower seed and oil by Mexico are based on a governmental agreement with the United States (see Table 11 in the first part of this chapter, General Description on Oilseeds and Oils). It is a feature of sunflower seed as an international commodity that the United States (in exports) and Europe (in imports) account for the majority of the trade.

B. SUNFLOWER OIL PRODUCTION, EXPORTS AND IMPORTS

Sunflower oil extraction is carried out in almost the same manner as for other oilseeds (see General Description on Oilseeds and Oils 4.2). Accordingly, mills which crush soybean and cottonseed perform

1) The meal left after oil extraction is used as a feedstuff, whereas the raw seeds are used as feed for small birds and pets.
2) Though there is a time lag between production and export, it is assumed that there is no substantial discrepancies: mean production and exports over this three-year period are used here.

sunflower oil extraction as well, but in sunflower producing areas in the United States, there are some oil mills exclusively for sunflower.

The husks covering the sunflower seeds are usually removed before crushing. Some mills crush seed in the husk in order to save time, in which case the oil is poor in quality. The meal produced in this manner contains much fiber, which is good for ruminants but too fibrous for other animals' feed.

Sunflower oil is used as a frying oil, a salad oil and as a material for shortening and margarine, and it has a unique flavor (Low linoleic acid is said to account for the good flavor). In the United States it is also used widely as a frying oil for potato chips.

Since sunflower oil contains abundant linolic acid (a polyunsaturated fatty acid) and α-tocopherol (Vitamin E, which has beneficial physiological effects), it is popular as a health food.

As previously stated, the majority of sunflower oil is extracted in sunflower seed producing countries. Among the countries which import seeds for crushing, the Federal Republic of Germany has the largest production. South European countries such as France, Spain and Portugal also crush seeds, both domestic and imported.

Sunflower oil production by country is listed in Appendix Table 6,[1] and the production and exports by the main producing countries in 1981/82 are shown in Table B-1 below.

As shown in the Table, the total world production of sunflower oil is about 5 million tons and the total exports are about 1.12 million tons; thus a large proportion of sunflower oil is consumed in the producing countries. It may be said that the USSR and China, which are the major producing countries, consume all the oil they produce, although the USSR exports a small amount of its oil, and imports more than that, as described later. On the other hand, Argentina, the United States and the Federal Republic of Germany export half of their production or more, and especially in the United States the export ratio is high.

Imports corresponding to the exports mentioned above are shown in Appendix Table 6, and the imports by main importing countries in recent

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1) Appendix Table 6 is derived from the U.S. Department of Agriculture (USDA), Foreign Agriculture Service (FOP 6-8, May 1982). Statistics for area under cultivation and production of sunflower seed shown in this Table are different from those of FAO's Production Yearbook in Appendix Table 1 with regard to time period (FAO uses calendar years while USDA uses harvesting years), but mostly agree with each other. Since FAO statistics are not available on oil and meal production, USDA statistics are mainly used for the supply and demand analyses in this chapter.

years are shown in Table B-2 below. The USSR has been the largest importing country since 1979, before which it was one of the main exporting countries (and largest exporting country in the 1976/1977 period). This reversal was caused by the decrease in production of sunflower seeds.

Table B-1 Sunflower Oil Production and Exports by Main Countries

(1,000 tons)

	Production	Exports
World total	5,075	1,124
USSR	1,582	75
Argentina	573	335
China	319	
Romania	297	
Turkey	228	
Germany, FR	226	150
Mexico	210	
Hungary	207	127
USA	199	165
Spain	172	
Bulgaria	162	25
S. Africa	121	
France	115	12
Yugoslavia	112	

Source: Excerpted from Appendix Table 6

Table B-2 Main Sunflower Oil Importing Countries

(1,000 tons)

USSR	225
France	126
Algeria	100
Venezuela	85
Cuba	75
World total	996

Source: Excerpted from Appendix Table 6

C. SUNFLOWER OIL CONSUMPTION AND PRICE

I. Consumption

Sunflower oil consumption by country, as estimated from the oil output, export and import figures, is shown in Appendix Table 6, and consumption in the main consuming countries in recent years (1981/1982) is shown in comparison with production, in the following Table:

Table C-1 Sunflower Seed Production, Oil Production and Consumption in Main Countries

(1,000 tons)

	Seed production	Oil production	Oil consumption
World total	14,234	5,075	4,984
USSR	4,600	1,582	1,732
USA	2,098	165	50
Argentina	1,750	573	230
China	1,200	319	319
Romania	806	297	202
Turkey	575	228	235
Bulgaria	448	162	137
France	400	115	243
Yugoslavia	320	112	115
Spain	298	172	197
S. Africa	290	121	101
Portugal	7	106	111
Algeria	-	0	100
Germany, FR	0	226	125

Source: Excerpted from Appendix Table 6

The above Table shows clearly that the greatest portion of sunflower oil consumption is supplied by domestic production, and any deficiency or surplus, i.e., the difference between production and consumption, results in exports or imports.

Consumption by country, as shown in the Table, however, does not represent the level of consumption in each country. Consumption per capita, which is calculated by dividing consumption by population, is

an average of approximately 1.1 kg annually in world consumption, but differs sharply by countries.

Bulgaria has the highest per capita consumption (15 kg), followed by Romania with 9 kg. On the other hand, the main countries with the lowest consumption are the United States with 0.2 kg and China with 0.24 kg. In the USSR and other East European countries, the per capita consumption is generally high.

II. Price

As already mentioned, sunflower seed and oil are consumed mainly within the producing country, and are distributed as international commodities in small quantities; the largest supplying country of both seeds and oil in the world market is the United States. Since production in the United States is concentrated in the northwest, Minneapolis, the capital of Minnesota State, is the market center, and spot and futures transactions in sunflower seed are conducted in the Minneapolis Grain Exchange. The price in Duluth, Minnesota, becomes the standard export price and the standards set up by the Minnesota State Department of Agriculture become the international standards, since almost all of the export volume is shipped from that port.

As previously stated in General Description on Oilseeds and Oils, there are strong correlations between the prices of various oilseeds and those of oils; since sunflower oil has a strong correlation to soybean oil, rapeseed oil, cottonseed oil and peanut oil, their prices over the past decade are listed together in Table C-2 below.

As shown in the Table, the price of sunflower oil is lower than those of peanut and cottonseed oils, and higher than those of soybean and rapeseed oils.

Recent annual average prices and monthly prices are shown in Tables C-3 and C-4 and in Fig. C-1 in relation to soybean and rapeseed oils, which lead the world market prices for vegetable oils and have the strongest influence on the price of sunflower oil.

The graph shows that the price of sunflower oil moves with the prices of soybean and rapeseed oils, but that its rise in the 1978/1979 period was greater than that of soybean and rapeseed oil prices. In this period, the prices of oils rose on the whole, and the USSR reduced sunflower oil exports by about 100,000 tons and began to import it for the first time, which may have raised the price of sunflower oil higher than that of other oils. In the reactionary price fall in the following 1979/1980 period, the price of sunflower oil fell more sharply than other oils, because the United States

Table C-2 Annual Average Prices of Main Vegetable Oils

(US$/MT)

	Soybean oil	Cottonseed oil	Peanut oil	Sunflower oil	Rapeseed oil
	Dutch products ex-store	US products CIF Rotterdam	All countries' products CIF Rotterdam	All countries' products Rotterdam ex-store	Dutch products FOB store
1971/72	251	333	400	335	241
1972/73	363	447	471	401	343
1973/74	728	835	948	845	643
1974/75	694	823	881	856	674
1975/76	422	604	678	593	406
1976/77	573	629	824	658	561
1977/78	578	630	1,009	618	583
1978/79	601	780	980	768	628
1979/80	531	680	784	634	587
1980/81	495	666	1,111	666	510
1981/82	422	597	716	575	454
Average standard deviation mutant	514.4	638.5	800.2	604.5	511.8
coefficient (%)	135.8	144.0	211.5	179.0	130.2
	26.4	22.6	26.4	29.6	25.4
Average premium or discount on sunflower oil	+89.6	-64.5	-196.2	-	+92.2

Source: Oil World

Table C-3 Average Annual Prices of Sunflower, Soybean and Rapeseed Oils

(US$/MT)

	Soybean oil	Sunflower oil	Rapeseed oil
1977/78	578	618	580
	(+40)		(+38)
1978/79	654	768	628
	(+114)		(+140)
1979/80	613	634	582
	(+21)		(+52)
1980/81	540	666	510
	(+126)		(+156)
Oct. 1981 - March 1982 average	464	575	451
	(+111)		(+124)

Note : The sign (+) refers to the premium of sunflower oil.

Source: Oil World

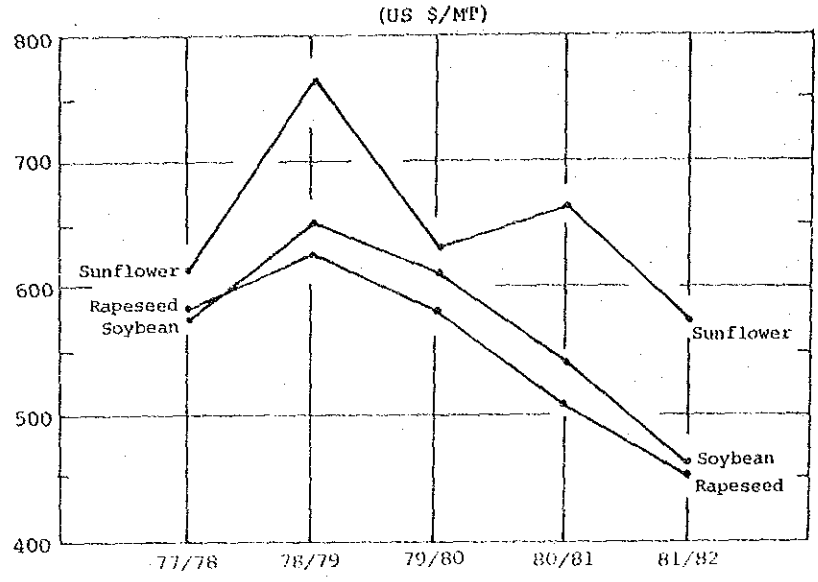
Table C-4 Monthly Average Prices of Sunflower, Soybean and Rapeseed Oils

(US$/MT)

	Soybean oil	Sunflower oil	Rapeseed oil
Oct. 1979	671	725	598
Nov. "	670	700	627
Dec. 1980	647	660	625
Jan. "	609	643	590
Feb. "	610	653	595
Mar. "	580	609	560
Apr. "	552	553	540
May "	562	572	535
June "	570	562	545
July "	635	632	593
Aug. "	636	657	589
Sept. "	615	639	590
Average	613	634	582

Source: Oil World

Fig. C-1 Prices of Vegetable Oils



increased production in response to the high price in the preceding year.

Though sunflower oil is always more expensive than soybean and rapeseed oils, sunflower meal is the cheapest of these three kinds of meal. There are price correlations between these three kinds of meal, but no price correlation is found between sunflower oil and sunflower meal (In the case of soybean, the price of the meal has an effect on that of the oil. See the preceding part of this chapter on soybeans).

D. SITUATION IN MAIN PRODUCING COUNTRIES

I. USSR

As already mentioned, the USSR ranks first in world sunflower production, accounting for about 32% of the total world production (1981/1982), although its production has declined since the 1970s.

Sunflower seed production in the USSR declined from an annual level of about 6 million tons in the 1960s to 5 million tons in the 1970s (but exceeded 6 million tons in the good harvest period of 1973/1974), and to 4 million tons in the 1980s. These decreases paralleled decreases in area under cultivation and in yield.

The yield, as shown in Appendix Table 1, fell from 1.29 tons/ha on the average in the 1969-1971 period to 1.08 tons/ha in 1980. A comparison of the yield in the USSR with the yield in other main countries is shown below:

(tons/ha)

	USA	USSR	Argentina	China
1969/71	1.10	1.29	0.74	0.87
1981	1.32	1.08	0.98	1.61

This table shows that only the USSR had a decrease in yield, whereas other main producing countries registered increases. The low crop yield is said to be attributable to the varieties. Unlike the United States (referred to below in Subsection II) where the use of hybrid-seed raised the yield, the USSR is still using ordinary varieties.

Recent the USSR's production, exports and imports of main oilseeds and oils are shown in Table D-1 below. It can be seen that despite the decrease in production mentioned above, sunflower still remains an important source of oil, accounting for about one third of the total oil output (including animal oil) in the USSR.

As a result of the decrease in the production of sunflower seed, which is the most important oil material, oil supply and demand in the USSR has become more stringent in recent years, and imports of soybean for use as a material, and of soybean oil, palm oil, sunflower oil, coconut oil, butter and so on have been increasing.

Table D-1 Production and Trade of Oilseed, Oil and Meal in the USSR

(1,000 tons)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82 (Forecast)
Oilseed production						
Sunflower seed	5,277	5,904	5,333	5,414	4,650	5,000
Cottonseed	4,511	4,693	4,804	4,510	5,300	5,000
Soybean	480	540	634	467	540	560
Linseed	337	290	250	254	250	250
Castorseed	41	45	43	62	59	67
Rapeseed	16	9	12	5	12	20
Total	10,662	11,481	11,076	10,712	10,811	10,897
Oilseed imports						
Soybean	1,364	906	1,765	1,065	1,300	1,500
Peanut	40	37	30	40	20	30
Copra	20	10	10	15	20	20
Sesame	5	8	7	11	10	10
Rapeseed	0	0	0	25	25	25
Linseed	3	1	0	0	0	0
Palm core	2	4	2	3	3	3
Total	1,434	966	1,814	1,159	1,378	1,588
Oilseed exports						
Cottonseed	72	47	43	25	20	20
Total	72	47	43	25	20	20
Gross supply	12,024	12,400	12,847	11,846	12,169	12,465
Oil production						
Sunflower oil	1,816	2,031	1,854	1,852	1,610	1,730
Cottonseed oil	697	722	637	665	775	725
Soybean oil	367	221	253	219	221	290
Linseed oil	23	17	10	10	10	10
Butter	1,500	1,472	1,469	1,350	1,315	1,300
Lard	742	828	852	826	800	800
Tallow/grease	333	343	345	340	350	350
Fish oil	76	82	82	82	82	82
Other oils	62	56	19	44	45	53
Total	5,616	5,772	5,471	5,388	5,206	5,340
Soybean oil*	0	107	25	50	200	200
Palm oil	46	48	105	103	120	120
Coconut oil	32	51	48	79	80	100
Sunflower oil	0	0	11	30	125	125
Linseed oil	50	53	67	90	60	70
Butter	62	32	174	249	100	125
Tallow/grease	76	44	85	100	100	100
Lard	2	2	11	10	10	10
Total	268	343	526	771	795	850
Oil exports						
Sunflower oil	231	148	113	123	100	100
Total	231	148	113	123	100	100
Gross supply	5,653	5,967	5,884	6,036	5,901	6,090
Oil production						
Soybean*	1,563	999	1,152	984	997	1,300
Cottonseed	1,845	1,800	1,865	1,742	2,272	2,140
Sunflower seed	1,942	2,173	1,962	1,967	1,711	1,840
Fish meal	579	495	503	512	515	520
Other meal	126	133	107	115	119	125
Total	6,055	5,600	5,589	5,320	5,614	5,925
Oil meal imports						
Soybean	0	0	52	500	1,000	1,500
Cottonseed	21	3	4	9	100	100
Peanut	0	0	76	52	100	100
Total	21	3	132	561	1,200	1,700
Oil meal exports						
Fish meal	19	21	20	18	20	20
Total	19	21	20	18	20	20
Gross supply	6,057	5,582	5,701	5,863	6,794	7,605
Proportion of imports to gross supply (%)						
Oilseed	18.3	12.8	7.1	10.5	9.3	8.1
Oil*	8.1	8.3	12.8	15.1	15.8	16.9
Oil meal*	15.8	11.5	23.0	21.5	28.8	34.4
Grain	4.7	8.9	6.7	17.4	18.3	21.6

* Including the production from imported seed.

Source: USDA, Foreign Agricultural Service, Oilseeds and Products

As for sunflower oil, the USSR was the largest exporting country in the world until the middle of the 1970s, but has become one of the main importing countries in recent years (with much higher imports than exports).

This has created a serious problem in the livestock industry in the USSR, in that the decrease in sunflower production resulted in a shortage of oil and a shortage of oil meal for use as a protein feed.

Though the numbers of the major livestock in the USSR (i.e., beef cattle, dairy cattle, pigs, sheep and goats) has continued to increase steadily, the production of such livestock products as beef, milk and pork has generally fallen since 1978. This may mean that feed supplies have been unfavorable and have resulted in a decrease in production, since poor-quality feed can only maintain the current number of cattle.

In these circumstances, the Government of the USSR is urgently trying to increase the production of soybean and sunflower as oil crops and for feed under a production plan as follows:

Table D-2 Production Plan of Soybean and Sunflower, USSR

(1,000 tons)

	1976/80 average result	1981/85 plan	1986/90 plan
Soybean	500	1,400	2,200-2,300
Sunflower	5,300	6,700	7,200-7,500

Source: Oil World

In this plan, it seems that the target production level for soybean is much higher than the present level, but that for sunflower is not much higher.

II. The United States

It was mentioned earlier that the United States is second to the USSR in sunflower seed production, and stands first in world sunflower seed and oil exports. Production and exports of sunflower seed and oil by the United States in the last six years are shown in Appendix

Table 7, and it can be noted that the production jumped to nearly double, from 1.8 million tons in 1979 to 3.48 million tons in 1980. In the following year, production returned to 1.8 million tons as the result of an increase in stock (owing to the large increase in production in the previous year and to a fall in price), but the normalization of stock is resulting in a further increase. This phenomenon implies that U.S. sunflower producers are strongly responsive to price changes, and there is a strong possibility of production increases, determined by price (i.e., position relative to other crops).

The United States' sunflower production is concentrated in three northwestern states: North Dakota, South Dakota and Minnesota, which together account for 98% of national production. In particular, North Dakota accounts for 59% of the national production (1980).[1)]

Certain features have made North Dakota the most prominent state in American sunflower production: the low annual rainfall (360 to 510 mm) in this state is tolerable to sunflowers with strong drought resistance; and labor and machines can be effectively used since wheat and barley, which are crops also with drought resistance, are harvested in August, while sunflowers are harvested in September and October.

In North Dakota, sunflowers are generally cultivated in rotation with wheat and barley instead of in consecutive sunflower cultivation, because sunflowers absorb more water and nutrients from the soil than other crops.

The dissemination of hybrid seeds is considered to have brought about a higher yield of sunflower in the latter part of the 1970s in the United States. There are about twenty companies producing hybrid seeds, some of which produce seeds not only for local use but also for California State, Florida State and Argentina. Hybrid seeds contribute to increases not only in seed production but also in oil production, since they provide a high rate of oil extraction.

Of all the sunflower seed produced in the United States, about 63% is exported and the rest is crushed within the country. About 56% of the oil extracted is exported and the rest goes for domestic consumption.[2)] All meal produced along with the oil goes for domestic use.

Thus, though the United States is the major sunflower producing country, sunflower oil has a low rate of domestic use because more than half of the products (seeds and oil) are exported. In the consumption of vegetable oil in the United States, soybean oil occupies

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1) USDA, Agriculture Statistics, 1981

2) Since the export ratio fluctuates yearly, these figures were estimated from the most recent three-year average.

the largest share in general, despite yearly changes, followed by palm oil (imported), cottonseed oil, coconut oil (imported) and corn oil, and the share of sunflower oil is almost negligible. Accordingly, sunflower oil consumption per capita in the United States is quite low compared with that in other sunflower producing countries.

III. Other Major Producing Countries

Producing countries which follow the USSR and the United States are Argentina and China, both of which have shown growth in recent years (see Appendix Tables 2 and 3).

Argentina exports part of the seed produced (with large yearly changes), whereas China crushes all its seeds domestically.

China consumes all of the oil it produces within the country, whereas Argentina exports almost half of its oil, being the largest exporting country in the world, as already mentioned (see Apendix Table 4), and also the major sunflower seed meal exporting country.

In contrast to the above-mentioned major producing countries, the Federal Republic of Germany is typical of importing countries. That is, the Federal Republic of Germany annually imports about 700,000 tons of sunflower seed to produce about 260,000 tons of sunflower oil. About 155,000 tons of the oil produced is exported, mainly to neighboring countries; and there are some imports of oil (all figures refer to the most recent three-year average).

E. CONCLUDING REMARKS

As shown above, the production and consumption of sunflower seed and oil in the world have slowly increased in a parallel manner in recent years. These increases in the world and in each main country are shown in Appendix Table 7.[1)]

In the production of sunflower seed and oil, the USSR and the United States hold a very large share, and future world supply and demand may largely depend on trends in these two countries and in Argentina, where production has recently grown.

As for production in the USSR, oil supply and demand problems will be eased if the previously mentioned government planning, especially for a large increase in soybean production, is carried out. In such a case, the imports of soybeans and sunflower would decrease, but not to such an extent as to provide a surplus for sunflower oil exports.

As already mentioned, since U.S. sunflower production fluctuates according to price, there is large potential for an increase in sunflower production, but such potential largely depends on the price relative to that of other competitive crops (wheat and barley) in main producing countries.

From the point of view of demand, sunflower oil has a strong substitutive relationship with soybean oil and rapeseed oil. There is a possibility of a shift in demand from low-priced oils to sunflower oil as a result of an increase in income, unless the premium on sunflower oil becomes larger because of its flavor or as a result of increased propensity to consume polyunsaturated fatty acids in consumers who are sensitive to cholesterol. Thus, it may be considered that sunflower oil supply and demand will continue to increase slowly in parallel.

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1) Appendix Table 7 is based mainly on USDA-FAS statistics in Appendix Table 6, complemented by figures in Oil World. Since FAO statistics (Appendix Table 1) carry figures for oilseed production but not for oil production, USDA data were also used for production figures in order to compare seed and oil production (Appendix Table 7).

Appendix Table 1 Areas under Cultivation, Yield and Production of Sunflower Seed

	Area under Cultivation (1,000 ha)				Yield (kg/ha)				Production (1,000 tons)			
	1969-71	1979	1980	1981	1969-71	1979	1980	1981	1969-71	1979	1980	1981
WORLD	8413	12751	12205	11668	1173	1245	1107	1182	9872	15308	13519	13795
AFRICA	230	551	536	554	680	877	907	1176	156	483	486	652
ALGERIA	4				310	92	643	333	1			
ANGOLA	11	15F	15F	16F	882	667	667	621	10	10F	10F	10F
BOTSWANA		5	7	7F	32	176	209	215		1	1	1F
EGYPT		7	5F	8F	364	1881	1855	1852		14	9F	14F
KENYA	4	14F	14F	14F	718	1103	1103	1079	3	15F	15F	15F
MALAWI	4	5F	4F	5F	719	800	845	814	3	3F	4F	4F
MOROCCO	19	34	25*	27F	651	1127	723	667	12	40	18F	18F
MOZAMBIQUE	8	35	35F	35F	517	615	629	571	4	22	22F	20F
SOUTH AFRICA	140	306	289	300F	757	1057	1143	1651	106	320	329	495
TANZANIA	33	60F	80F	80F	426	388	500	500	13	31	40F	40F
TUNISIA		3	3	3F		585	593	625		2F	2	2F
UGANDA	4	4F	4F	5F	407	447	453	444	1	2F	2F	2F
ZAMBIA	2	24	3F	31F	300	536	648	645	1	13	20F	20F
ZIMBABWE	5	20F	25F	25F	551	540	556	430	3	11	14	11
N C AMERICA	175	2503	1703	1743	965	1461	1138	1320	169	3657	1939	2301
CANADA	48	161	136	121	807	1350	1217	1445	39	218	166	175
MEXICO	17	37	32*	32*	528	836	643	875	9	31	25*	28*
USA	110	2305	1537	1590	1101	1479	1137	1319	121	3409	1748	2098
SOUTH AMERIC	1356	1695	2060	1398	736	910	663	974	1329	1543	1727	1352
ARGENTINA	1263	1557	1920	1290	739	918	868	984	949	1430	1650	1260
BRAZIL		28F	41F	41F		1300	1000	1000		25*	41*	41*
CHILE	20	22	32	9F	1275	1536	1183	1176	26	33	38	10*
URUGUAY	95	88	86	59	572	583	553	699	55	51	48	41
ASIA	515	898	1247	1193	985	1085	1366	1378	507	974	1696	1642
AFGHANISTAN	2	2F	3F	3F	1555	1633	1940	1778	2	4F	5F	5F
BANGLADESH					655	500	500	500				
BURMA	1	55	35	68	326	258	269	374		14	9	25
CHINA	81F	368	620F	620F	871	924	1502	1613	71F	340	920F	1200F
IRAN	70	7F	10F	30F	551	492	400	500	39	3	4F	15
IRAQ	3	5F	5F	5F	715	1044	1044	1043	2	5F	5F	5F
ISRAEL	4	8	10	9F	1051	713	951	761	4	6	10	7F
JORDAN							2000					
LEBANON	5	2F	2F	2F	470	353	333	347	2	1F	1F	1F
PAKISTAN	1		1	1	627	649	600	631				2
SYRIA	1	6	9	5	1627	1731	1463	1664	2	11	13	8
TURKEY	347	445	575	450F	1104	1326	1304	1278	383	593	750	575
EUROPE	1374	2050	2088	2333	1404	1483	1356	1320	1930	3051	2827	3080
ALBANIA	18	30F	30F	32F	950	800	800	738	13	25F	26F	25F
AUSTRIA	1	2		1F	1985	2430	2242	2200	1	5	1	3F
BULGARIA	277	230	247	260	1697	1854	1535	1705	471	426	383	444
CZECHOSLOVAK	2	18	15	15	1825	1338	1355	1347	4	26	25	20F
FRANCE	31	91	102	121	1268	2559	2351	2480	55	155	244	424
GREECE	2	2F	3F	3F	1042	1491	1491	1465	2	2	5	5F
HUNGARY	96	228	273	350F	1265	1637	1671	1776	122	419	456	622
ITALY	4	26	32	49	2209	2141	1639	1705	9	55	58	84
PORTUGAL	1	2C	2C*	2C*	767	612	975	335	1	12	24*	8
ROMANIA	562	515	526	506F	1375	1711	1609	1632	769	885	817	824F
SPAIN	179	635	685	705	813	792	736	421	146	504	492	299
YUGOSLAVIA	199	252	180	210F	1679	2043	1678	1536	334	525	378	323
OCEANIA	38	261	221	201	680	714	641	688	26	186	142	138
AUSTRALIA	38	261	221	201	680	714	641	688	26	186	142	138
USSR	4682	4334	4355	4235	1293	1243	1069	1086	6055	5414	4652	4600
DEV.PED M E	750	4066	3231	3336	1114	1330	1399	1192	842	5473	3520	3953
N AMERICA	158	2606	1673	1711	1012	1472	1169	1329	160	3627	1914	2273
W EUROPE	436	1025	1011	1166	1313	1238	1133	973	567	1269	1125	1140
OCEANIA	38	261	221	201	680	714	641	663	26	186	142	138
OTH DEV.PED	143	314	298	309	755	1038	1137	1626	110	326	339	502
DEV.PING M E	1935	2699	2975	2239	786	946	923	970	1520	2365	2745	2172
AFRICA	90	238	243	247	560	626	608	579	50	149	148	143
LAT AMERICA	1415	1732	2040	1420	733	939	962	972	1038	1573	1802	1380
NEAR EAST	428	674	608	501	1007	1324	1296	1241	431	839	786	622
FAR EAST	2	56	35	71	455	267	275	384	1	15	10	27
CENTR PLANND	5722	5326	6030	6022	1312	1316	1203	1252	7509	7536	7254	7540
ASIAN CPE	81	308	630	620	873	924	1500	1613	71	340	900	1000
E EUR+USSR	5640	5355	5430	5402	1313	1343	1170	1211	7438	7196	6354	6540
DEV.PED ALL	6396	9425	8633	9788	1295	1337	1144	1205	8281	12674	9874	10593
DEV.PING ALL	2317	3367	3575	2859	789	963	1020	1109	1591	2705	3645	3172

Source: FAO, Production Yearbook, 1981

Appendix Table 2 Trends in Area under Sunflower Seed Cultivation

(1,000 ha)

	USSR	USA	Argentina	China	Romania	Turkey	Spain	Hungary	Bulgaria	S. Africa	World total
1966	5,004	32	1,023	76	468	218	39	94	255	229	7,922
1967	4,767	90	1,242	80	481	215	26	83	268	159	7,870
1968	4,863	74	1,054	80	520	240	39	78	280	138	7,818
1969	4,772	77	1,189	84	533	286	71	85	287	137	8,071
1970	4,777	85	1,347	80	604	360	166	91	278	130	8,581
1971	4,498	167	1,313	80	548	396	300	118	267	152	8,585
1972	4,394	329	1,287	79	554	495	344	108	274	156	8,990
1973	4,745	304	1,338	81	512	481	416	103	252	346	9,526
1974	4,686	263	1,190	82	509	425	440	113	262	241	9,000
1975	4,045	287	1,005	95	511	418	792	144	238	239	8,669
1976	4,534	328	1,258	115	521	445	506	154	226	288	9,191
1977	4,574	892	1,227	172	513	374	545	140	237	389	9,898
1978	4,558	1,132	2,000	320	512	415	584	153	227	449	11,372
1979	4,334	2,189	1,557	340	520	440	642	230	230	306	12,010
1980	4,353	1,537	1,900	600	508	575	669	273	247	28	12,208
1981	4,235	1,590	1,280	620	506	450	708	350	260	300	11,648

Source: FAO, Production Yearbook, 1980

Appendix Table 3 Trends in Sunflower Seed Production

(1,000 MT)

	USSR	USA	Argentina	China	Romania	Turkey	Spain	Hungary	Bulgaria	S. Africa	World total
1966	6,150	32	782	66	672	200	33	105	423	101	9,096
1967	6,608	104	1,120	70	721	230	21	82	478	100	9,992
1968	6,685	84	940	70	731	230	31	97	459	81	9,924
1969	6,358	81	876	73	748	310	55	119	543	89	9,892
1970	6,144	86	1,140	70	770	375	159	96	407	95	9,938
1971	5,663	196	830	70	791	465	223	152	462	133	9,785
1972	5,048	334	828	65	850	560	293	134	494	152	9,599
1973	7,385	353	880	70	756	560	293	153	448	233	12,073
1974	6,784	274	970	70	681	420	286	121	368	253	10,949
1975	4,993	357	732	80	728	488	416	155	426	209	9,392
1976	5,277	389	1,085	100	799	550	312	188	362	255	10,137
1977	5,904	1,330	900	150	807	455	388	215	422	484	12,076
1978	5,333	1,840	1,600	279	816	485	470	225	369	453	13,108
1979	5,370	3,488	1,430	300	889	590	500	400	400	315	15,206
1980	4,652	1,748	1,650	900	817	750	492	456	380	329	13,519
1981	4,600	2,098	1,260	1,000	824	575	298	622	444	495	13,765

Source: FAO, Production Yearbook, 1980

Appendix Table 4 Trends in Exports and Export Values of Sunflower Seed

(Volume: MT; Prices: 1,000 US $)

Country / Year	USA	France	Canada	Australia	Hungary	China	Austria	Malawi	Egypt	Germany, FR	Others	World Total
Volume of Exports												
1965												
1966		5,282	8,529		13,683	4,761	2,455	192		397		384,322
1967		5,997	2,716		17,046	8,091	1,657	354		257		526,362
1968		3,754	1,054		18,216	3,903	474	659		303		513,131
1969		23,897	1,329		35,890	4,320	637	2,870		259		630,394
1970	1,800	22,271	2,611		24,142	2,323	275	1,395		245		479,298
1971	5,500	28,299	11,546		24,097	3,869	266	2,711		135		292,235
1972	140,000	12,011	24,256	79,186	21,551	1,819	235	3,688		19,035		531,800
1973	175,040	23,083	31,147	33,419	23,022	2,500	422	2,965	57	38,094		470,468
1974	184,919	15,927	21,173	8,379	23,334	2,000	443	4,575	13	22,230		368,012
1975	210,290	8,260	8,047	15,142	26,880	3,000	495	—	407	1,460		355,344
1976	398,863	33,518	9,528	40,442	26,467	3,000	555	4,507	903	1,105		546,008
1977	621,967	7,307	26,250	155	29,056	3,000	334	3,270	1,745	684		739,057
1978	1,316,595	26,023	74,309	28	55,234	4,800	288	2,036	4,224	1,214		1,745,055
1979	1,325,944	62,327	89,231	52,457	125,714	6,100	199	3,286	1,928	1,493		1,700,486
1980	1,535,484	98,523	95,793	93,182	75,921	6,600	3,827	2,727	2,400	2,309		1,937,541
Export Value												
1965												
1966		645	1,445		2,379	600	306	14		98		58,144
1967		758	561		2,459	1,000	301	30		55		73,427
1968		471	245		2,424	500	134	70		77		70,039
1969		3,752	281		4,503	520	178	206		91		80,242
1970		3,823	457		3,781	300	174	110		57		69,509
1971	210	5,975	1,505		4,401	500	224	385		41		48,227
1972	710	2,867	3,698	9,636	3,985	270	201	452		2,740		84,945
1973	21,000	6,558	6,143	5,691	5,370	500	403	548	14	7,239		104,621
1974	43,700	6,728	7,504	2,065	7,291	600	427	1,214	8	7,110		130,294
1975	71,636	3,319	2,622	5,076	9,777	1,000	857	—	258	582		116,899
1976	65,136	10,940	3,315	10,698	11,957	850	936	1,381	505	555		165,042
1977	114,074	3,174	5,888	69	15,283	830	915	770	965	447		199,563
1978	152,540	12,343	19,105	14	22,573	1,250	833	584	4,202	699		470,398
1979	343,650	33,724	21,996	13,661	47,256	1,850	673	991	633	895		516,919
1980	410,939	53,726	24,264	27,654	27,722	2,100	2,268	901	820	1,367		563,457

Source: FAO, Trade Yearbook, 1980

Appendix Table 5 Trends in Imports and Import Values of Sunflower Seed

(Volume: MT; Prices: 1,000 US $)

Country / Year	Germany, FR	Mexico	Portugal	Italy	UK	France	Belgium Luxemburg	Netherlands	Czechoslovakia	S. Africa	Others	World Total
Volume of Imports												
1965												
1966	27,782			122,942		379	2,339	1,268	45,701			317,206
1967	22,938			191,504		352	3,961	1,399	61,363			509,135
1968	36,678			211,499		897	2,866	2,169	86,000			589,894
1969	77,540			186,980		839	1,811	6,937	72,000			623,881
1970	78,968		4,140	179,703		1,866	1,531	17,249	65,000			562,410
1971	48,549			76,847		17,119	1,465	2,650	31,000			358,171
1972	119,224		19,099	51,630		53,459	1,368	5,933	67,000			464,971
1973	181,457		60,784	29,193		35,463	3,161	10,438	104,000			531,023
1974	120,153		32,358	30,605		46,891	1,896	15,120	69,000			409,040
1975	126,329		25,487	4,167	2,073	22,229	4,225	3,025	63,000			338,598
1976	267,507		53,980	794	17,200	2,254	6,733	10,849	62,000			503,096
1977	336,414	180	74,853	15,922	9,767	30,825	7,117	15,881	71,000			632,666
1978	660,786	304,500	130,834	90,380	43,253	88,545	10,610	7,000	67,000	13,699		1,478,150
1979	669,982	91,400	171,289	168,453	114,225	130,006	21,399	3,891	105,000	40,687		1,640,957
1980'	791,731	296,000	220,306	220,238	124,978	106,462	73,520	63,662	39,000	29,210		2,072,312
Import Value												
1965												
1966	4,847			16,369		70	349	227	6,778			49,066
1967	3,560			25,974		60	408	259	9,312			74,426
1968	5,296			26,838		164	408	374	13,450			83,401
1969	10,644			21,467		148	257	1,130	10,400			83,420
1970	12,492		582	23,049		324	249	2,523	10,650			83,742
1971	9,630			12,228		2,830	321	494	5,100			58,995
1972	20,441		3,402	6,657		9,391	311	1,072	11,000			81,874
1973	41,632		13,349	5,670		9,669	1,015	2,743	23,000			121,744
1974	42,145		12,122	12,773		19,114	819	6,333	25,000			150,851
1975	45,272		11,143	1,813	878	10,154	1,576	1,276	21,000			125,561
1976	82,306		18,076	283	5,694	990	2,213	3,527	20,700			165,092
1977	98,119	98	29,899	4,886	4,732	7,715	2,621	5,311	23,000			202,804
1978	193,331	84,000	39,390	26,058	13,356	26,323	3,690	2,369	25,000	3,765		440,915
1979	231,947	29,000	59,029	55,136	39,060	42,686	8,078	1,797	45,000	7,625		573,048
1980	266,975	89,000	68,402	63,379	39,981	33,935	23,563	20,591	16,273	5,475		671,750

Source: FAO, Trade Yearbook, 1980

Appendix Table 6 Sunflower Oil Supply and Demand by Country

(1,000 MT)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
PRODUCTION						
UNITED STATES	14	86	115	224	298	199
CANADA	0	14	14	15	16	16
MEXICO	1	46	94	82	123	210
ARGENTINA	357	392	519	577	425	573
BRAZIL	1	1	2	8	12	17
CHILE	5	10	12	13	2	3
URUGUAY	11	19	13	8	16	21
BELGIUM-LUXEMBURG	0	2	8	30	42	38
FRANCE	18	44	60	83	87	115
FED. REP. GERMANY	79	234	247	308	246	226
GREECE	0	0	0	0	1	2
ITALY	25	59	68	103	73	84
NETHERLANDS	4	2	2	19	76	56
UNITED KINGDOM	4	18	45	43	20	36
AUSTRIA	0	0	0	1	0	0
PORTUGAL	37	72	79	109	114	106
SPAIN	121	151	183	172	169	172
SWITZERLAND	1	5	7	7	9	10
TURKEY	204	184	196	224	252	228
BULGARIA	131	153	133	150	136	162
CZECHOSLOVAKIA	29	29	31	21	16	23
GERMAN DEM. REP.	2	2	11	9	8	8
HUNGARY	64	73	68	117	158	207
ROMANIA	295	295	301	328	301	297
YUGOSLAVIA	119	189	196	190	116	112
USSR	1816	2031	1834	1852	1611	1582
AUSTRALIA	22	52	58	23	46	50
INDIA	0	0	56	51	57	54
IRAN	9	6	5	0	0	0
ISRAEL	2	2	2	2	2	2
JAPAN	0	0	0	0	0	1
CHINA	46	63	88	107	290	319
ETHIOPIA	8	10	8	7	7	7
MOROCCO	5	6	4	6	1	2
MOZAMBIQUE	2	5	5	5	5	5
SOUTH AFRICA	140	141	150	147	174	121
TANZANIA	2	2	4	2	2	2
ZIMBABWE	8	7	2	2	2	3
TOTAL	3582	4386	4612	5045	4913	5075
EXPORTS 2/						
UNITED STATES	15	34	41	86	301	165
ARGENTINA	131	161	259	355	190	335
BRAZIL	3	-	0	3	6	9
URUGUAY	2	5	0	2	0	0
BELGIUM-LUXEMBURG	14	24	36	24	25	25
FRANCE	10	17	14	22	12	12
FED. REP. GERMANY	37	101	124	168	149	150
ITALY	4	10	17	23	28	7
NETHERLANDS	9	9	9	15	71	56
UNITED KINGDOM	0	3	20	21	5	18
PORTUGAL	0	0	0	4	5	8
SPAIN	5	8	6	13	9	5
TURKEY	0	0	0	0	15	0
BULGARIA	21	19	17	20	20	25
HUNGARY	32	36	45	48	85	127
ROMANIA	130	140	120	135	75	95
YUGOSLAVIA	2	13	34	34	16	0
USSR	231	146	113	123	75	75
SOUTH AFRICA	21	5	17	11	32	20
ZIMBABWE	0	0	1	0	0	0
TOTAL	662	725	838	1050	1121	1124
IMPORTS 2/						
MEXICO	0	0	0	4	7	1
BRAZIL	0	0	0	0	0	1
CUBA	68	71	74	75	15	75
CHILE	3	5	5	6	3	5
URUGUAY	0	0	6	7	4	4
VENEZUELA	0	39	82	66	87	85
BELGIUM-LUXEMBURG	32	45	42	43	34	48
FRANCE	97	111	148	121	142	126
FED. REP. GERMANY	69	24	28	32	36	37
IRELAND	2	3	3	3	3	3
ITALY	2	3	9	11	9	8
NETHERLANDS	24	35	39	35	25	25

Appendix Table 6 (cont'd.)

(1,000 MT)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
IMPORTS (con't)						
UNITED KINGDOM	15	3	4	5	6	5
AUSTRIA	28	29	29	32	30	30
CYPRUS	0	1	1	1	1	1
DENMARK	1	1	1	1	1	1
PORTUGAL	0	1	0	3	0	5
SPAIN	10	53	57	20	14	30
SWEDEN	2	2	3	2	2	2
SWITZERLAND	23	23	21	32	30	30
TURKEY	0	0	0	0	19	0
CZECHOSLOVAKIA	38	43	40	21	35	35
GERMAN DEM. REP.	40	25	21	28	22	20
POLAND	22	29	20	18	20	20
ROMANIA	6	4	3	3	3	0
YUGOSLAVIA	1	1	0	0	10	10
USSR	0	0	11	90	228	225
AUSTRALIA	0	12	2	5	1	0
IRAN	15	5	0	62	11	15
JAPAN	0	1	1	6	12	10
NEW ZEALAND	4	5	6	6	6	6
ALGERIA	27	55	47	95	100	100
EGYPT	35	44	95	19	25	26
MOROCCO	0	6	0	3	2	8
ZAMBIA	1	1	1	0	1	1
TOTAL	371	673	805	382	1010	996
CONSUMPTION						
UNITED STATES	7	49	76	72	29	59
CANADA	0	14	14	15	16	16
MEXICO	1	41	92	88	127	211
ARGENTINA	220	233	263	280	245	230
BRAZIL	1	1	2	5	6	9
CUBA	68	71	74	75	75	75
CHILE	5	10	12	15	9	8
URUGUAY	11	16	19	15	20	25
VENEZUELA	0	32	82	86	87	85
BELGIUM-LUXEMBURG	38	23	32	49	47	61
FRANCE	116	140	195	179	220	243
FED. REP. GERMANY	111	147	167	148	144	125
GREECE	0	1	1	1	1	2
IRELAND	2	2	3	3	3	3
ITALY	23	37	67	86	54	85
NETHERLANDS	27	29	29	31	30	30
UNITED KINGDOM	15	24	25	27	21	23
AUSTRIA	28	28	29	33	30	30
CYPRUS	0	1	1	1	1	1
DENMARK	1	1	1	1	1	1
PORTUGAL	56	7	78	105	109	111
SPAIN	160	194	238	182	174	197
SWEDEN	2	2	1	2	2	2
SWITZERLAND	28	29	28	39	39	40
TURKEY	204	168	196	193	230	235
BULGARIA	119	134	116	130	116	137
CZECHOSLOVAKIA	67	64	71	42	51	55
GERMAN DEM. REP.	42	27	32	27	30	28
HUNGARY	52	35	23	69	23	80
POLAND	22	28	20	33	20	20
ROMANIA	171	162	184	196	229	202
YUGOSLAVIA	115	170	157	170	120 *	115
USSR	1585	1685	1732	1419	1764	1732
AUSTRALIA	22	64	60	28	47	50
INDIA	0	1	56	51	57	54
IRAN	24	11	6	62	13	13
ISRAEL	2	2	2	2	2	2
JAPAN	0	1	4	6	10	15
CHINA	46	63	96	107	293	319
NEW ZEALAND	4	5	6	6	6 *	6
ALGERIA	27	43	47	96	100	100
EGYPT	35	44	95	19	25	26
ETHIOPIA	6	11	6	7	7	7
MOROCCO	5	12	6	9	9	10
MOZAMBIQUE	2	5	5	5	5	5
SOUTH AFRICA	119	136	132	136	142	101
TANZANIA	2	2	4	2	2	2
ZAMBIA	2	1	1	0	1	1
ZIMBABWE	8	2	1	2	2	3
TOTAL	3512	4165	4555	4768	4839	4984

Appendix Table 6 (cont'd.)

(1,000 mt)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
ENDING STOCKS 3/						
UNITED STATES	0	3	7	73	41	35
MEXICO	0	5	7	5	8	8
ARGENTINA	21	19	30	27	17	25
CHILE	0	1	0	4	0	0
FRANCE	11	17	22	25	22	8
FED. REP. GERMANY	0	21	12	26	17	5
ITALY	0	0	0	5	5	5
NETHERLANDS	3	2	2	10	10	5
PORTUGAL	2	4	0	1	0	0
SPAIN	0	0	5	2	2	2
TURKEY	0	0	0	31	57	50
YUGOSLAVIA	18	25	30	16	6	13
JAPAN	0	0	1	1	3	5
TOTAL	55	92	116	225	188	151

1/ ALL DATA ARE SHOWN ON A MARKETING YEAR BASIS. SPLIT YEAR INCLUDES NORTHERN HEMISPHERE CROPS HARVESTED IN THE LATE MONTHS OF THE FIRST YEAR SHOWN COMBINED WITH SOUTHERN HEMISPHERE CROPS HARVESTED IN THE EARLY MONTHS OF THE FOLLOWING YEAR. A LISTING OF THE MONTHS INCLUDED IN THE SPLIT YEAR FOR EACH COUNTRY MAY BE FOUND IN FOP 5-81, "REFERENCE TABLES ON THE MAJOR PRODUCERS AND CONSUMERS OF SUNFLOWERSEED AND SUNFLOWERSEED PRODUCTS," MAY 1981.
2/ WORLD EXPORTS WILL NOT EQUAL IMPORTS AS NOT ALL TRADING COUNTRIES HAVE BEEN IDENTIFIED.
3/ STOCKS DATA ARE NOT INCLUDED FOR ALL COUNTRIES AND WHERE INCLUDED ARE, IN MOST CASES, ESTIMATES. WHERE NO STOCK ESTIMATES ARE AVAILABLE, CHANGES ARE INCLUDED IN CONSUMPTION.

Source: USDA, Foreign Agricultural Service, Oilseeds and Products

Appendix Table 7 Sunflower Seed and Oil Supply and Demand in the World and in Main Countries 1976/77 - 1981/82

A. World Supply and Demand

1) Seed

(1,000 MT)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	Average 1976/77-1978/79 (A)	Average 1979/80-1981/82 (B)	(B)/(A) %	Annual average growth factor(%)
Area (1,000 ha)	9,372	11,002	12,236	12,643	11,939	12,411	10,870	12,331	113.4	104.3
Yield (MT/ha)	1.085	1.170	1.054	1.220	1.105	1.147	1.102	1.158	105.1	101.7
Production	10,173	12,872	12,902	15,422	13,187	14,234	11,982	14,281	119.2	106.0
Export	469	1,312	1,649	2,268	1,933	2,143	1,143	2,115	185.0	122.8
Import	485	1,177	1,716	2,068	1,945	2,281	1,126	2,098	186.3	123.0
Processing	8,885	10,782	11,415	12,535	12,345	12,982	10,361	12,621	121.8	106.8

2) Oil

(1,000 MT)

Production	3,852	4,386	4,612	5,045	4,913	5,075	4,193	5,011	119.5	106.1
Export	662	725	838	1,050	1,121	1,124	742	1,098	148.0	113.2
Import	571	674	805	882	1,010	996	683	963	140.9	112.1
Consumption	3,512	4,305	4,555	4,768	4,839	4,984	4,124	4,863	117.9	105.6

Appendix Table 7 (cont'd.)

B. USSR

1) Seed

(1,000 MT)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	Average 1976/77-1978/79 (A)	Average 1979/80-1981/82 (B)	(B)/(A) %	Annual average growth factor(%)
Area (1,000 ha)	4,534	4,574	4,558	4,334	4,353	4,235	4,555	4,307	94.6	98.2
Yield (MT/ha)	1.164	1.291	1.170	1.249	1.069	1.086	1.209	1.135	93.9	97.9
Production	5,277	5,904	5,333	5,414	4,652	4,600	5,505	4,889	88.8	96.1
Export	-	-	-	-	-	-	-	-	-	-
Import	-	-	-	-	-	-	-	-	-	-
Processing	4,222	4,723	4,266	4,277	3,720	3,600	4,404	3,866	87.8	95.8

2) Oil

(1,000 MT)

Production	1,816	2,032	1,834	1,852	1,611	1,582	1,894	1,682	88.8	96.1
Export	231	148	113	123	75	75	164	91	55.5	82.2
Import	-	-	11	90	228	225	4	181	4,525.0	165.4
Consumption	1,585	1,883	1,732	1,819	1,764	1,732	1,733	1,772	102.3	100.8

Appendix Table 7 (cont'd.)

C. The United States

1) Seed

(1,000 MT)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	Average 1976/77-1978/79 (A)	Average 1979/80-1981/82 (B)	(B)/(A) %	Annual average growth factor(%)
Area (1,000 ha)	425	959	1,192	2,257	1,537	1,590	859	1,795	209.0	127.9
Yield (MT/ha)	1.089	1.387	1.529	1.510	1.137	1.319	1.403	1.347	96.0	98.6
Production	463	1,330	1,823	3,409	1,748	2,098	1,205	2,418	200.7	126.1
Export	337	942	1,366	1,820	1,505	1,650	882	1,658	188.0	123.4
Import	2	3	7	10	28	28	4	22	550.0	176.5
Processing	35	219	292	547	780	500	182	609	334.6	149.6

2) Oil

(1,000 MT)

Production	14	86	115	224	298	199	72	240	333.3	149.4
Export	15	14	41	86	301	165	23	184	800.0	200.0
Import	-	-	-	-	-	-	-	-	-	-
Consumption	7	49	70	72	29	50	42	50	119.0	106.0

Appendix Table 7 (cont'd.)

D. China

1) Seed

(1,000 MT)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	Average 1976/77-1978/79 (A)	Average 1979/80-1981/82 (B)	(B)/(A) %	Annual average growth factor(%)
Area (1,000 ha)	200	250	320	367	850	1,100	257	772	300.4	144.3
Yield (MT/ha)	0.750	0.800	0.872	1.079	1.068	1.091	0.817	1.187	145.3	113.3
Production	150	200	279	340	908	1,200	210	816	388.6	157.2
Export	7	5	6	6	8	12	6	9	150.0	114.5
Import	-	-	-	-	-	-	-	-		
Processing	132	179	251	307	828	1,096	187	744	397.9	158.5

2) Oil

(1,000 MT)

Production	46	63	88	107	290	319	66	239	362.1	153.6
Export	-	-	-	-	-	-	-	-	-	-
Import	-	-	-	-	-	-	-	-	-	-
Consumption	46	63	88	107	290	319	66	239	362.1	153.6

Appendix Table 7 (cont'd.)

E. Argentina

1) Seed

(1,000 MT)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	Average 1976/77-1978/79 (A)	Average 1979/80-1981/82 (B)	(B)/(A) %	Annual average growth factor(%)
Area (1,000 ha)	1,233	2,000	1,557	1,855	1,280	1,475	1,597	1,537	96.2	98.7
Yield (MT/ha)	0.730	0.800	0.918	0.889	0.984	0.843	0.820	1.010	123.2	107.2
Production	900	1,600	1,430	1,650	1,260	1,750	1,310	1,553	118.5	105.8
Export	-	200	2	1	25	100	67	42	62.7	85.6
Import	-	-	-	-	-	-	-	-	-	-
Processing	1,088	1,187	1,479	1,639	1,255	1,625	1,251	1,506	120.4	106.4

2) Oil

(1,000 MT)

Production	357	392	513	577	425	573	421	525	124.7	107.6
Export	131	161	239	300	190	335	177	275	155.4	115.8
Import	-	-	-	-	-	-	-	-	-	-
Consumption	220	233	263	280	245	230	239	252	105.4	101.8

Appendix Table 7 (cont'd.)

F. Germany, FR

1) Seed

(1,000 MT)

	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	Average 1976/77-1978/79 (A)	Average 1979/80-1981/82 (B)	(B)/(A) %	Annual average growth factor(%)
Area (1,000 ha)	-	-	-	-	-	-	-	-	-	-
Yield (MT/ha)	-	-	-	-	-	-	-	-	-	-
Production	-	-	-	-	-	-	-	-	-	-
Export	-	-	-	-	-	-	-	-	-	-
Import	228	608	672	828	684	600	503	704	140.0	111.9
Processing	202	584	635	799	655	595	474	683	144.0	112.9

2) Oil

(1,000 MT)

Production	79	234	247	308	246	226	187	260	139.0	111.6
Export	37	101	124	168	147	150	87	155	178.2	121.2
Import	69	28	28	22	36	37	42	32	131.3	109.5
Consumption	111	147	160	148	144	125	139	139	100.0	100.0

[1-2-4-3] COTTONSEED

A. INTRODUCTION

Cottonseed is a byproduct of cotton production. In other words, the cotton plant provides staple cotton as the primary product, and linter and cottonseed as byproducts, the latter providing cottonseed oil and meal.

Linters are the short fibers attached to the seeds left after the removal of staple cotton; the short fiber linters of the first cut are used as materials for mats and coarse yarns, and cellulose, which is the principal chemical component of the linters of the second and subsequent cuts, is used for various kinds of chemicals (e.g., acetate rayon, plastics and gunpowder).

Crude oil is obtained from the seed after linter removal by means of crushing or by solvent extraction. In the former case, 3.5 to 7% of the oil remains in the meal, and in the latter case, the oil content of the meal is 1% or less.

Cottonseed oil is used almost exclusively for food, and only the sub-standard goods and soap-stock produced during refining are used in the non-food industries.

Cottonseed oil is used mainly as cooking oil and salad oil in the home and in restaurants, and also as a material for processed oil products such as margarine, shortening and mayonnaise (mentioned later).

The meal obtained after cottonseed oil extraction is used as protein feed.

Although cotton cultivation and industry in the world have a long history, the history of the cottonseed industry is short, beginning when the cotton gin was invented. Cottonseed treatment, especially the linters removal method, was developed at the end of the eighteenth century, and it was only at the beginning of this century that the cottonseed industry began to develop into a true industry. It developed first in the United States and then spread gradually to other cotton cultivating countries. Until the development of the cottonseed oil

industry, cotton mills disposed of the cottonseed produced, which created an environmental pollution problem. In the 1870s, some cotton cultivating states in the United States regulated the disposal of cottonseed into rivers by state laws.

B. COTTONSEED PRODUCTION AND EXPORTS

Since cottonseed is a byproduct of cotton, its production roughly parallels cotton production. Area under cultivation, yield and production of cotton by country are shown in Appendix Table 1,[1] and cottonseed production is shown in Appendix Table 2.

According to Appendix Table 1, the USSR, the United States and China are the major cotton producing countries, accounting for the majority of the world production. As for cotton yield, the USSR has a particularly high yield (seed cotton, 3.1 tons/ha), which is nearly twice as high as that in the United States and China.[2] The yield in India is 0.5 tons/ha, the lowest.

In cottonseed production, as in staple cotton production, the USSR, the United States and China are the three major producing countries, followed by India, Pakistan and Brazil. Together these six countries account for nearly 80% of world cottonseed production. The production of these six countries is shown as a three-year average (1979-1982) in Table B-1 below:

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1) The unit of cotton in Appendix Table 1 is seed cotton. The unit of cotton in Appendix Tables of other chapter (i.e., [5] Cotton) is staple cotton or ginned cotton. The sources for staple cotton statistics is different from those used for seed cotton.

2) The reason for the high yield in the USSR is that since Central Asian republics (Uzbek, Turkmen and Kazakh), which are the major staple cotton producing areas in the country, have high temperatures and are dry, cultivation is done with well-equipped irrigation systems which collect water from rivers and canals. Also, it is said that a sharp difference in temperature between night and daytime is favorable to cotton cultivation.

Table B-1 Cottonseed Production in Main Producing Countries

(1,000 tons)

USSR	USA	China	India	Pakistan	Brazil	Other countries	World total
5,271 (20.1%)	5,031 (19.2%)	4,865 (18.6%)	2,623 (10.0%)	1,435 (5.5%)	1,150 (4.4%)	5,848 (22.2%)	26,223 (100%)

Source: From Appendix Table 2-(1)

The cottonseed produced is mostly crushed in the producing countries and is partly exported in the form of seed. World exports in the form of seed account for 1% or less of the total production.

In addition to being crushed in the producing countries, some seed is used as feed and as fuel, the quantity of which is estimated at 25% or less of production.

Cottonseed exports by country are listed in Appendix Table 2-(2), which shows that only the United States and the USSR are exporters among the main producing countries, and together account for the largest part of exports, the rest of which is shared by many other producing countries with a small amount of exports each. In small producing countries also, there has been a tendency for the amount crushed domestically to increase and for cottonseed exports to decrease.

The average exports over the past three years by major producing countries are shown as follows:

Table B-2 Cottonseed Exports by Major Producing Countries

(1,000 tons)

USA	Thailand	USSR	Mali	Other countries	World total
74 (37.0%)	39 (19.5%)	36 (18.0%)	19 (9.5%)	32 (16.0%)	200 (100%)

The largest importing countries are Japan and Mexico, accounting together for a little more than 70% of the world imports.

C. COTTONSEED OIL PRODUCTION AND EXPORTS

Three countries, the USSR, China and the United States, which are major cottonseed producing countries, are also major cottonseed oil producing countries, together accounting for the majority of world cottonseed oil production.

Among these three countries, the USSR consumes almost all of its production and China exports only a minor part of its production, whereas the United States exports almost half, being the largest cottonseed oil exporting country in the world.

The exporting country second to the United States is Brazil, which exports about 40% of its production. In addition to these, there are many exporting countries such as Paraguay, Argentina and Israel, where the export ratio is generally high.

The production and exports and imports of cottonseed oil are shown in Appendix Tables 2-(3) and 2-(4), respectively, and the oil production, exports and imports in the main producing countries (averages in 1979-1981) are shown in Tables C-1, C-2 and C-3 below:

Table C-1 Cottonseed Oil Production and Share of Main Countries

(1,000 tons)

USSR	USA	China	India	Brazil	Pakistan	Other countries	World total
648	599	417	272	150	138	778	3,002
(21.6%)	(20.0%)	(13.9%)	(9.1%)	(5.0%)	(4.6%)	(25.8%)	(100%)

Table C-2 Cottonseed Oil Exports and Share of Main Countries

(1,000 tons)

USA	Brazil	Other countries	World total
321	61	44	426
(75.4%)	(14.3%)	(10.3%)	(100%)

Table C-3 Cottonseed Oil Imports and Share of Main Countries

(1,000 tons)

Egypt	Venezuela	Japan	Dominican Republic	Other countries	World total
180 (42.3%)	83 (19.5%)	37 (8.7%)	32 (7.5%)	94 (22%)	426 (100%)

Source: Oil World

D. COTTONSEED OIL CONSUMPTION AND IMPORTS

Cottonseed oil is used as cooking oil, as salad oil, and in mayonnaise, margarine and shortening. When it is used as a material for margarine and shortening, it is cured by hydrogenation to raise the melting point. It is also used in canned foods, especially oil-preserved sardines and tuna.

Cottonseed oil consumption by year and country is derived from the disappearance, which is calculated by using the formula: Beginning stock + Production + Imports - Exports - Ending stock = Disappearance.

The disappearance estimated by Oil World and by the U.S. Department of Agriculture (USDA) is shown in Appendix Tables 2-(5) and 3, respectively, the latter showing disappearance in the main countries.

According to these estimates, cottonseed and cottonseed oil producing countries have a high consumption of cottonseed oil. The latest USDA statistics on the consumption of cottonseed oil as an edible oil by country (1981) show that the USSR, which uses almost all of its production within the country, and China have the highest consumption (USSR 690,000 tons, China 590,000 tons), but the United States, which exports more than half of its production, has a consumption of about 250,000 tons. Consumption as an edible oil is from 100,000 to 200,000 tons in India, Pakistan and Brazil. It is noted that Egypt, which imports cottonseed oil to supplement its domestic production, has a consumption of

330,000 tons, more than that of the United States. Mexico, which imports the oil to supplement that from domestic cottonseed crushing, has a consumption of about 100,000 tons.

Cottonseed non-producing countries consume little cottonseed oil. Among cottonseed non-producing countries, Japan is the largest consuming country. Japan imports both cottonseed for crushing, and cottonseed oil.

Since trends in Japan's cottonseed oil consumption provide a good model of the consumption patterns of cottonseed oil, they are described below.

In Japan, cotton was cultivated domestically until the end of the last century, and cottonseed oil has been used since long ago. At the beginning of this century, cotton cultivation in Japan almost stopped, and consequently Japan began to depend on cotton imports for material for cotton spinning, and simultaneously to import cottonseed for oil extraction. Imports gradually increased, and Japan has become the largest importer of cottonseed in the world.

However, in the latter half of the 1960s, and especially in the 1970s, as cottonseed producing countries increased their domestic oil extraction, Japan has had increasing difficulty in obtaining materials, which has led Japan to turn to various sources of imports. The trends are shown as follows.

Table D-1 Japan's Cottonseed Imports by Origin

(tons)

	1976	1977	1978	1979	1980	1981
Thailand	3,645	4,733	18,852	21,988	42,454	49,892
Philippines	168	690	942	1,120	3,474	6,959
Indonesia	495	2,357	100	670	1,892	5,494
USSR	51,543	43,482	34,106	25,123	8,749	-
USA	-	3,336	14,738	2,138	34,276	2,152
Nicaragua	998	-	-	-	-	-
S. Africa	4,720	-	-	-	-	-
Ethiopia	2,625	9,429	6,780	-	-	-
Other African countries	30,214	30,548	15,238	21,019	-	1,996
Other countries	580	92	866	234	-	-
Total	94,988	94,667	91,622	72,292	90,845	66,493

Source: Ministry of Finance, Customs and Tariff Bureau, Government of Japan

Table D-2 Japan's Annual Cottonseed Oil Supply

(tons)

	1976	1977	1978	1979	1980	1981
Material treated	90,322	92,673	92,486	74,359	77,713	73,071
Cottonseed oil output	18,216	18,123	19,083	14,078	13,433	13,178
Cottonseed oil imports	12,745	22,644	31,071	36,599	32,181	42,534
Gross supply	30,961	40,767	50,154	50,677	45,614	55,722

Source: Ministry of Agriculture, Forestry and Fisheries; and Customs and Tariff Bureau, Government of Japan

As shown in the above Tables, the difficulty in obtaining cottonseed caused a decrease in domestic crushing and an increase in oil imports, and the domestic supply has continued to increase on the whole. This increase is due to the increase in the use of cottonseed oil as a home cooking oil and as a salad oil, but with regard to its use in processed foods such as shortening and margarine, oil consumption has decreased. This is attributed to changes in the average family's eating habits, especially the adoption of salad dishes, and to the substitution of other oils for cottonseed oil in processed foods.

Table D-3 Japan's Cottonseed Oil Sales by Use

(tons)

	1977	1978	1979	1980	1981
Canned food	4,496(10)	4,060(9)	3,922(8)	4,180(9)	4,413(9)
Margarine & shortening	8,022(20)	11,398(24)	11,737(23)	6,995(14)	6,468(12)
Mayonnaise	6,425(16)	7,649(16)	7,916(16)	6,032(12)	5,340(10)
General household and other uses	22,144(54)	23,646(51)	26,913(53)	31,288(65)	36,127(69)
Total	41,087(100)	46,753(100)	50,488(100)	48,495(100)	52,348(100)

Note : Figures in parentheses refer to percentages.

Source: The Association of Japan Cottonseed Industry

E. COTTONSEED OIL PRICE

Cottonseed oil, which is one of the so-called premium oils, is the second most expensive edible oil, almost equal in price to sunflower oil, following peanut oil. The following Table shows the annual average price of cottonseed oil over the past decade.

Table E-1 Annual Average Price of Cottonseed Oil

(US$/MT CIF Rotterdam)

1960	235	1970	354
1961	305	1971	392
1962	266	1972	324
1963	243	1973	500
1964	250	1974	939
1965	278	1975	726
1966	333	1976	593
1967	378	1977	622
1968	305	1978	661
1969	291	1979	798
		1980	657

Source: Oil World Digest

It goes without saying that the price is determined fundamentally by the balance of supply and demand; and moreover, regarding the supply of vegetable oils, the fluctuation in the production of oilseeds is the major factor. As already stated in the section of General Description on Oilseeds and Oils of this chapter, the production of perennial crops such as palm and coconut palm is more stable in supply than that of annual crops. Oilseed production from annual crops is generally more responsive to price than that from perennial crops. In other words, a rise or fall in price encourages or discourages the producers with regard to production in the following year.

However, cottonseed and cottonseed oil are somewhat different from other vegetable oils in price formation due to their being byproducts of staple cotton production. That is, cottonseed production is strongly bound to staple cotton price rather than to the prices of cottonseed and cottonseed oil. This means that cottonseed production has extremely weak, if any, responsiveness to price.

F. CONCLUDING REMARKS

As already stated, cottonseed oil, which is a high-quality edible oil, one of the "premium oils", as is peanut oil, holds a strong position in its use as a salad oil and cooking oil, as does peanut oil. Accordingly, it may be considered that its future prospects for demand are the same as those for peanut oil, as considered in the preceding part of this chapter. A difference, however, is that peanut is used as a food as well as for crushing, whereas cottonseed is used exclusively for crushing.

From the point of view of production, cottonseed depends on the production of staple cotton as previously mentioned, and as considered in other parts of this Study (the chapter on Cotton), if the production of staple cotton continues to slowly increase in the future, cottonseed production will increase at about the same rate. If the supply increases at such a rate, the share held by cottonseed oil in the vegetable oil market would decrease.

As already stated in the section of General Description on Oilseeds and Oils, in the case of oil plants in general, production trends are subject to the governmental policies of the producing country, such as price support and production control and encouragement, as well as to economic factors; but in the case of cottonseed, the production trends are subject to similar policies on cotton in the producing country.

The United States adopts such policies as production control and price support for staple cotton, as it does for main grains and for peanuts, and many producing countries also use price supports or production subsidies in some form (see the chapter on Cotton).

If cottonseed production increases along with the production of cotton, some countries may export cotton but crush the cottonseed and consume the oil within the country, while some countries may do the opposite. Thus future cottonseed supply and demand will vary depending on which area or country increases or decreases production of cotton in the future.

As mentioned in the section of General Description on Oilseeds and Oils, though future oil consumption is forecasted to grow greatly in developing countries, it is not expected that these countries will import such an expensive oil as cottonseed oil for consumption, except for such countries as Egypt, where cottonseed oil is domestically produced to some extent and where the people have acquired a taste for it for a long time. If a developing country, however, expands production of cotton, with a resulting increase in cottonseed production, an increase in the consumption of cottonseed oil would be possible in that

country. On this point, Thailand, the Philippines and Indonesia are of interest. These three countries, although their lands are not suitable for growing cotton plants, plan to increase production of cotton as part of their agricultural policies.

These three countries aim to achieve for self-sufficiency in raw cotton by increasing the production of staple cotton, since they depend almost entirely on imports for cotton, though their spinning industries have already developed considerably with the advance of industrialization. As a result of such policies, the production of cottonseed as a byproduct is expanding in these countries, and cottonseed exports to Japan from Thailand and the Philippines have recently soared.

In summary, it seems that world production of cottonseed oil will slowly increase along with the slow increase in the production of cotton, and regarding consumption, cottonseed oil may be replaced by soybean oil and others in the processed oil sector (margarine and shortening), but it will maintain its position as a cooking oil and salad oil, allowing the increase in production to be absorbed in consumption.

Appendix Table 1-(1) Areas under Cultivation, Yield and Production of Seed Cotton

	Area under Cultivation (1,000 ha)				Yield (kg/ha)				Production (1,000 MT)			
	1969-71	1979	1980	1981	1969-71	1979	1980	1981	1969-71	1979	1980	1981
WORLD	32709	32190	32975	33386	1079	1307	1277	1369	35238	42057	42113	45689
AFRICA	4737	3732	3615	3556	798	860	915	902	3778	3210	3308	3205
ALGERIA	1				485	610	610	610	1			
ANGOLA	80	61*	57*	57F	1032	607	579	579	83	37F	33F	33F
BENIN	38	32	28*	38F	736	792	556	632	28	26	16F	24F
BOTSWANA	1	1F	1F	1F	2745	2727	2727	2727	3	3F	3F	3F
BURUNDI	6	8	8F	8F	925	726	813	913	8	6	7F	7F
CAMEROON	103	57	63F	50F	561	1421	1401	1309	58	90	89*	65F
CENT AFR REP	131	90	85	71F	404	374	335	321	53	34	28	23F
CHAD	298	243*	202*	195F	358	374	410	369	107	91*	83*	72F
EGYPT	669	502	523	495*	2145	2554	2678	2768	1436	1282	1400*	1370F
ETHIOPIA	20	20F	28F	28F	2002	2093	2143	2143	40	56F	60F	60F
GAMBIA		3*	3*	3F		934	604	900		2*	2*	2F
GHANA	1	12*	10*	10F	540	593	633	650	1	7*	6*	7F
IVORY COAST	43	107	123	126*	929	1071	1163	1061	37	115	143	134*
KENYA	74	90	140*	142*	215	337	272	299	16	28	38	42*
MADAGASCAR	10	15	17	20	1913	1372	1526	1514	20	35	26	31
MALAWI	46	34*	32*	35*	447	1019	721	989	21	35*	23*	35*
MALI	70	109*	121*	121*	805	1248	1306	942	57	136*	158*	114*
MOROCCO	17	8	13	13F	1302	1846	1296	1298	22	15	17	17F
MOZAMBIQUE	360	121*	142*	142F	353	372	380	401	127	45*	54*	57F
NIGER	20	7	10	10F	468	662	559	556	9	4	6	6F
NIGERIA	405	559*	476*	450*	458	230	187	189	185	110F	90F	85F
RWANDA					918							
SENEGAL	14	31	28*	33*	1054	869	780	1045	15	27	22*	35*
SOMALIA	13	12*	12*	12*	313	333	385	385	4	4*	5*	5*
SOUTH AFRICA	81	110*	120*	123*	617	1282	1239	1276	50	142	149	157F
SUDAN	502	435	412*	397*	1362	935	808	730	684	407	333*	290*
SWAZILAND	12	19*	23*	23F	616	1231	1447	1391	9	23*	33*	32F
TANZANIA	425	405*	364*	376*	494	437	410	442	210	177	149	167*
TOGO	34	26	26	27F	183	497	708	729	7	13	20	20
TUNESIA					1367							
UGANDA	923	263*	252*	162*	279	81	109	101	258	23*	26*	16*
UPPER VOLTA	75	72	50F	90F	387	836	841	789	31	60	78	71F
ZAIRE	169	140F	140F	142F	272	143	214	212	63	20F	30F	30F
ZAMBIA	9	24	30	40*	933	621	756	555	8	15	23	22
ZIMBABWE	78	95*	86F	112F	1706	1615	1871	1560	133	153	160	175
N C AMERICA	5270	6041	6010	6239	1431	1761	1759	1734	7540	10640	9225	10816
ANTIGUA					471	714	743	771				
COSTA RICA	1	12*	7	9	1637	935	1579	1842	2	11	12	15
CUBA	4	4*	4*	4F	854	750	750	750	3	3F	3F	3F
DOMINICAN RP	2	6F	6F	5F	1092	977	977	982	3	4	6	6F
EL SALVADOR	56	102	85	59	2381	1963	2201	2003	134	203	186	117
GRENADA					350	73	75	75				
GUADELOUPE	1				1111				1			
GUATEMALA	77	122	122	102	2479	4029	3745	3831	190	491	464	392
HAITI	5	14	8F	10F	375	410	500	450	2	6	4*	5F
HONDURAS	6	11	13	5*	2142	2273	1935	2432	13	25	23	20*
MEXICO	461	405	372	355	2144	2726	2663	2676	988	1096	980*	950F
MONTSERRAT					1945	1533	1533	1533				
NICARAGUA	112	176	45*	66*	2097	2158	1956	2037	236	375	70*	211*
ST KITTS ETC					1033	517	703	754				
ST VINCENT					838							
USA	4543	5152	5349	5593	1313	1703	1731	1627	5963	8427	6478	9099
SOUTH AMERICA	3563	3402	3351	3339	815	951	970	1035	2902	3221	3252	3144
ARGENTINA	408	465	569	277	908	956	858	1017	370	573	485	282
BOLIVIA	11	34	24	14*	1830	1755	812	1371	20	43	20	15*
BRAZIL	2644	2023	2064	2064	651	842	865	928	1829	1715*	1785*	1915*
COLOMBIA	241	187	213	155*	1662	1512	1513	1645	152	282	353	255F
ECUADOR	13	20	25*	30*	1092	1266	1600	1317	15	25	40	40*
PARAGUAY	46	313	260	324*	674	711	847	1019	31	235	228	330*
PERU	150	135	149	134*	1633	1227	1409	1904	245	300*	280*	255F
URUGUAY	1	1	1F	1F	719	476	454	484	1			
VENEZUELA	46	41	45	52*	695	1181	1330	1300	41	49	61	52F
ASIA	16089	15611	16529	17064	861	974	1004	1056	13855	15230	16596	18011
AFGHANISTAN	54	50F	52*	85*	1378	1167	1330	1240	75	105	65	100
BANGLADESH	11	6	6F	6F	519	717	714	714	6	5	5F	5F
BURMA	162	165	194	229	242	330	324	290	39	54	63F	66F
CHINA	4918	4512	4920	5300*	1314	1462	1661	1698	6463	6621	8121	9000F
CYPRUS					983	1265	1065	1065				
INDIA	7707	7500*	8000F	8000F	424	524	494	510	3264	3927	3900F	4080F
INDONESIA	10	4F	4F	4F	698	565	815	2273	7	2*	3*	10*
IRAN	331	223*	145*	150*	1313	1345	1241	1747	441	300*	180*	262*
IRAQ	33	17F	17F	17F	1304	814	872	992	43	14F	15F	16F
ISRAEL	34	63	62	64	2819	3169	3282	3756	95	199	204	244
JORDAN												
KAMPUCHEA DM	4	3F	3F	4	869	1286	1310	1418	3	4F	4F	6F
KOREA DPR	15	15F	15F	15F	600	600	600	667	9	9F	9F	10F
KOREA REP	16	8	9	5	835	968	842	923	13	8	7	4
LAO	6	4	3	3	1479	805	2100	2173	9	8	15	15
PAKISTAN	1817	2081	2139	2161	983	1050	1017	1041	1786	2184	2144	2250
PHILIPPINES		4	5F	5F	1200	1107	869	889		5	4F	4F
SRI LANKA	1	3	1	1F	1255	3343	4211	4727	2	11	5	5F
SYRIA	266	155	135	163	1672	2223	2326	2500	391	344	323	408
THAILAND	51	115F	149*	161F	231	1219	1390	1426	37	141	207	230
TURKEY	618	812	877	670*	1953	2023	1935	1903	1146	1238	1300	1275*
VIET NAM	9	7	5	5F	683	682	918	789	6	5F	5F	5F

Appendix Table 1-(1) (cont'd.)

	Area under Cultivation (1,000 ha)				Yield (kg/ha)				Production (1,000 MT)			
	1969-71	1979	1980	1981	1969-71	1979	1980	1981	1969-71	1979	1980	1981
YEMEN AR	6	6	5*	5*	850	857	943	943	5	5	5*	5*
YEMEN DEM	14	12F	12F	12F	1055	1083	1030	1067	15	13F	12F	13F
EUROPE	335	244	249	247	1686	1930	2120	2263	564	471	528	560
ALBANIA	22	30F	30F	30F	668	857	830	860	15	26F	26F	26F
BULGARIA	42	16	12	13	922	1086	947	1022	39	18	12	13*
GREECE	147	142	139	128	2333	2089	2240	2721	342	297*	312	347*
ITALY	6	2	3	3	635	448	651	248	4	1	2	1
ROMANIA		2	1	1F		632	222	500		1		1F
SPAIN	106	50	62	72	1456	2540	2809	2389	155	127	175	172
YUGOSLAVIA	12	2	1F	1F	859	902	909	909	10	1	1*	1F
OCEANIA	33	50	75	75	2454	3113	3248	3594	82	155	244	270
AUSTRALIA	33	50	75	75	2454	3113	3248	3594	82	155	244	270*
USSR	2685	3090	3147	3168	2445	2964	3066	3057	6566	9160	9662	9683
DEV.PED M E	4962	5611	5811	6059	1351	1666	1302	1698	6705	9350	7564	10291
N AMERICA	4543	5192	5348	5593	1313	1623	1271	1627	5967	8427	6678	9099
W EUROPE	271	196	206	204	1887	2176	2302	2557	511	426	490	521
OCEANIA	33	50	75	75	2454	3113	3248	3594	82	155	244	270
OTH DEV.PED	115	173	182	187	1266	1571	1916	2139	145	341	353	401
DEV.PING M E	20053	18904	19031	18791	772	892	862	886	15481	16965	16411	16658
AFRICA	3486	2685	2560	2539	462	514	537	547	1611	1379	1426	1335
LAT AMERICA	4286	4271	4014	3685	1044	1272	1246	1319	4474	5434	5000	4861
NEAR EAST	2499	2052	1975	1990	1695	1807	1840	1879	4234	3709	3633	3739
FAR EAST	9780	9896	10483	10578	528	641	608	630	5162	6343	6352	6669
CENTR PLANNO	7696	7675	8133	8536	1702	2064	2230	2196	13101	15843	18138	18741
ASIAN CPE	4947	4537	4943	5324	1310	1663	1646	1694	6481	6638	8139	9019
E EUR+USSR	2749	3138	3190	3212	2403	2933	3134	3027	6620	9204	10000	9722
DEV.PED ALL	7712	8749	9001	9271	1728	2121	1951	2159	13325	18554	17564	20013
DEV.PING ALL	24997	23441	23974	24115	879	1003	1024	1065	21962	23533	24550	25676

Source: FAO, Production Yearbook, 1981

Appendix Table 1-(2) Cottonseed Production

(1,000 MT)

	1969-71	1979	1980	1981
WORLD	22728	26838	27139	29337
AFRICA	2417	2027	2189	2033
ALGERIA	1			
ANGOLA	55	25*	22*	22F
BENIN	18	17F	10F	15F
BOTSWANA	2	2F	2F	2F
BURUNDI	5	4*	4F	5F
CAMEROON	33	49*	55*	63F
CENT AFR REP	32	23F	18F	16F
CHAD	65	57F	52F	45F
EGYPT	901	792	872	860F
ETHIOPIA	27	32F	40F	40F
GAMBIA		1F	1F	1F
GHANA		4*	4*	4F
IVORY COAST	21	55	80	74*
KENYA	11	18	25*	28*
LIBYA				
MADAGASCAR	12	23	17	20
MALAWI	14	23*	15*	23*
MALI	36	84*	78*	70*
MOROCCO	15	10*	11*	11F
MOZAMBIQUE	84	30*	36*	37F
NIGER	6	3*	4*	4F
NIGERIA	123	73F	60F	57F
RWANDA				
SENEGAL	9	17*	14*	22*
SOMALIA	3	3*	3*	3*
SOUTH AFRICA	33	91	97	100F
SUDAN	442	262*	215*	197*
SWAZILAND	5	16	21	21F
TANZANIA	136	116	98	110*
TOGO	4	8F	13F	13F
TUNISIA				
UGANDA	173	35*	18*	11*
UPPER VOLTA	19	35*	48*	45F
ZAIRE	42	13F	19F	19F
ZAMBIA	5	10	15	15*
ZIMBABWE	67	100	104	114
N C AMERICA	4681	6451	5320	6664
ANTIGUA				
COSTA RICA	1	7	6F	9
CUBA	2	2*	2*	2*
DOMINICAN RP	2	3*	4*	4*
EL SALVADOR	83	119	109	68
GRENADA				
GUADELOUPE				
GUATEMALA	113	268	251	249
HAITI	1	3F	2F	3F
HONDURAS	7	15*	15*	11*
MEXICO	603	605	538	530
MONTSERRAT				
NICARAGUA	130	156	37*	115*
ST KITTS ETC				
ST VINCENT				
USA	3742	5242	4556	5673
SOUTH AMERIC	1836	1975	2202	1950
ARGENTINA	220	330	276	153
BOLIVIA	12	25	12	10*
BRAZIL	1197	1085*	1175*	1206*
CHILE				
COLOMBIA	205	161	216*	160F
ECUADOR	9	15*	24*	24*
PARAGUAY	20	145*	146*	208F
PERU	148	191*	172*	185*
URUGUAY				
VENEZUELA	25	24*	32*	25*

Appendix Table 1-(2) (cont'd.)

(1,000 MT)

	1969-71	1979	1980	1981
ASIA	9143	10044	10972	11871
AFGHANISTAN	49	67*	43	66
BANGLADESH	4	3	3F	3F
BURMA	25	34*	40*	44F
CHINA	4309	4414	5414	6000F
CYPRUS				
GAZA STRIP				
INDIA	2176	2618	2600F	2720F
INDONESIA	5	1*	2*	7*
IRAN	285	200*	120*	175*
IRAQ	29	10F	10F	11F
ISRAEL	58	124	125	152
JORDAN				
KAMPUCHEA DM	2	2F	3F	3F
KOREA DPR	6	6F	6F	6F
KOREA REP	9	5	4	3*
LAO	6	5*	10	10
LEBANON				
PAKISTAN	1198	1456	1428	1500
PHILIPPINES		3F	3F	3F
SRI LANKA	1	3	3	3F
SYRIA	261	215	206	213*
THAILAND	25	55	138	153
TURKEY	205	762	830	785*
VIET NAM	*	3F	3F	3F
YEMEN AR	3	3*	3F	3F
YEMEN DEM	10	9F	8F	9F
EUROPE	385	320	319	356
ALBANIA	10	17F	17F	17F
BULGARIA	26	12	8	9
FRANCE				
GREECE	227	197	297	230*
ITALY	2	1	1	1
MALTA				
PORTUGAL				
ROMANIA		1*		
SPAIN	96	73	56*	100*
YUGOSLAVIA	7	1	1F	1F
OCEANIA	45	87	136	161
AUSTRALIA	45	87	136	161
USSR	4261	5954*	6500*	6300F
DEV.PEO & E	4259	5816	4768	6418
N AMERICA	3742	5242	4056	5673
W EUROPE	330	272	295	332
OCEANIA	45	87	136	161
OTH DEV.PEO	92	216	222	252
DEV.PING & E	5922	10614	10382	10581
AFRICA	1040	882	506	886
LAT AMERICA	2774	3184	2967	2941
NEAR EAST	2666	2320	2277	2309
FAR EAST	3441	4228	5231	4446
CENTR PLANND	8598	10408	11955	12338
ASIAN CPE	4321	4425	5426	6013
E EUR+USSR	4277	5983	6525	6326
DEV.PED ALL	8496	11759	11232	12744
DEV.PING ALL	14243	15039	15907	16591

Source: FAO, Production Yearbook, 1981

Appendix Table 2-(1) Cottonseed Production

(1,000 tons)

	HARVEST(a)	82/83p	81/82p	80/81p	79/80	78/79	77/78	76/77	75/76	74/75	Average 77/78-81/82	Average 72/73-76/77
Greece.....	Sep-Oct(1)	210*	205*	195	180	252	251	200	218	216*	217*	212
Spain.....	Sep-Nov(1)	98*	109*	103*	73	58	84	81	88	114	85*	96
Bulgaria....	Sep-Oct(1)	...	8*	8	12	11	9	14*	21	25	10*	24*
U.S.S.R.(b).	Sep-Oct(1)	5400*	5296	5479	5038	4675	4905	4635	4404	4877	5079	4519
Benin.....	Oct-Dec(1)	...	14*	8*	17*	13*	9*	14*	14*	21*	12*	22*
Cameroon....	Oct-Dec(1)	...	55*	59*	55*	41*	27*	32*	39*	27*	47*	29*
Chad.....	Nov-Jan	85*	42*	49*	53*	80*	73*	86*	105*	86*	59*	82*
Egypt.....	Aug-Oct(1)	780*	855*	872r	792	736	690	677	663	753	789*	770
Ethiopia....	Nov-Jan	...	50*	50*	46*	44*	37*	41*	44*	44*	45*	42*
Ivory Coast.	Nov-Feb	...	77*	82*	83*	65	53	43	39	36	73*	37
Madagascar..	Jly-Sep(1)	...	15*	14*	16*	20*	22	20	20	20*	17*	18
Mali.....	Dec-Feb	...	57*	65*	90*	76*	68*	73*	62*	37*	71*	48*
Mozambique..	May-Jly(1)	...	39*	32*	28*	39*	34*	22*	32*	83*	34*	58*
Nigeria(c)..	Dec-Feb	60*	44*	49*	53*	69*	73*	152*	121*	104*	58*	106*
Senegal.....	Nov-Feb	25*	23*	14*	18*	24*	25*	30*	19	27	21*	22*
South Africa	May-Jly(1)	82*	101*	114*	97	91	81	77	39	71	97*	59
Sudan.....	Nov-Apr	270*	280*	170*	190	258	354	294	220	395	250*	338
Tanzania....	Jly-Oct(1)	115*	110*	98	116	105	107	132	87	143*	107*	125
Uganda.....	Dec-Feb	...	13*	9*	11*	14*	40*	28	49	63*	17*	80
Upper Volta.	Nov-Feb	...	41*	40*	48	38	24	35	33	19	38*	25
U.S.A.....	Aug-Jan	3100*	5796r	4056	5242	3873	5009	3739	2919	4091	4795	4039
El Salvador.	Nov-Jan	60*	65*	68	109	119	134	119	93	125	99*	117
Guatemala...	Dec-Jan	...	134*	205*	241	261	245	231	187	193	217*	191
Honduras....	Sep-Jan	...	12*	12*	15*	12*	18*	11*	6*	8*	14*	8*
Mexico.....	Sep-Dec(1)	400*	495*	557*	520*	534	557*	349	345	826	533*	554
Nicaragua...	Aug-Dec(1)	...	109*	123*	37*	191*	206*	201*	187*	207*	134*	204*
Argentina...	Mar-Jly(2)	...	286r	153	276	330	414r	318	258	314	292	274
Brazil.....	Aug-Jly	1150*	1175*	1175*	1100*	1055*	865*	1045*	760*	1015*	1078*	1019*
Colombia....	Jly-Feb	95*	165*	220*	237*	154*	265*	277	235	263*	208*	249
Paraguay....	Mar-May(2)	...	165*	196*	144*	133*	171*	139*	72*	62*	162*	72*
Peru(c).....	Oct-Nov(1)	155*	165*	190*	191*	165*	137*	117*	118*	117*	170*	139*
Venezuela...	Jly-Feb	10*	11*	13*	31*	24*	37*	34*	44*	69*	23*	46*
China,PR(d).	Aug-Mar	5650*	5490*	5015*	4890*	4010*	3790*	4010*	4290*	4610*	4479*	4305*
India.....	Sep-Apr	2650*	2650*	2600*	2618	2698	2416	2060	2320	2580	2595*	2337
Iran.....	Aug-Oct(1)	140*	130*	108*	181*	240*	323*	284*	252*	432*	196*	341*
Israel.....	Aug-Nov(1)	140*	152	125	124	133	108	87	83	84	128	76
Pakistan....	Sep-Jan	1470*	1450*	1419	1436	950	1106	837	1023	1268	1272*	1171
Philippines.	May-Sep(1)	...	14*	11*	6	2	2	1	-	-	7*	0
Syria.....	Sep-Nov(1)	220*	208*	189*	215	233	232	253	256	242	215*	251
Thailand....	Nov-Feb	...	153	138	115*	52*	49	43	44	40	101	42
Turkey.....	Sep-Dec(1)	780*	800	780	763	760	820	750	768	956	805	835
Australia...	Apr-Jun(2)	210	217r	161	136	87	72	46	41	54	135	49
Oth countries		...	511*	502*	503*	480*	479*	479*	507*	603*	496*	554*
WORLD.....		25100	27787	25551	25351	23205	24546	22130	21130	26320	25281	23577

(a)Bulk of harvesting time, i.e. first of the split years in the case of (1) and second in the case of (2). (b)Revised : 58% of the raw cotton crop up to 74/75, 56% - for the seasons 75/76 to 77/78, and 55% since 78/79. (c)Revised series.
(d)Based on official raw cotton crops of 2968,2707, 2207 and 2167 thousand T in 81/82, 80/81, 79/80 and 78/79 (we assumed a seed/lint ratio of 1.85).

Date : July 23, 1982

Source: Oil World Statistics Update

Appendix Table 2-(2) Cottonseed Exports

(1,000 tons)

	Oct Sept 81/82F	Oct Sept 80/81	Oct Sept 79/80	Oct Sept 78/79	Oct Sept 77/78	Oct Sept 76/77	Jan Sept 1982F	Jan Sept 1981	Oct Dec 1981	Oct Dec 1980	Jan Dec 1981	Jan Dec 1980	Jan Dec 1979
Belgium-Lux...	- *	.	-	-	-	-	- *	.	- *	-	. *	-	-
Denmark.....	- *	2.0	-	-	-	-	- *	2.0	- *	-	2.0*	-	-
Spain.....	- *	0.2	0.1	-	.	0.1	- *	-	- *	0.2	- *	0.3	-
West Europe...	-	2.2	0.1	-	.	0.1	-	2.1	-	0.2	2.1	0.3	-
Yugoslavia....	0.2*	0.2*	0.3*	. *	0.2*	1.3*	0.1*	0.1*	0.1*	0.1*	0.2*	0.4	.
U.S.S.R.....	24.0*	30.8*	33.9*	49.1*	48.5*	89.0*	17.0*	20.0*	7.0*	10.8*	27.0*	36.8	42.6
Benin.....	2.0*	0.7*	2.0*	6.3*	9.6*	8.5*	1.0*	0.5*	1.0*	0.2*	1.5*	1.3	7.1
Chad(a).....	- *	. *	- *	2.0*	1.1*	7.2*	- *	. *	- *	. *	. *	- *	. *
Ethiopia.....	3.0*	3.4*	3.2*	.	7.8	7.5*	2.3*	2.3*	0.7*	1.1*	3.0*	4.3*	-
Ivory Coast...	0.6*	0.9*	1.1*	0.2*	1.0*	3.3*	0.5*	0.5*	0.3*	0.4*	0.8*	1.9*	.
Madagascar....	0.8*	1.0*	0.1*	-	0.9*	3.8*	0.4*	0.6*	0.4*	0.4*	1.0*	0.5*	-
Mali.....	8.3*	11.0*	22.0*	25.0*	16.0*	32.0*	6.0*	8.4*	2.3*	2.6*	10.7*	18.0*	29.0*
Nigeria.....	1.6*	2.0*	3.0*	5.9*	8.9*	2.1*	1.2*	1.4*	0.4*	0.6*	1.6*	2.6*	4.0*
Sudan.....	0.2*	0.4*	1.5*	- *	-	0.3	0.1*	0.3*	0.1*	0.1*	0.4*	1.6*	- *
Swaziland.....	6.5*	7.0*	7.3*	9.8*	8.9*	3.4*	5.0*	5.5*	1.5*	1.5*	7.0*	7.0*	7.6
Togo.....	5.5*	5.2*	5.0*	4.1*	2.9	5.7	4.4*	4.4*	1.1*	0.6*	5.5*	5.8*	4.1
U.S.A.....	88.0*	57.4	148.7	5.3	48.2	10.8	74.9*	14.0	11.5	43.4	25.5	189.1	7.5
El Salvador...	0.1*	0.1*	0.4*	0.6*	0.7*	0.7	0.1*	- *	- *	0.1*	- *	0.4*	0.4*
Guatemala.....	0.9*	0.9*	0.7*	0.2*	0.8*	0.1*	0.7*	0.7*	0.2*	0.2*	0.9*	0.9*	.
Honduras.....	0.1*	- *	0.1*	0.5*	1.7*	1.0*	0.1*	- *	- *	- *	- *	- *	0.2
Paraguay.....	- *	- *	-	- *	0.1	-	- *	- *	-	- *	- *	- *	- *
Afghanistan(b)	- *	- *	- *	- *	- *	- *	- *	- *	- *	- *	- *	- *	- *
Israel.....	0.2*	0.3*	0.2*	0.1	.	.	0.1*	0.2*	0.1*	0.1*	0.3*	0.3*	0.1
Philippines(a)	7.0*	3.7*	- *	- *	- *	- *	3.2*	3.7*	3.8*	- *	7.5*	- *	- *
Thailand.....	52.0*	47.5*	42.0	22.3	18.3	4.5	45.2*	44.2*	6.8*	3.3	51.0*	40.7	24.7
Other ctrs....	4.0*	4.5*	3.9*	5.5*	4.7*	9.0*	3.0*	3.0*	1.0*	1.5*	4.0*	4.5*	5.7*
Total.....	203.2	179.4	279.5	135.9	178.3	190.2	164.9	111.9	38.3	67.5	155.2	316.0	132.9

(a)Imports less known importing countries, considering one month shipping time.
(b)Revised series (the quantities, which the Greek import statis shows from Afghanistan, are all transshipped Soviet origin.

Source: Oil World Statistics Update

Appendix Table 2-(3) Cottonseed Oil Production

(1,000 tons)

Production	Oct Sept 81/82F	Oct Sept 80/81	Oct Sept 79/80	Oct Sept 78/79	Oct Sept 77/78	Oct Sept 76/77	Jan Sept 1982F	Jan Sept 1981	Oct Dec 1981	Oct Dec 1980	Jan Dec 1981	Jan Dec 1980	Jan Dec 1979
Greece.....	29*	25*	24*	30*	30*	30*	18*	18*	6*	7*	28*	25*	27*
Ireland.....	- *	- *	- *	- *	-	-	- *	- *	- *	-	- *	-	- *
Spain.....	18*	16*	11*	9*	13*	13*	12*	11*	6*	5*	17*	12*	10*
West Europe...	44	41	36	39	43	42	30	28	14	13	42	37	37
Bulgaria.....	3*	3*	2*	2*	1*	3*	2*	2*	1*	1*	3*	3*	2*
U.S.S.R.....	663*	646*	672*	663*	759*	716*	550*	510*	133*	136*	643*	665	637
Egypt.....	116*	116*	112*	104*	97*	95*	81*	82*	35*	35*	117*	114*	106*
Sudan.....	27*	27*	30*	41*	56*	46*	22*	21*	5*	5*	27*	29*	39*
U.S.A.....	749*	542	645	561	659	543	547*	374	193	167	566	656	572
Mexico.....	70*	78*	78*	66*	75*	50*	49*	54*	20*	24*	75*	60*	67*
Argentina ..	29*	30*	48*	55*	60*	39*	23*	20*	6*	11*	26*	43*	54*
Brazil.....	145*	155*	146*	143*	119*	136*	120*	128*	25*	28*	152*	152*	145*
China,PR.....	520*	462*	385*	358*	323*	319*	369*	330*	150*	131*	461*	408*	368*
India.....	297*	266*	280*	241*	217*	205*	211*	204*	86*	64*	291*	277*	247*
Japan.....	14*	13	13	16	15	17	11*	10	3*	3	13*	13	14
Pakistan.....	158*	144*	152*	99*	119*	65*	111*	101*	47*	43*	149*	150*	115*
Turkey.....	103*	98*	96*	96*	114*	93*	72*	69*	31*	29*	100*	97*	96*
Oth countries.	362*	364*	369*	379*	392*	367*	253*	252*	110*	113*	362*	368*	373*
Total.....	3290	3059	3057	2882	3054	2782	2436	2187	681	622	3047	3091	2867

Source: Oil World Statistics Update

Appendix Table 2-(4) Cottonseed Oil Exports and Imports

(1,000 tons)

Exports	Oct/Sept 81/82F	Oct/Sept 80/81	Oct/Sept 79/80	Oct/Sept 78/79	Oct/Sept 77/78	Oct/Sept 76/77	Jan/Sept 1982F	Jan/Sept 1981	Jan/Dec 1981	Jan/Dec 1980	Jan/Dec 1980	Jan/Dec 1979
Belgium-Lux...	0.1*	0.1	*	0.1	*	-	0.1*	0.1	*	-	0.1*	*	0.1
France.....	*	*	*	*	*	*	*	*	*	-	*	*	*
Greece.....	*	0.2*	-	-	0.2	1.0	*	- *	- *	0.2	- *	0.2	-
Ireland.....	0.2*	0.2	0.4	0.3	0.3	0.4*	0.2*	0.2	- *	0.1	0.2*	0.3	0.4
Netherlands...	0.3*	0.2	0.1	0.1	0.1	0.2	0.2*	0.2	0.1*	*	0.2*	*	0.2
U.K.....	0.1*	0.1*	*	0.2	0.3	*	0.1*	0.1*	*	*	0.1*	0.1	0.1
Germany, FR....	2.0*	2.5	1.6	0.1	0.1	0.2	1.7*	1.8	0.3*	0.7	2.1*	2.2	0.1
EC.....	2.7	3.3	2.2	0.7	1.0	2.0	2.3	2.4	0.6	0.9	2.6	2.6	0.9
Sweden.....	*	-	*	*	-	0.4	*	-	- *	-	- *	*	-
West Europe...	2.7	3.3	2.2	0.7	1.0	2.4	2.3	2.4	0.6	0.9	2.6	2.6	0.9
U.S.S.R.....	- *	- *	0.4*	0.1	0.4	0.9	- *	- *	- *	- *	- *	0.4*	-
U.S.A.....	360.0*	322.1	330.2	300.4	344.1	313.1	307.4*	246.0	72.6	76.1	318.6	356.5	287.6
El Salvador...	- *	- *	- *	-	-	*	- *	- *	- *	- *	- *	- *	-
Guatemala.....	0.9*	1.0*	1.9*	2.7*	2.2*	0.2*	0.6*	0.6*	0.3*	0.4*	0.9*	1.8*	2.5*
Nicaragua.....	1.0*	2.0*	0.1	9.2	9.2	7.2	0.5*	2.0*	0.5*	-	2.5*	-	5.7
Argentina(a)...	9.0*	10.6p	23.1	23.5*	16.3*	5.2*	8.6*	9.6p	0.4p	1.1	9.6p	16.9	27.9
Brazil.....	75.0*	120.6	31.1	31.0	15.0	10.6*	67.6*	96.6	5.4*	24.1	102.0*	50.4	31.6
Paraguay.....	13.0*	10.3*	1.9	3.2	5.0	1.2	10.2*	9.7*	2.6*	0.6*	12.5*	1.5*	2.9
China,PR.....	2.5*	1.9*	0.6*	0.5*	0.5*	1.4*	2.1*	1.6*	0.4*	0.3*	2.0*	0.8*	0.5*
Hong Kong.....	*	*	*	*	*	*	*	*	- *	*	*	*	*
Israel.....	6.0*	6.2*	10.8*	5.0	7.1	5.4	5.2*	4.2*	0.8*	2.0*	5.0*	11.6	5.5*
Japan.....	*	*	0.1	*	*	0.3	*	*	*	*	*	0.1	*
Australia.....	*	*	0.1	0.2	0.2	0.6*	*	*	- *	*	*	0.1	0.2
Other ctrs....	4.0*	2.4*	3.3*	6.0*	1.9*	7.9*	3.0*	2.0*	1.0*	0.4*	3.0*	2.4*	6.5*
Total.....	492.1	480.5	405.8	382.7	403.4	362.1	407.5	374.5	84.2	106.6	459.1	447.1	372.1

Appendix Table 2-(4) (cont'd.)

Imports	Oct-Sept 81/82F	Oct-Sept 80/81	Oct-Sept 79/80	Oct-Sept 78/79	Oct-Sept 77/78	Oct-Sept 76/77	Jan-Sept 1982F	Jan-Sept 1981	Oct-Dec 1981	Oct-Dec 1980	Jan-Dec 1981	Jan-Dec 1980	Jan-Dec 1979
Belgium-Lux....	0.2*	0.3	.	.	.	0.4	0.1*	0.2	.*	0.1	0.3*	0.1	.
France.........	0.2*	0.2	.	.	.	.	0.2*	0.2	.	-	0.2	.	.
Greece.........	4.0*	8.0*	3.8*	-	-	.	4.0*	4.5*	-*	3.2*	4.8*	7.0*	-
Ireland........	1.4*	0.5	1.5	0.9	1.6	1.4	1.2*	0.4	0.2*	0.1	0.6*	1.6	0.8
Italy..........	.*	0.3	.	.	0.2	1.4	.*	-	-*	0.3	-*	0.3	.
Netherlands....	0.7*	0.8	0.1	0.2	.	0.4	0.4*	0.6	0.3*	.	1.1*	0.1	0.2
U.K............	4.0*	3.7*	6.5	7.1	7.0	8.3	3.5*	2.6*	0.5*	1.1	3.1*	6.5	6.4
Germany, FR	3.0*	2.7	1.6	2.1	1.6	9.4	2.7*	2.6	0.3*	0.2	2.8*	1.6	2.0
EC.............	13.4	16.5	13.5	10.4	10.5	21.2	12.2	11.0	1.3	4.9	12.9	17.1	9.5
Austria........	.*	.	.	-	0.1	0.6	.*	.	.	.	.	.	-
Finland........	.*	-	-	-	-	0.2	.*	-	-*	-	-*	-	-
Sweden.........	[illegible]	6.1	7.3	11.2	9.3	9.3	6.4*	5.3	2.4*	0.2	5.3*	4.0	6.8
West Europe....	22.4	22.5	20.8	20.5	19.8	31.6	18.6	17.3	3.7	5.1	18.2	21.2	16.3
GDR/E Germany(b)	3.0*	3.3*	4.3*	.*	1.0*	3.0*	3.0*	2.5*	-*	0.5*	2.5*	4.0*	1.0*
Poland(b)......	-*	-*	-*	-*	0.5*	-*	-*	-*	-*	-*	-*	-*	-*
U.S.S.R.(b)....	3.0*	1.5*	-	-	-	-	3.0*	1.5*	-*	-	1.5*	-	-
Egypt(b).......	200.0*	183.7*	172.5*	171.7*	226.8*	162.3*	165.5*	123.0*	34.5*	58.7*	152.5*	207.0*	171.5*
Madagascar.....	4.0*	3.5*	7.1*	5.9*	3.5*	3.1*	3.3*	2.5*	0.7*	1.0*	3.2*	3.0*	13.6*
Nigeria(b).....	1.0*	-*	2.0*	0.5*	3.3*	0.2*	1.0*	-*	-*	-*	-*	2.0*	.*
Canada.........	4.5*	2.8	4.8	4.4	5.1	5.5	3.5*	1.9	1.0*	0.9	2.9*	4.6	4.2
U.S.A..........	.*	.*	-	-	-	-	.*	.*	-*	-	.*	-	-
Costa Rica.....	4.3*	3.6*	3.7*	6.2*	7.2*	6.6*	3.0*	3.0*	1.3*	0.6*	4.3*	2.9	5.7
Dominican Rep.	40.0*	36.5*	32.0*	25.9*	6.9*	4.7*	33.5*	27.5*	6.5*	9.6*	34.0*	29.0	34.4
El Salvador....	7.0*	8.3*	3.4*	0.3*	0.6*	0.1*	5.3*	6.1*	1.7*	2.2*	7.8*	5.6*	.
Honduras.......	2.0*	1.2*	2.7*	1.0*	1.2*	0.9*	1.6*	1.0*	0.4*	0.2*	1.4*	2.8*	0.6
Mexico.........	0.4*	0.3*	0.1*	.*	0.1	.	0.3*	0.1*	0.1*	0.2*	0.0*	0.3*	.
Nicaragua......	12.0*	8.5*	15.2*	.*	0.3	-	9.4*	4.9*	2.6*	3.6*	7.5*	15.8*	.
[illegible]	2.0*	2.0*	.*	.*	0.5*	0.5*	2.0*	2.0*	.*	-*	2.0*	-*	.*
Venezuela......	138.0*	110.1*	76.8*	51.0*	57.8*	65.1*	72.0*	91.0*	24.0*	15.1*	115.0*	65.1	68.6
Hong Kong......	.*	0.1	.	0.1	0.3	0.2*	.*	.	-*	.	.*	.	0.2
India(b).......	0.5*	25.2*	-*	-*	-*	-*	0.5*	25.2*	-*	-*	25.2*	-*	-*
Iran(b)........	2.0*	0.6*	0.2*	58.4*	22.0*	22.5*	2.0*	0.6*	-*	-*	0.6*	0.2*	40.6*
Japan..........	40.0*	42.7	29.9	35.9	29.3	18.7	33.4*	33.7	7.6*	9.0	43.3*	32.2	27.1
Korea, South...	2.0*	2.5	1.5*	1.4*	1.2	1.0	1.7*	2.0	0.3*	0.5	2.3*	1.7	1.5
Lebanon........	0.3*	0.4*	1.1*	0.2*	0.3*	0.4*	0.3*	0.2*	.*	0.2*	0.2*	1.2*	0.2*
Pakistan(b)....	2.0*	4.0*	-*	-*	10.4*	-	2.0*	4.0*	-*	-*	4.0*	-*	-*
Saudi Arabia...	3.0*	2.2*	2.6*	2.2*	1.1*	2.4*	2.2*	1.5*	0.8*	0.7*	2.3*	2.5	2.9
Turkey.........	4.7*	0.3*	5.0*	-	-	-	4.5*	0.3*	0.2*	.*	0.5*	5.0*	-
Australia......	.*	.	.	-	1.1	1.6	.*	.	.*	-	.*	.	-
Other ctrs.....	10.0*	11.5*	6.5*	2.1*	2.5*	5.0*	8.6*	5.5*	2.5*	3.0*	11.0*	6.0*	2.0*
Total..........	488.4	479.8	393.0	393.5	432.7	380.2	398.9	380.0	[illegible]	113.5	455.8	420.2	402.5

(a)All numbers with an asterisk estimated by ISTA on the basis of prel. shipping data and complete supply and demand balances. (b)Exports of known supplying countries, considering one month shipping time.

Appendix Table 2-(5) Cottonseed Oil Disappearance

(1,000 tons)

Disappearance	Oct Sept 81/82F	Oct Sept 80/81	Oct Sept 79/80	Oct Sept 78/79	Oct Sept 77/78	Oct Sept 76/77	Jan Sept 1982F	Jan Sept 1981	Oct Dec 1981	Oct Dec 1980	Jan Dec 1981	Jan Dec 1980	Jan Dec 1979
EC	37*	38*	35*	41*	45*	47*	26*	27*	9*	11*	38*	34*	36*
Oth.W.Europe..	27*	22*	18*	19*	23*	23*	16*	17*	8*	5*	25*	18*	19*
West Europe...	63	60	53	60	68	70	46	44	17	16	61	57	55
U.S.S.R.....	667*	646*	672*	658*	768*	732*	542*	525*	125*	121*	650*	659*	657*
Egypt.....	318*	289*	300*	280*	307*	275*	241*	197*	76*	52*	273*	327*	288*
U.S.A.....	316*	239*	299	260	313	242	219*	169*	97*	69	286*	288	276
Dominican Rep.	40*	37*	32*	27*	7*	5*	34*	28*	7*	9*	34*	29	34
Mexico.....	70*	76*	78*	66*	75*	50*	50*	54*	21*	24*	75*	80*	67*
Argentina.....	20*	20*	25*	31*	44*	34*	14*	10*	6*	9*	16*	25*	26*
Brazil.....	72*	35*	117*	112*	104*	123*	52*	31*	19*	3*	50*	101*	113*
Venezuela.....	116*	110*	77*	52*	58*	69*	92*	91*	24*	19*	115*	65	69
China,PR.....	517*	460*	364*	357*	323*	317*	367*	329*	150*	131*	479*	407*	363*
India.....	291*	322*	270*	236*	213*	204*	208*	235*	82*	68*	317*	262*	244*
Iran.....	2*	1*	*	58*	22*	23*	2*	1*	- *	- *	1*	. *	41*
Japan.....	55*	55	46	52	46	33	43*	43	12*	12	55*	47	50
Pakistan.....	160*	146*	152*	99*	129*	85*	113*	105*	47*	43*	155*	155*	115*
Turkey.....	107*	98*	102*	96*	114*	93*	76*	69*	31*	29*	100*	103*	96*
Oth.countries.	417*	415*	430*	420*	448*	431*	307*	294*	111*	117*	405*	427*	426*
Total.....	3231	3086	3038	2883	3035	2786	2406	2224	826	783	3050	3047	2915
Ending stocks.	305	250	250	244	233	215	305	250	290	296	290	290	275

(a)Residual of the balance. (b)At mills, refiners and renderers. (c)At mills only.
(d) See Sb b - A 14.

Source: Oil World

Appendix Table 3 Cottonseed Oil, Supply and Consumption in Major Countries

(1,000 tons

MARKET YEAR BEGIN.	HARV. AREA	YIELD	PRODUCTION	BEGIN. STOCKS	MKT.YR. IMPORTS	TOTAL SUPPLY/ DISTRIB	MKT.YR. EXPORTS	CRUSH	FOOD USE	FEED SEED WASTE	TOTAL DOMES- TIC USE	END. STOCKS
	000 HA.	KG/HA	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT
United States												
1973 10-1972	4,427	15.73	696	92	--	788	266	436				86
1974 10-1973	4,347	16.17	703	86	--	789	258	481				50
1975 10-1974	3,834	15.80	606	50	--	656	511	283				62
1976 10-1975	2,678	15.53	416	62	--	478	227	203				48
1977 10-1976	3,174	17.10	543	48	--	591	313	239				39
1978 10-1977	3,915	16.84	659	39	--	698	344	315				39
1979 10-1978	3,744	15.54	582	39	--	621	308	282				39
1980 10-1979	3,840	16.79	645	39	--	684	339	299				55
1981 10-1980	3,765	15.98	602	55	--	657	363	249				45
USSR												
1973 10-1972	3,594	18.00	647	--	--	647	--	647				--
1974 10-1973	3,600	18.00	648	--	--	648	--	648				--
1975 10-1974	3,711	18.00	668	--	--	668	--	668				--
1976 10-1975	4,094	18.00	737	--	--	737	--	737				--
1977 10-1976	3,967	17.99	714	--	--	714	--	714				--
1978 10-1977	3,872	18.00	697	--	--	697	--	697				--
1979 10-1978	4,011	18.00	722	--	--	722	--	722				--
1980 10-1979	3,783	16.81	637	--	--	637	--	637				--
1981 10-1980	4,940	13.98	691	--	--	691	--	691				--
China												
1973 10-1972	2,982	15.59	477	--	--	477	--	477				--
1974 10-1973	3,570	15.59	571	--	--	571	--	571				--
1975 10-1974	3,500	16.00	560	--	--	560	--	560				--
1976 10-1975	3,262	16.00	522	--	--	522	--	522				--
1977 10-1976	2,870	15.99	459	--	--	459	--	459				--
1978 10-1977	2,870	15.99	459	--	--	459	--	459				--
1979 10-1978	3,038	15.98	485	--	--	485	--	485				--
1980 10-1979	3,090	15.98	494	--	--	494	--	494				--
1981 10-1980	3,688	15.99	590	--	--	590	--	590				--

Appendix Table 3 (cont'd.)

(1,000 tons)

ANALY YEAR	MKT.YR BEGINS	HARV. AREA	YIELD	PRO-DUCTION	BEGIN. STOCKS	MKT.YR. IMPORTS	TOTAL SUPPLY/ DISTRIB	MKT.YR. EXPORTS	CRUSH	FOOD USE	FEED SEED WASTE	TOTAL DOMES-TIC USE	END. STOCKS
		000 HA.	KG/HA	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT
India													
1973	10-1972	1,425	14.05	200	--	--	200	--	200	--	--	200	--
1974	10-1973	1,450	13.98	230	--	--	200	--	200	--	--	200	--
1975	10-1974	1,230	14.05	170	--	--	170	--	170	--	--	170	--
1976	10-1975	1,500	14.00	210	--	--	210	--	210	--	--	210	--
1977	10-1976	1,285	14.00	180	--	--	180	--	180	--	--	180	--
1978	10-1977	1,285	14.00	180	--	--	180	--	180	--	--	180	--
1979	10-1978	1,450	13.96	200	--	--	200	--	200	--	--	200	--
1980	10-1979	1,450	13.96	200	--	--	200	--	200	--	--	200	--
1981	10-1980	1,435	13.96	200	--	--	200	--	200	--	--	200	--
Pakistan													
1973	09-1972	1,025	15.02	154	--	--	154	--	154	--	--	154	--
1974	09-1973	962	14.96	144	--	7	151	--	151	--	--	151	--
1975	09-1974	891	15.03	134	--	--	134	--	134	--	--	134	--
1976	09-1975	724	15.05	109	--	--	109	--	109	--	--	109	--
1977	09-1976	610	15.08	92	--	--	92	--	92	--	--	92	--
1978	09-1977	540	15.02	126	--	10	136	--	136	--	--	136	--
1979	09-1978	672	15.02	101	--	--	101	--	101	--	--	101	--
1980	09-1979	1,080	13.96	151	--	--	151	--	151	--	--	151	--
1981	09-1980	1,062	13.96	148	--	--	148	--	148	--	--	148	--
Brazil													
1973	08-1972	1,087	14.99	163	--	--	163	2	161	--	--	161	--
1974	08-1973	960	15.00	144	--	--	144	1	143	--	--	143	--
1975	08-1974	842	14.96	126	--	--	126	9	117	--	--	117	--
1976	08-1975	654	14.90	98	--	--	98	13	85	--	--	85	--
1977	08-1976	965	14.96	136	--	--	136	22	114	--	--	114	--
1978	08-1977	785	15.03	118	--	--	118	14	104	--	--	104	--
1979	08-1978	942	15.49	146	--	--	146	32	114	--	--	114	--
1980	08-1979	926	15.55	144	--	--	144	49	95	--	--	95	--
1981	08-1980	998	15.53	155	--	--	155	40	115	--	--	115	--

Appendix Table 3 (cont'd.)

(1,000 tons)

Market Year Begin	Harvested Area	Yield	Production	Beginning Stocks	Mkt. Yr. Imports	Total Supply/ Distrib.	Mkt. Yr. Exports	Crush	Food Use	Feed & Waste	Total Domestic TIC Use	Ending Stocks
	000 Ha.	MT/Ha	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT	000 MT
Egypt												
1973 08-1972	277	15.95	124	--	124	248	--				248	--
1974 08-1973	355	15.00	121	--	106	227	--				227	--
1975 08-1974	654	16.05	185	--	229	314	--				314	--
1976 08-1975	570	15.96	91	--	140	231	--				231	--
1977 08-1976	567	16.04	91	--	196	287	--				287	--
1978 08-1977	615	16.24	100	--	213	313	--				313	--
1979 08-1978	661	16.03	106	--	167	273	--				273	--
1980 08-1979	717	16.31	117	--	236	353	--				353	--
1981 08-1980	787	16.01	126	--	210	336	--				336	--
Japan												
1973 01-1973	152	19.73	31	3	30	53	--				45	4
1974 01-1974	133	23.30	27	4	17	46	--				45	3
1975 01-1975	115	16.81	19	3	10	32	--				33	2
1976 01-1976	99	19.18	18	2	13	33	--				31	2
1977 01-1977	91	19.35	18	2	23	43	--				40	3
1978 01-1978	91	21.97	23	3	31	54	--				49	5
1979 01-1979	74	19.91	14	5	37	56	--				50	6
1980 01-1980	92	26.32	24	6	30	60	--				55	5
1981 01-1981	100	20.00	20	5	30	55	--				50	5

Source: USDA, Foreign Agriculture Circular, FOP-7-81, April 1981

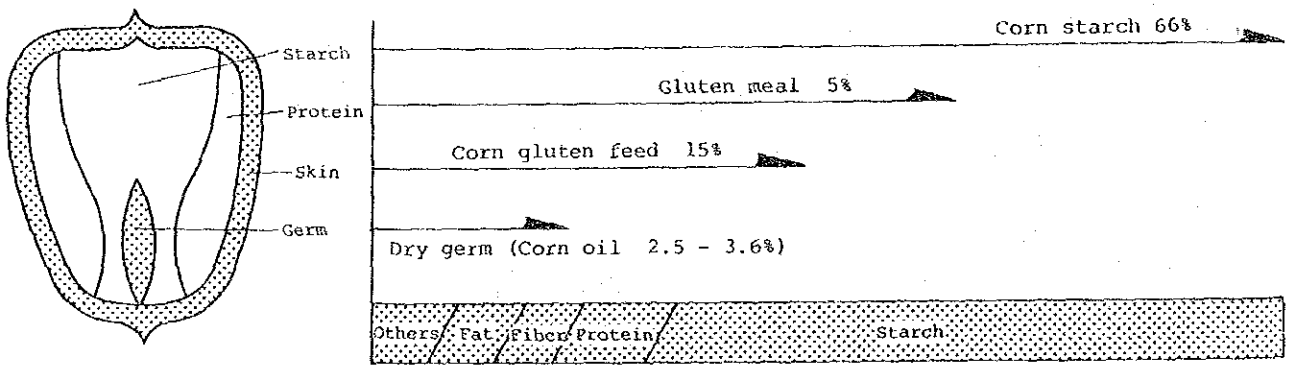
[1-2-4-4] CORN OIL

A. INTRODUCTION

As corn oil is obtained from corn germ (a byproduct of the corn processing industry, from the production of such items as cornstarch), it is to be called more precisely as "corn germ oil".

The proportion of oil in corn is 2.5 to 3.0%, a very low quantity, as shown in Fig. A-1. An increase in demand for cornstarch necessarily leads to an increase in the production of the material corn germ, leading to an increase in corn oil production.

Fig. A-1 Components of Corn



Oil extraction is carried out in or near cornstarch mills, since corn germ deteriorates in quality (e.g. by oxidation) if it is left unused for a long time. Accordingly, there is little marketing of corn germ for use in oil extraction.

Features of corn oil are that it contains a relatively high proportion of nonsaponifiable matter and a very high proportion of unsaturated fatty acids, as do other germ oils. Unsaturated fatty acids account for

80% or more of the total. Of the unsaturated fatty acid content, 50 to 60% is linoleic acid and the rest is oleic acid with no linolenic acid; thus, corn oil may be said to be an oleic-linoleic type oil. It is known that polyunsaturated fatty acids such as linoleic acid are efficacious in inhibiting the rise of cholesterol, but it has been said recently that the phytosterols in nonsaponifiable material also have an important function. Corn oil also contains 0.1% of tocopherols, or Vitamin E, of which 80 to 90% is -type, which is highly anti-oxidative. This is why it keeps for a relatively long period and has good thermal stability, although it contains much unsaturated fatty acid.

Thus the image of corn oil as a health food is very familiar to consumers, and corn oil now holds a stable position as one of the premium oils throughout the world, with its bright yellow color, distinctive flavor and taste. Especially in the United States, which is the largest producing and consuming country, there is a deep-rooted demand for corn oil as an expensive edible oil.

Corn oil is used mainly as a food, as a high-quality salad oil, in margarine, in shortening, in mayonnaise and as a frying oil; in addition, a small amount is used in medicines.

B. PRODUCTION

The fact that it is the byproducts which are used as materials for extraction, as is also true for rice meal oil and cottonseed oil, limits the number of corn oil producing countries. The following pages describe production on the basis of U.S. and Japanese data (Appendix Table 1), and production during the 1972-1977 period based on the FAO Food Balance Sheet.

According to USDA data, the world production of corn oil nearly doubled from 277,000 tons in 1969/70 to 525,000 tons in 1981/82. During this period, the annual average rate of increase was 5.5%, showing steady growth, although production fell in 1974/75 and soared in 1975/76. The decrease in 1974/75 is attributed to the decrease in production in the United States (by 30,000 tons from the previous year), due to a severe drought which caused a sharp decrease in corn production in that country.

The share of corn oil in world edible vegetable oil production (USDA data) showed a decreasing trend, from 1.13% in the first half of the 1970s to 0.98% in 1975, but since 1976, it has remained at around 1.3%, and this level of production is expected to continue in the future. Fundamentally, however, production may depend on trends in the production of corn and cornstarch in the United States.

Among the producing countries, the United States produces by far the most corn oil. According to USDA data, this country has held a share of 71 to 78% of world production for thirteen years. This is because the United States is the top corn producing country in the world, and cornstarch production is high. The uses of corn, except as a feed, in this country are as listed below, and around 70% goes to wet milling (cornstarch production).

Table B-1 Uses of Corn in the United States - excluding feed

(1,000 tons)

	1974/75	1975/76	1976/77	1977/78
Wet milling	8,000	8,712	9,195	9,652
Alcohol	1,651	1,803	1,880	2,007
Grits, flake	864	889	889	889
Others	787	838	864	889
Total	11,303	12,243	12,827	13,437

Source: USDA

The share held by the United States of world corn oil production fell from around 77% in the early 1970s to around 72% in recent years. This indicates an expansion of production in other countries.

According to FAO data, the country following the United States in output is South Africa, which produced 50,000 tons in the 1972-1974 period (three-year average) and 100,000 tons in the 1975-1977 period (same). South Africa is also one of the main corn producing and exporting countries and has had a cornstarch industry since relatively early days.

Japan's corn production is relatively high, and according to MAFF data, was in the range of 25,000 to 30,000 tons without any major increase until 1975, but as a result of the substantial increase in

cornstarch production after 1976, corn oil production expanded remarkably in the second half of the 1970s, and reached 71,000 tons in 1981. The increase in cornstarch production after 1976 was due to the increased demand for starch for saccharification in the production of sugars such as glucose and isomerized sugar, and at present 70% or more of the demand for starch (including saccharified starch) is met by cornstarch. The uses of corn in Japan, except as feed, are shown below. Around 75% is supplied to the cornstarch industry.

Table B-2 Corn Germ for Crushing and Corn Oil Production in Japan

(1,000 tons)

	Corn germ for crushing	Corn oil production	Ratio to previous year
1970	53	25	
1971	49	23	92%
1972	56	24	104
1973	60	29	121
1974	62	30	103
1975	60	31	103
1976	76	41	132
1977	100	48	117
1978	113	54	113
1979	128	61	113
1980	140	66	108
1981	146	71	108

Source: Ministry of Agriculture, Forestry and Fisheries, Government of Japan

Table B-3 Uses of Corn in Japan other than Feed

(1,000 tons)

	1974	1975	1976	1977	1978	1979
Cornstarch	1,233	1,030	1,238	1,420	1,408	743
Alcohol	42	90	104	112	110	55
Grits, Flake		239	244	234	248	147
Others	104	86	56	27	33	19
Total	1,635	1,446	1,642	1,793	1,800	963

Source: Same as Table B-2

Other producing countries are the Federal Republic of Germany, Belgium, Luxemburg, France, the Netherlands, Italy and the United Kingdom in Western Europe, Yugoslavia and Czechoslovakia in Eastern Europe, and in South America, Venezuela, a country whose production exceeded 10,000 tons in the 1975-1977 period (three-year average; FAO data).

C. CONSUMPTION

The greatest portion of corn oil consumption is as a food. Corn oil is established as one of the premium oils and is traded at high prices in developed countries. According to FAO's Food Balance Sheet, however, the food to non-food ratio of world corn oil consumption, which was 89 to 11 in the 1972-1974 period, and 82 to 18 in the 1975-1977 period, shows a tendency for non-food consumption to be slightly on the increase.

Table C-1 Consumption by Country

(1,000 MT)

	1972-74 3-year average	1975-77 3-year average
USA	213	242
S. Africa	46	95
Japan	28	36
Germany, FR	23	27
Belgium	17	24
Canada	14	21
Italy	16	16

Source: FAO, Food Balance Sheet

Corn oil consumption by country most closely follows production in the case of the United States, which has maintained a production of 240,000 to 300,000 tons since the middle of the 1970s. It is only since the mid-1970s that corn oil consumption grew in this country, having leveled off at around 190,000 to 200,000 tons in the 1960s and the first half of the 1970s. The greatest proportion is used as food. Direct use as a food is the largest, occupying 49 to 69% of corn oil consumption in the past decade. Consumption of the oil as a material for margarine is also established, at around 100,000 tons over the past five years. The share held by corn oil among the oils used for margarine was 10 to 12% from 1970-1980, and consumption in this area has increased at an average annual rate of 1.8%. In addition, corn oil is used as a material for shortening, but this use has been decreasing since the peak of 6,000 tons at the end of the 1960s. Consumption of corn oil in the non-food sector leveled off at a little less than 20,000 tons in the 1970s.

According to FAO data, South Africa, the consuming country second only to the United States, doubled its corn oil consumption from 46,000 tons in the 1972-1974 period (three-year average) to 95,000 tons in the 1975-1977 period (same). Although the ratio of non-food to food uses of corn oil was 91 to 9 in 1972/74 and 78 to 22 in 1975/77 (three-year averages; FAO data), the recent trend in consumption is said to be centered on the food sector.

Japan's corn oil consumption has expanded since 1976 as a result of the expansion in oil production accompanying an increase in the production of corn germ, and reached 65,000 tons in 1981. Consumption stood at 27,000 tons in 1975, before which it was much less, and doubled in the second half of the 1970s. Corn oil in Japan had been regarded as low-class oil, equal to or lower than soybean oil until the first half of the 1970s, and had been principally used as an extender to increase the volume of food oil. For some time before that, corn germ had been used as feed without extracting oil.

The growth of consumption in the second half of the 1970s was due to the increase in corn oil production resulting from expansion in the cornstarch industry. Another factor is that linoleic acid was favorably evaluated and sellers promoted the image of corn oil as a health food. A little less than 70% of corn oil is consumed as edible oil, not mixed with other oils, and about 30% is used as a material for margarine and shortening.

Table C-2 Corn Oil Supply and Demand Balance in the United States

(1,000 tons)

	1963/64	64/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81
Supply																		
Initial inventory	28.6	28.1	15.9	24.9	21.3	18.6	32.2	27.2	26.3	31.8	25.9	30.8	23.6	28.1	20.9	33.1	31.8	30.0
Production	187.3	197.3	203.7	202.3	200.5	211.8	215.0	220.0	226.3	237.2	239.5	210.9	208.7	318	315	334	359	391
Imports	1.4	-	2.3	0.9	4.1	3.6	1.4	0.5	-	-	0.5	0.9	0.5	5	1.4	-	-	-
Total	217.0	225.4	224.5	228.2	216.8	234.1	248.6	247.7	252.7	269.0	265.8	242.7	232.2	342	337	367	391	421
Food																		
Non-mixed oil	103.0	109.8	103.0	98.9	94.3	84.8	98.9	91.6	87.5	117.5	129.7	125.2	135	137	119	135	144	163
Shortening	2.3	4.1	3.2	5.4	5.0	5.0	6.4	3.6	2.3	1.4	2.3	3.2	1.8	1.4	1.8			
Margarine	65.8	72.6	70.3	78.5	78.9	80.3	82.1	85.3	84.4	88.0	96.6	85.3	96	106	110	96	101	101
Others	5.4	9.1	7.3	0.5	2.7	3.6	2.7	2.7	4.5	2.7	0.9	0.5	0.5	0.9	-			
Total	176.5	195.5	183.7	183.3	181.0	173.7	190.1	183.3	183	203	183	161	233	246	231			
Non-food	12.7	12.7	15.4	15.4	15.4	12.7	16.3	18.6	16.8	20.4	20.9	19.5	20.4	17.2	20.9			
Total domestic consumption	188.7	209.6	199.1	198.7	196.0	188.7	205.9	201.9	199.1	223.2	204.1	181.1	254	295	263	281	299	239
Exports	-			8.2	11.3	13.2	15.4	19.5	22.3	20.0	30.8	38.1	45	34	39.9	54.9	64.0	82.1

Source: Economic Research Service, USDA
1) USDA, Fats and Oils Situation
2) Counselor and Attache Reports, Foreign Agricultural Service Oilseeds and Products
(Some figures are inconsistent because of combined data.)

Table C-3 Corn Oil Consumption in Japan

(Crude oil: tons)

		1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Domestic demand	Edible simple oil	16,676	9,375	15,192	19,562	16,147	30,094	30,895	34,365	42,763	41,280	40,911
	Margarine Shortening	1,000	4,459	5,438	5,192	6,127	6,448	9,629	10,342	12,326	17,737	21,180
	Other processed goods	3,651	7,344	6,149	2,774	5,027	4,752	5,159	3,802	2,736	2,497	2,442
Subtotal		21,327	21,178	26,780	27,528	27,301	41,294	45,683	48,509	57,825	61,514	64,533
(Proportion to the previous year)			(99)	(126)	(103)	(77)	(150)	(111)	(106)	(119)	(106)	(105)
Exports		1,844	2,000	2,550	2,076	1,612	1,713	1,463	1,860	6,172	5,212	1,100
Total		23,171	23,178	29,330	29,604	28,913	43,007	47,146	50,369	63,997	66,726	65,633
(Proportion to the previous year)			(100)	(126)	(101)	(98)	(149)	(110)	(107)	(127)	(104)	(98)

Source: Ministry of Agriculture, Forestry and Fisheries

D. TRADE AND PRICE

I. Trade

It is only since 1980 that FAO Trade Yearbook have covered corn oil, because the absolute volume of its trade is very small, though the proportion of trade to production is relatively high. According to the statistics, trade in corn oil has shown a gradual increase from 150,000 to 220,000 tons over the past three years.

On the basis of FAO data and USDA's, the main countries' exports and imports of corn oil are described below.

The United States is the largest exporting country; its exports have rapidly increased in the past three years, with its share of world exports increasing from 25.2% in 1978 to 31.5% in 1980 (FAO data). According to USDA data, exports in the 1980-1981 period were 82,100 tons, 206% times the level of exports in 1977-1978, at 39,900 tons. The growth of exports since the second half of the 1970s is remarkable.

According to the U.S. Department of Commerce's data, the countries of destination of United States exports are developed and petroleum-producing countries such as Canada, the Netherlands and Saudi Arabia. The United States is an exporter of soybeans, soybean oil and various other kinds of oilseeds and oils, and the share of corn oil in the sum of these exports showed a tendency to increase on the whole, despite yearly fluctuations, in the period between the second half of the 1970s and the beginning of the 1980s, from 3.9% in 1975 to 6.6% in 1981 (Appendix Tables 3 and 4).

Following the United States, South Africa, Singapore, France, Belgium-Luxemburg and the Netherlands had exports exceeding 10,000 tons in the past three years, and these countries, including the United States, accounted for 88% of world exports in 1980 (FAO data). Besides these countries, Brazil, the Federal Republic of Germany, Sweden and Zimbabwe, which export corn oil, are new producing countries.

Imports are large to such petroleum-producing countries as Saudi Arabia, the United Arab Emirates and Kuwait, which together accounted for 31% of the total in 1980. Their share, which was 21.6% in 1978, has shown a rapid increase since the latter half of the 1970s. Other major importing countries, except for Italy, Canada and Hong Kong, not only consume the imported oil but also re-export it.

Table D-1 World Exports and Imports of Corn Oil

1. Exports

(MT)

	1972-74 Ave. 1)	1975-77 Ave. 1)	1978 2)		1979 2)		1980 2)	
World	n.a.	n.a.	161,704	100	200,782	124	213,865	132
				(100)		(100)		(100)
USA	16,000	28,000	40,738	100	57,122	140	67,293	165
				(25.2)		(28.4)		(31.5)
South Africa	5,000	16,000	32,000	100	38,000	119	32,000	100
				(19.8)		(18.9)		(15.0)
Singapore	n.a.	2,000	10,187	100	18,705	184	30,858	303
				(6.3)		(9.3)		(14.4)
France	14,000	19,000	22,178	100	22,876	103	24,033	108
				(13.7)		(11.4)		(11.2)
Belgium - Luxemburg	6,000	10,000	9,809	100	17,294	176	20,210	206
				(6.1)		(8.6)		(9.4)
Netherlands	11,000	12,000	18,800	100	19,517.	104	14,148	75
				(11.6)		(9.7)		(6.6)
Brazil	n.a.	n.a.	3,103	100	1,525	49	7,500	242
				(1.9)		(0.8)		(3.5)
Germany, FR	n.a.	n.a.	10,650	100	9,853	93	7,435	70
				(6.6)		(4.9)		(3.5)
Sweden	n.a.	n.a.	8,574	100	8,155	95	6,000	70
				(5.3)		(4.1)		(2.8)
Zimbabwe	n.a.	n.a.	2,956	100	4,260	144	2,000	68
				(1.8)		(2.1)		(0.9)
Other countries	n.a.	n.a.	2,709	100	3,475	128	2,388	88
				(1.7)		(1.8)		(1.2)

Table D-1 (cont'd.)

2. Imports

(MT)

	1972-74 Ave. 1)	1975-77 Ave. 1)	1978 2)	1979 2)	1980 2)
World			151,124 100	221,144 146	217,160 144
			(100)	(100)	(100)
Saudi Arabia		9,000	26,321 100	42,943 163	47,000 179
			5,556(17.4)	6,801(19,4)	9,468(21.6)
Italy			30,857 100	65,084 211	44,818 145
			4,071(20.4)	8,262(29.4)	5,733(20.6)
Belgium -Luxemburg	24,000	20,000	19,213 100	22,259 116	20,838 108
			2,604(12.7)	6,692(10.1)	7,624 (9.6)
Canada	8,000	14,000	19,707 100	16,627 84	17,284 88
		fr.VS	16,967(13.0)	11,127 (7.5)	11,195 (8.0)
			(86%)		
Singapore		4,000	8,582 100	17,065 199	17,094 199
			(5.7)	(7.7)	(7.9)
UAE			4,795 100	7,342 153	14,385 300
			(3.2)	(3.3)	(6.6)
Netherlands	4,000	6,000	9,636 100	9,155 95	10,882 113
			4,501 (6.4)	8,489 (4.1)	7,261 (5.0)
France	4,000	8,000	10,084 100	9,232 92	10,261 102
			(6.7)	(4.2)	(4.7)
Kuwait			1,477 100	1,261 85	6,100 413
			661 (1.0)	399 (0.6)	4,094 (2.8)
Hong Kong			3,153 100	3,939 125	5,315 169
			(2.1)	(1.8)	(2.4)
Other countries			17,299 100	26,237 152	23,183 134
			(11.4)	(11.9)	(10.8)

Source: 1) FAO, Provisional Food Balance Sheets, 1972-74, 1975-77 ave.
2) FAO, Trade Yearbook

II. Price

Since there is no international corn oil exchange, there is no guiding international prices for corn oil. However, the trading price in the United States, which is the greatest producing, consuming and exporting country, influences the world corn oil price. Among dealers, the ex-mill price in Midwest Mills at the center of the United States' processing industry, provides a guide for the trading price.

Trends in the price of corn, which is the primary material (as the source of both corn oil and corn germ), and in the price of cornstarch, which provides corn germ as a material for corn oil, need to be considered, in addition to corn oil supply and demand and trends in other edible vegetable oils, as determinants of the corn oil price.

Factors related to the corn price are: a. supply and demand in the United States and Chicago markets; b. purchases by centrally planned economies such as the USSR and China; c. the climate in the corn belt in the United States; and d. the development of the use of corn for alcohol fuel in the United States. Factors related to the cornstarch price are: a. the demand for isomerized sugar; b. the development of new uses for processed starch; c. competition with potato starch in Europe; and d. developments in the production of starch from cassava, sweet potato, sago palm and the like.

The United States export prices of corn oil and soybean oil, and the conditions of the Chicago corn market are shown in Appendix Table 5 and Appendix Fig. 1. Although corn oil holds a special position, its price movements are similar to those of soybean oil and other edible oils. The price correlation between corn as the primary material and corn oil is not strong in the United States, but may be stronger in corn oil producing countries which are dependent on imports of corn for the primary material.

E. CONCLUDING RAMARKS

Corn oil has come to be highly regarded due to a recent improvement of the image of vegetable oils (centered around linolic acid) as health foods, in contrast to the past image of corn oil as merely one of the mixing oils, receiving little attention. However, the increase in production is not necessarily the result of an expansion in demand, but rather demonstrates the character of corn oil as a byproduct similar to cottonseed oil.

Accordingly, future trends in corn oil supply and demand may depend on the balance of supply and demand for cornstarch, which is the primary product. That is, if corn oil production increases as a result of an increase in cornstarch production, and exceeds demand, the price will fall below that of other premium vegetable oils, and as a result, consumption of corn oil as a substitute for other premium oils will grow. Conversely, if the price of corn oil rises, the other premium oils will be used as substitutes for corn oil.

Appendix Table 1 Corn Oil Production

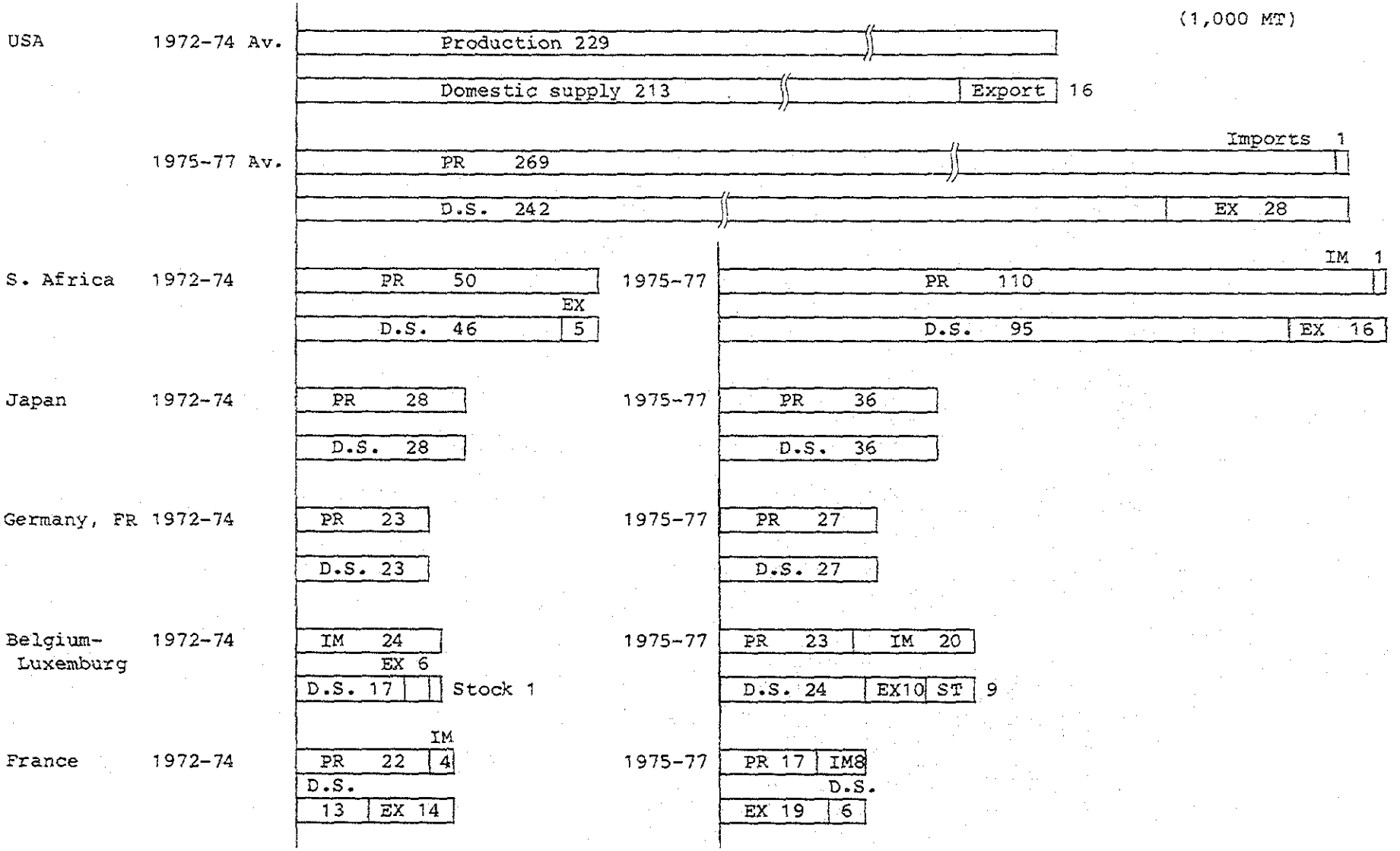
(1,000 MT)

Period 1)	Year 2)	USA (in the period shown in 1)	Japan (in the year shown in 2)	Others (in the period shown in 1)	World
1963/64	1964	187			
1964/65	1965	197			
1965/66	1966	204			
1966/67	1967	202			
1967/68	1968	201			
1968/69	1969	212			
1969/70	1970	215	25		2) 277
1970/71	1971	220	23		2) 289
1971/72	1972	226	24		2) 292
1972/73	1973	237	29		2) 309
1973/74	1974	240	30		2) 311
1974/75	1975	211	31		2) 297
1975/76	1976	292	41		2) 412
1976/77	1977	305	48	105	1) 410
1977/78	1978	327	54	133	1) 460
1978/79	1979	337	61	129	1) 466
1979/80	1980	368	66	144	1) 512
1980/81	1981	373	71	145	1) 518
1981/82	1982	380		145	1) 525

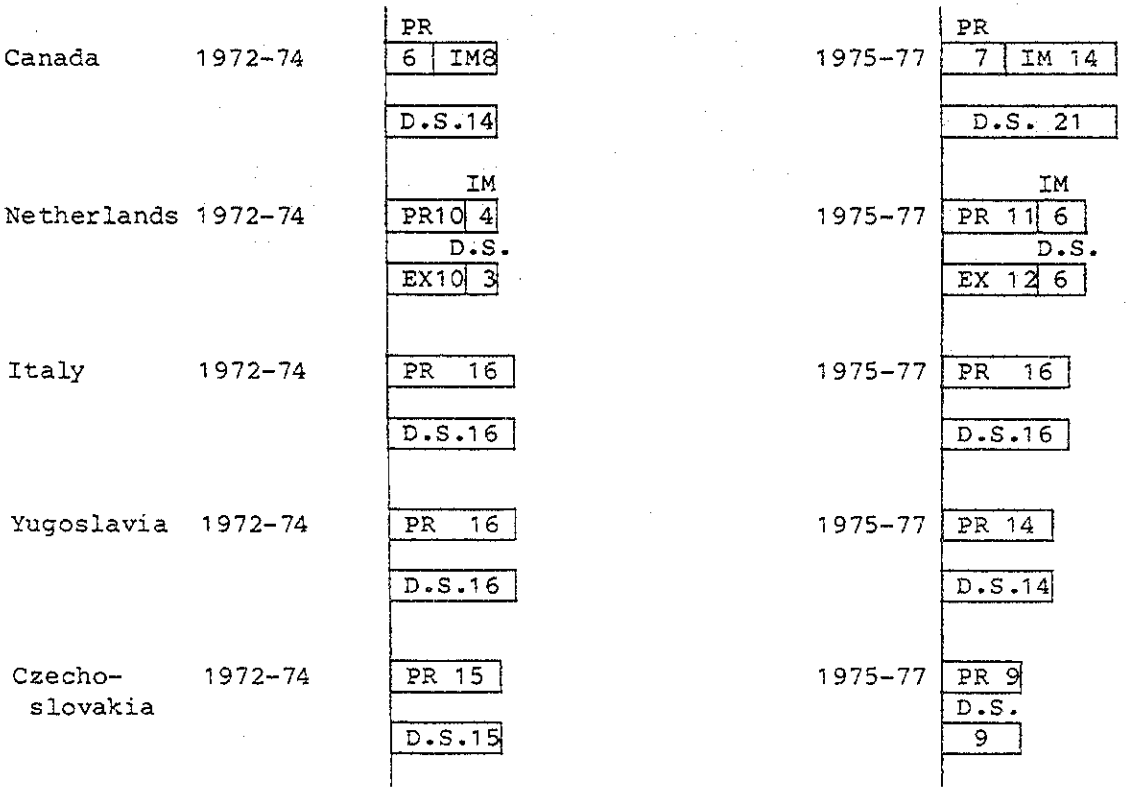
Source: USA, Others, World: USDA
Japan: Ministry of Agriculture, Forestry and Fisheries, Government of Japan

Appendix Table 2 Corn Oil Supply and Demand (11 main countries)

(1,000 MT)



Appendix Table 2 (cont'd.)



Source: FAO, Food Balance Sheets

Appendix Table 3 Corn Oil 1/: U.S. Exports by Country of Destination (Annual) 1975-1981

(MT)

COUNTRY OF DESTINATION:	FIVE-YEAR AVE 1975-1979	1975	1976	1977	1978	1979	1980	1981 2/
BELGIUM-LUXEMBOURG	3,904	1,946	7,047	1,238	2,604	6,492	7,624	9,651
BERMUDA	69	105	65	76	48	31	0	12
CANADA	11,558	8,304	9,487	11,906	16,967	11,127	11,195	23,732
IRAN	1,964	529	756	1,205	1,694	5,937	0	614
ITALY	2,476	8	8	2,038	4,871	8,242	5,735	4,981
JAMAICA	650	575	568	616	758	545	239	155
KUWAIT	667	961	901	491	661	379	4,094	614
LEBANON	219	464	0	141	98	368	437	525
NETHERLANDS	4,675	705	4,638	5,022	4,501	6,489	7,241	15,511
SAUDI ARABIA	6,310	4,536	6,447	6,452	5,536	6,801	9,468	7,868
OTHER	4,260	2,412	3,764	2,728	3,405	8,993	21,220	30,520
TOTAL	36,658	20,484	33,687	31,854	48,784	57,123	67,270	82,974

NOTE: FIGURES COMPUTED FROM UNROUNDED DATA.
1/ CRUDE AND REFINED OIL COMBINED AS SUCH.
2/ PRELIMINARY.

SOURCE: U.S. DEPARTMENT OF COMMERCE

MAY 1982 USDA/FAS

Appendix Table 4 U.S. Exports of Oilseeds and Products, Value

(US $1,000)

OILS	Five-Year Ave. 1975-79	1975	1976	1977	1978	1979	1980	1981
SOYBEAN 4/	457,968	268,857	240,039	443,210	569,199	748,604	688,890	473,908
COTTONSEED	182,547	197,598	126,189	197,112	196,976	192,878	226,493	199,213
PEANUT	28,463	12,894	49,200	37,358	38,337	4,509	14,762	17,619
COCONUT	4,194	1,279	7,944	3,742	3,269	4,484	2,812	6,544
LINSEED	12,185	32,084	4,612	4,159	11,218	7,021	15,915	28,047
TUNG 5/	117	219	176	190	8	0	0	0
CORN	35,860	22,920	27,008	29,021	42,329	58,823	60,358	67,311
SUNFLOWERSEED 6/	18,031	7,050	20,949	9,258	27,092	19,703	93,764	160,219
OTHER	42,959	33,494	34,730	35,731	45,118	55,811	65,465	72,075
TOTAL	782,321	581,796	523,916	761,610	933,247	1,111,035	1,168,659	1,016,936

NOTE: FIGURES COMPUTED FROM UNROUNDED DATA.
4/ BEGINNING IN 1978, EXCLUDES PARTIALLY HYDROGENATED SOYBEAN SALAD OIL.
5/ NOT SEPARATELY CLASSIFIED AFTER 1977.
6/ PRIOR TO 1978, MAY INCLUDE SMALL QUANTITIES OF OLIVE, RAPE, COLZA OR MUSTARDSEED OIL.

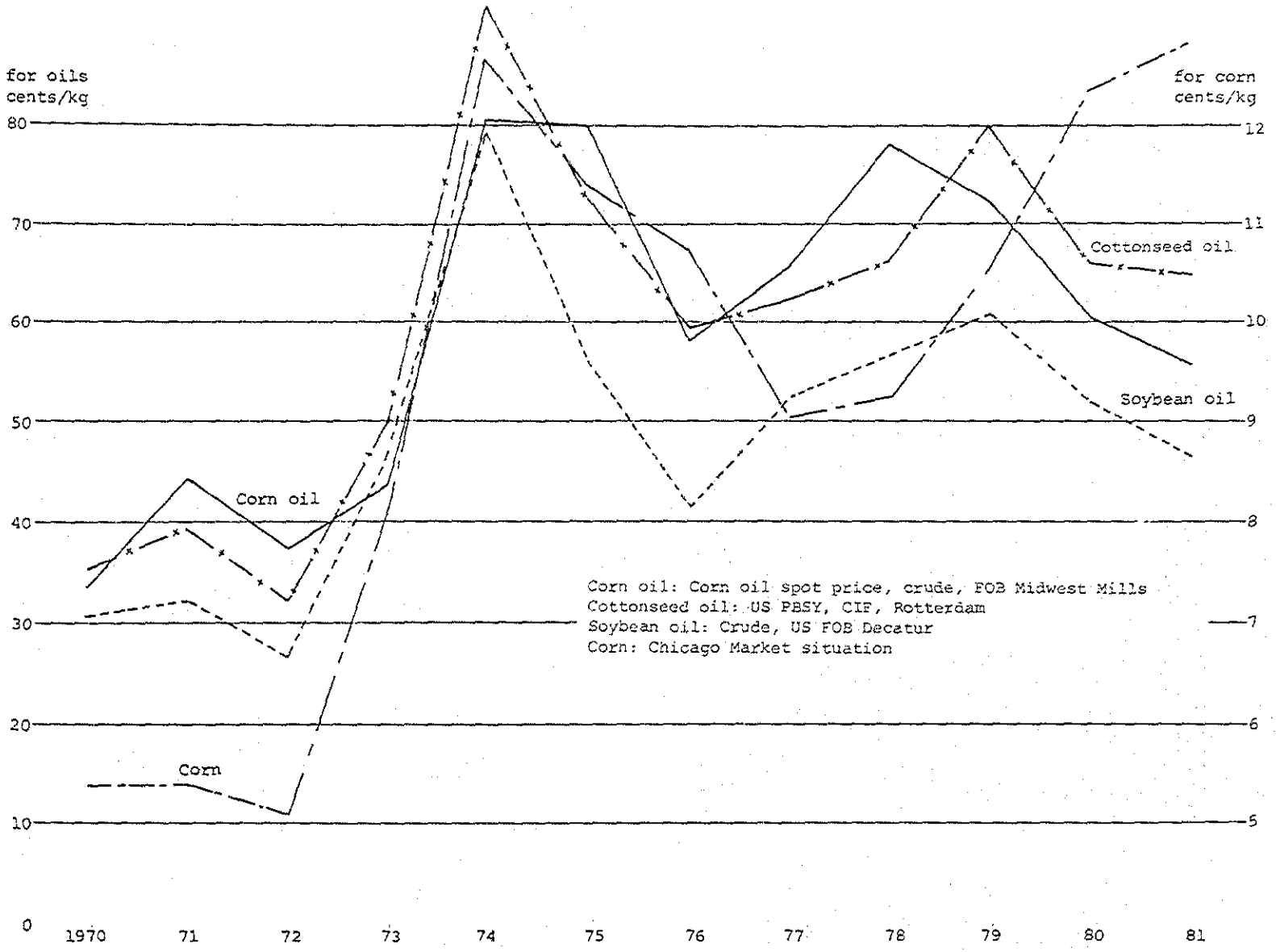
Source: USDA

Appendix Table 5 Corn Oil Spot Price, Crude, FOB

	Midwest Mills (Tank Cars)				Soybean oil US, FOB, Decatur	Cottonseed oil US, PBSY, CIF, Rotterdam
	High price	Cheap price	Average			
1969/70	36.2	30.2	33.5	1970	30.7	35.4
1970/71	60.6	37.5	44.3	71	32.3	39.2
1971/72	41.9	32.0	37.3	72	27.0	32.4
1972/73	77.2	34.8	43.7	73	46.5	50.0
1973/74	104.7	52.9	80.5	74	79.0	93.9
1974/75	99.2	58.4	79.8	75	56.0	72.6
1975/76	71.7	43.7	58.0	76	41.4	59.3
1976/77	79.4	51.1	65.5	77	52.3	62.2
1977/78	97.0	58.4	78.0	78	56.7	66.1
1978/79	77.2	66.1	72.3	79	60.8	79.8
1979/80	72.3	44.1	60.4	80	51.9	65.7
1980/81	61.7	47.4	55.6	81	46.4	64.9

Sources: Corn oil: Commodity Yearbook
Soybean oil and cottonseed oil: Oil World

Appendix Fig. 1 Movements of Corn Oil Prices and Relationship with Other Oil Prices



[1-2-4-5] CASTOR BEANS

A. INTRODUCTION

Castor (scientific name: Ricinus communis) is a plant which falls under Euphorbiaceae. Its origin is said to be Africa, and it had been already cultivated to obtain fuel oil in Egypt in the pre-Christian era. It was for castor oil as a medicine (purgative) that castor began to be widely cultivated throughout the world. However, today castor is used mostly in industry.

Castor is an annual herb in the temperate zone, but is a perennial in the form of an evergreen shrub in the tropical zone. The length of the stem is between 1 m and 7 m, but some stems exceed 10 m in the tropical zone.

Although high temperatures are favorable to castor, it is cultivated not only in the tropical zone but also in the temperate zones. In the latter, it requires a growing period of 140 to 180 days without frost. Areas with too much rain and waterlogged areas are unsuitable for castor.

As shown in Appendix Table 1, castor is widely cultivated all over the world, although three countries, Brazil, India and China, account for 76% of the world area under cultivation. Appendix Table 1 also shows that the yield per unit area varies greatly from country to country: Brazil and Thailand produce a crop of about 700 kg/ha, whereas India produces the lowest crop (230 kg/ha), with China (432 kg/ha) and the USSR (432 kg/ha) occupying the middle position.

The castor cultivation is generally of small-scale, though there are large-scale plantations in Brazil and China. Since the difficulty in mechanizing the harvesting of the beans necessitates hand harvesting, the merit of large-scale plantations is small. In the United States, however, mechanised large-scale cultivation is carried out using dwarf hybrid suitable for mechanical harvesting. In the wet tropical zone (e.g., Thailand, Indonesia), harmful insects, particularly the insect called American Army Worm (Arhaea janata), are a great enemy of castor, and large-scale cultivation is more vulnerable to such danger.

The harvesting time for castor varies by country. The standard harvesting time in the major producing countries is shown in the following Table.

Table A-1 Harvesting Time of Castor Beans by Country

Country	Harvesting time	
Romania	July	to September
USSR	July	to September
Ethiopia	October	to December
Sudan	February	to May
Tanzania	May	to August
Mexico	July	to November
Brazil	May	to September
Ecuador	September	to December
Paraguay	May	to September
China	July	to January
India	December	to May
Pakistan	December	to May
Philippines	September	to December
Thailand	September	to December

Source: Oil World

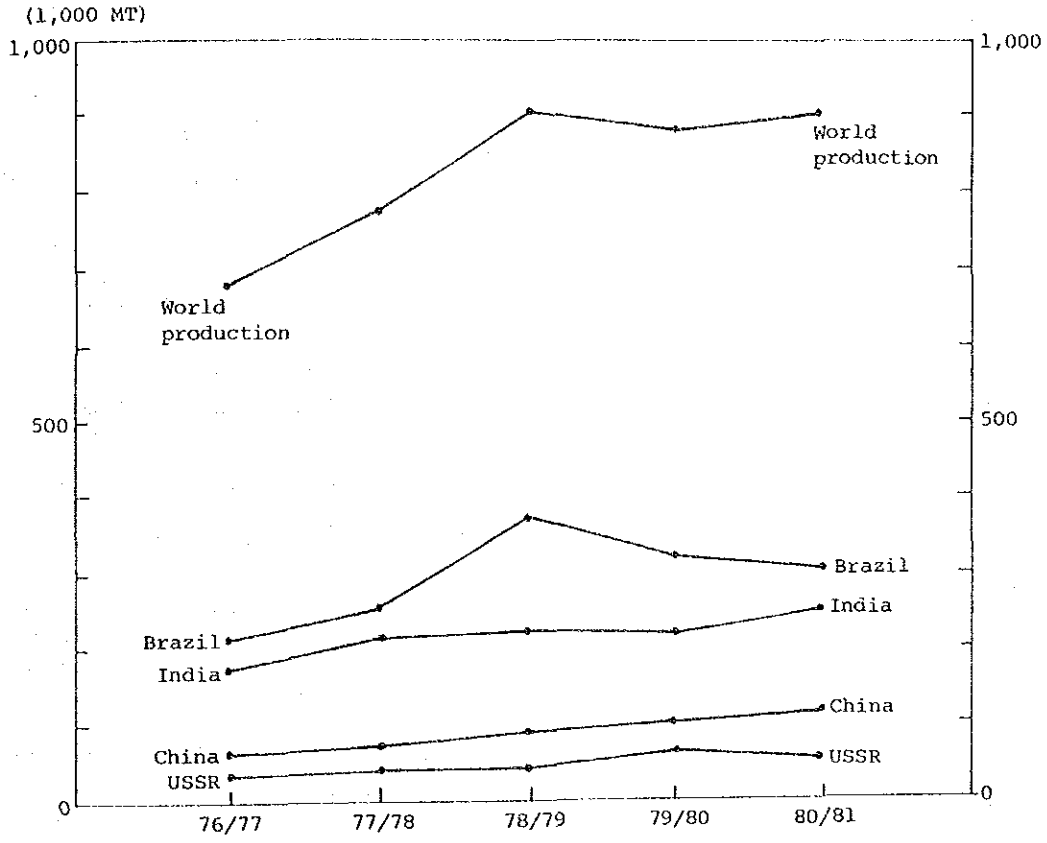
B. CASTOR BEAN PRODUCTION, EXPORTS AND IMPORTS

Brazil, India and China are the three major producing countries in terms of the area under cultivation, accounting for 76% of the world area under cultivation and 75% of the world production. The USSR, Thailand, the Philippines and Paraguay are the other main producing countries (Appendix Table 1).

According to the graph of trends in production over the last five

years, shown in Fig. B-1, although world production increased from about 700,000 tons in 1976/77 to 900,000 tons in 1980/81, this increase was achieved in the first half of the period (from 1976/77 to 1978/79), and production leveled off in the second half.

Fig. B-1 Trends in World Castor Beans Production in 1976-1981



Source: Figures taken from Oil World

In Brazil, which is the largest producing country, the production increased remarkably in the first half of the above period, but tended to decrease in the second half.

In India and China, production slowly increased through the entire period. In the USSR, the increase was marked in the second half. All producing countries increased their production except for Thailand and Pakistan, which registered decreases in the above five-year period.

The continued decrease in production in Thailand in 1978/79 and 1979/80 can be attributed to ban on castor bean exports imposed by the government to accomodate the newly-built domestic castor oil extraction mills, which caused the domestic price to fall and discouraged farmers from producing castor.

Castor bean exports and imports over the last five years are shown in Tables B-1 and B-2, respectively.

Table B-1 Castor Bean Exports by Main Producing Country

(1,000 MT, %)

	1976/77		1977/78		1978/79		1979/80		1980/81	
Brazil	-	-	-	-	-		-		-	-
India	-	-	-	-	-		-		-	-
China	1.0	(1.1)	0.1	(0.1)	9.8	(13.8)	17.5	(28.3)	14.0	(22.7)
USSR	-	-	-	-	-	-	-	-	-	-
Thailand	62.4	(66.3)	44.6	(60.8)	27.8	(39.3)	2.1	(3.4)	-	-
Philippines	4.9	(5.2)	8.5	(11.6)	10.8	(15.3)	17.4	(28.1)	21.0	(34.1)
Paraguay	5.1	(5.4)	11.1	(15.1)	9.9	(14.0)	10.0	(16.2)	11.0	(17.9)
Total	73.4	(78.0)	64.3	(87.7)	58.3	(82.3)	47.0	(75.9)	46.0	(74.7)
Others	20.7	(22.0)	9.0	(12.3)	12.5	(17.7)	14.9	(24.1)	15.6	(25.3)
World total	94.1	(100)	73.3	(100)	70.8	(100)	61.9	(100)	61.6	(100)

Comparing exports with production in recent years (1980-1981), the total world production was about 900,000 tons, whereas exports stood at around 60,000 tons, accounting for only 6.6% of the total production. This means that almost all castor bean is crushed in the producing countries.

Brazil, India and the USSR, which are major producing countries, do not export castor bean at all. Although Thailand had been the largest exporter until several years ago, its exports have been zero since 1979/80 as a result of the introduction of domestic crushing as mentioned above.[1)]

1) Brazil and India have banned castor bean exports for some time, but Thailand was exporting its entire castor bean production because of the lack of crushing facilities. In 1979, however, Thai Castor Oil Industries Co. (TCO) was set up as a joint venture between the West German Boley Co. and Thailand, and castor bean exports are now controlled by an export license system. In the subscription of capital for TCO, the ratio of Thai to West German capital is 65 to 35.

Table B-2 Castor Bean Imports by Main Importing Country

(1,000 MT, %)

	1976/77		1977/78		1978/79		1979/80		1980/81	
Brazil	10.0	(9.5)	7.4	(7.7)	7.3	(10.5)	9.2	(11.0)	13.0	(16.4)
India	-	-	-	-	-	-	-	-	-	-
China	-	-	-	-	-	-	-	-	-	-
USSR	-	-	-	-	-	-	-	-	-	-
Japan	41.5	(39.5)	36.3	(37.9)	30.0	(43.2)	33.6	(40.2)	31.0	(39.1)
Germany, FR	27.9	(26.5)	31.6	(33.0)	22.3	(32.1)	30.1	(36.0)	25.0	(31.5)
Thailand	-	-	-	-	-	-	-	-	-	-
Total	79.4	(75.5)	75.3	(78.6)	59.6	(85.9)	72.9	(87.3)	69.0	(87.0)
Others	25.7	(24.5)	20.5	(21.4)	9.8	(14.1)	10.6	(12.7)	10.3	(13.0)
World total	105.1	(100)	95.8	(100)	69.4	(100)	83.5	(100)	79.3	(100)

Source: Oil World

As shown in Table B-2, the main importing countries are the EC countries (especially the Federal Republic of Germany), Japan and Brazil. Although Brazil is the major producing country of castor bean, it compensates for shortages in the supply of materials for domestic crushing with imports. The EC countries and Japan do not produce castor bean and depend entirely on imports.

Since the castor bean producing countries have converted from castor exports to oil exports (which have higher value), countries dependent on imports of castor, such as the EC countries and Japan, have had increasing difficulty obtaining castor for crushing. As a recent example, the Japanese industries which depended largely on Thailand for castor bean have recently purchased bean from other sources, especially the Philippines and China, as Thailand stopped the export of castor bean.

Recent changes in sources of castor bean imports to Japan are shown in Tables B-3 and B-4 below. In this context, Appendix Table 1 shows that production in the Philippines has rapidly increased as a result of Japan's purchases.

The Federal Republic of Germany, which like Japan, depends on imports for its supply of castor bean, used to depend mainly on Paraguay as its source of supply, but recently has been purchasing from the Philippines as well.

Table B-3 Sources of Castor Bean Imports into Japan

(tons)

Supplier	1977	1978	1979	1980	1981
Thailand	32,237	21,544	19,109	0	0
China	-	-	2,272	8,935	4,727
Indonesia	863	588	570	331	938
Pakistan	5,222	1,340	2,487	1,977	978
Ethiopia	392	723	504	49	0
Philippines	4,736	6,802	11,605	17,442	17,894
Others	56	191	44	26	871
Total	43,506	31,188	36,589	28,760	25,408

Source: Ministry of Finance, Customs and Tariff Bureau, Government of Japan

Table B-4 Sources of Castor Bean Imports into Germany, FR

(1,000 tons)

	1980	1981
Kenya	1.3	1.7
Sudan	-	2.0
Paraguay	13.7	6.4
China	4.8	4.0
Philippines	-	4.6
Others	3.6	1.9
Total	23.3	20.5

Source: Oil World

C. CASTOR OIL PRODUCTION, EXPORTS AND IMPORTS

I. Properties and Uses of Castor Oil

Castor beans contain the toxic protein ricin and the alkaloid ricinin, and 30 to 60% of oil.

Castor oil is a non-drying oil containing 80 to 90% linolenic acid, and it has special uses different from other vegetable oils because of its linolenic acid content. The meal, which is a byproduct of oil extraction, is too toxic to be used directly as a feed, but is used as a fertilizer.[1)]

Castor oil has been known for its medicinal (purgative) properties since ancient times, but today its use as a medicine is negligible; and it is almost exclusively used as a material for industry.[2)]

The principal properties of castor oil as an industrial material are as follows:

a. Viscosity: It has much higher viscosity than other oils, and forms a good lubricative surface.

b. Stability: It is relatively stable in sunlight, air and heat.

c. Electrical properties: It has good values in specific inductive capacity, volume resistivity and dielectric power factor.

d. Resin solubility: It is soluble in many resins such as nitrocellulose, rosin, shellac and polyamides.

e. Solvent solubility: One of the features of castor oil is that it is highly soluble in alcohol, ketonic ether and esters, especially in alcohol.

f. Hydrophilic properties: Castor oil is the most hydrophilic of the vegetable oils, which is favorable for the protection of skin and hair.

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1) The removal of harmful components from the meal can be done relatively simply by heating, and the detoxicated meal can be used as fertilizer.

2) The removal of hydroxyl groups from castor oil by chemical treatment provides high-quality edible oil, but is costly.

These properties provide a range of castor oil uses for industry which is very wide and diverse. An outline is shown below, although the proportion of each use varies with country and time. In Japan, for example, applications in paints and in textile processing (as a dyeing solvent) account for a large proportion (about 30% each), but in France, almost all castor oil is used as material for 11-Nylon (trade name "Rilsem") by ATO Chemical Co.[1] (Appendix Fig. 1).

II. Castor Oil Production

Castor beans are treated (crushed) in both the producing and the importing countries, and volume of crushing in the world and in the main countries is shown in Table C-1. The volume crushed in Brazil is the largest, followed by India and China. In other words, the major producing countries of castor bean are also the major crushing countries. Among castor bean importing countries, Japan and the Federal Republic of Germany are the main crushing countries.

Table C-1 Castor Bean Crushed by Main Country (Demand)

(1,000 MT, %)

	1976/77	1977/78	1978/79	1979/80	1980/81
Brazil	280.0(39.6)	330.0(420.5)	395.0(47.2)	340.0(40.5)	320.0(38.7)
India	166.5(23.6)	186.7 (24.0)	214.3(25.6)	222.3(26.5)	225.0(27.2)
China	62.3 (8.8)	73.5 (9.5)	81.4 (9.7)	83.7(10.0)	90.0(10.9)
USSR	40.0 (5.7)	39.1 (5.0)	36.0 (4.3)	50.5 (6.0)	52.0 (6.3)
Japan	42.5 (6.0)	38.3 (4.9)	27.4 (3.3)	35.0 (4.2)	33.0 (4.0)
Germany, FR	28.0 (4.0)	31.0 (4.0)	23.0 (2.7)	30.1 (3.6)	24.0 (2.9)
Thailand	0.5 (0.1)	0.5 (0.1)	0.5 (0.1)	19.8 (2.4)	26.4 (3.2)
Total	619.8(87.7)	699.1 (90.0)	777.6(92.8)	781.4(93.0)	770.4(93.1)
Others	86.7(12.3)	77.9 (10.0)	59.9 (7.2)	58.8 (7.0)	57.5 (6.9)
World total	706.5 (100)	777.0 (100)	837.5 (100)	840.2 (100)	827.9 (100)

Source: Oil World

1) In Japan also, castor oil is used as a material for nylon, in the sebacic acid type 6-10 Nylon used mainly for fishing nets. Japan also imports 11-Nylon from France for use in pipes in automobiles. 11-Nylon is said to be more flexible and more suitable than polyvinyl chloride as the material for such pipes.

Oil production corresponds to the crushing mentioned above, and is shown by main countries in Table C-2. Trends in production in recent years are shown in Fig. C-1.

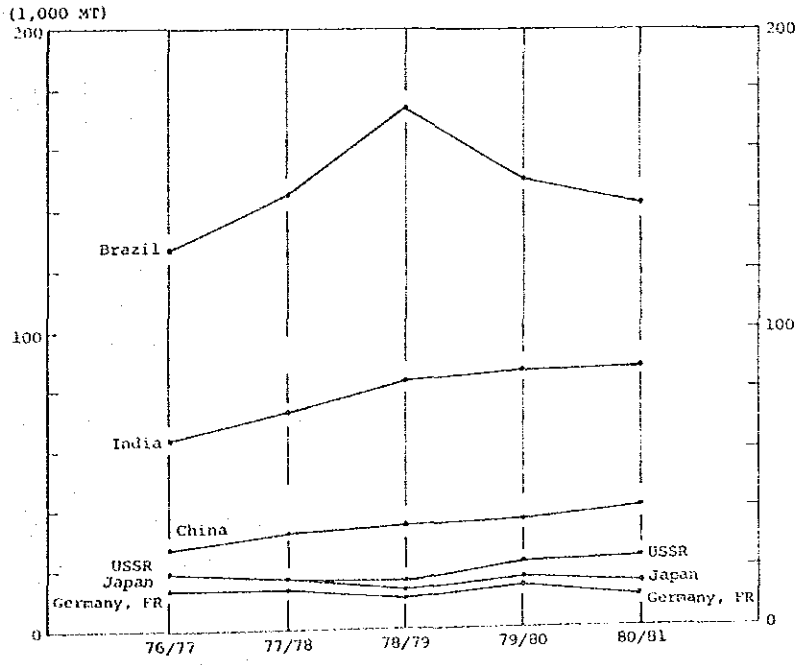
Table C-2 Castor Oil Production by Main Country

(1,000 MT, %)

	1976/77		1977/78		1978/79		1979/80		1980/81	
Brazil	123	(40.6)	145	(43.8)	174	(48.9)	150	(41.9)	141	(40.2)
India	64	(21.1)	72	(21.8)	83	(23.3)	86	(24.0)	87	(24.8)
China	27	(8.9)	32	(9.7)	35	(9.8)	36	(10.1)	39	(11.1)
USSR	19	(6.3)	17	(5.1)	16	(4.5)	22	(6.1)	23	(6.6)
Japan	19	(6.3)	17	(5.1)	13	(3.7)	16	(4.5)	15	(4.3)
Thailand	-	-	-	-	-	-	9	(2.5)	12	(3.4)
Germany, FR	13	(4.3)	13	(3.9)	10	(2.8)	14	(3.9)	10	(2.8)
Italy	4	(1.3)	3	(0.9)	2	(0.6)	3	(0.8)	3	(0.9)
UK	2	(0.7)	2	(0.6)	2	(0.6)	2	(0.6)	1	(0.3)
France	5	(1.7)	4	(1.2)	-	-	-	-	-	-
Total	276	(91.1)	305	(92.1)	335	(94.1)	338	(94.4)	331	(94.3)
Others	27	(8.9)	26	(7.9)	21	(5.9)	20	(5.6)	20	(5.7)
World total	303	(100)	331	(100)	356	(100)	358	(100)	351	(100)

Source: Oil World

Fig. C-1 Castor Oil Production in the World and Main Countries



Source: Table C-2

The above graph naturally shows almost the same movements as the graph of castor bean production in Fig. B-1: production rose in 1976-1978, after which it fell in Brazil and leveled off in India. The large increase in Brazil in 1978/79 was the result of a heavy crop of castor bean in Brazil in that year.

III. Castor Oil Exports and Imports

Castor oil exports and imports are shown in Tables C-3 and C-4. In exports too, Brazil ranks first, accounting for 60% of the total. Brazil and India (which ranks second) together account for 90% of the total.

China began to export castor oil (4,000 tons) in 1977/78, and subsequently, China's exports increased from 6,000 tons to 8,000 tons.

In castor oil imports, the United States ranks first, followed by France. The United States and France annually import about 50,000 tons of castor oil, and the USSR imports slightly less than 30,000 tons.

Table C-3 Castor Oil Exports by Main Country

(1,000 MT, %)

	1976/77	1977/78	1978/79	1979/80	1980/81
Brazil	112.4(68.5)	117.7(66.5)	156.9(69.8)	100.5(61.1)	104.0(58.3)
India	35.0(21.3)	43.0(24.3)	47.2(21.0)	39.0(23.7)	45.0(25.2)
China	- -	4.0 (2.3)	6.2 (2.8)	6.0 (3.6)	8.0 (4.5)
Ecuador	3.8 (2.3)	3.4 (1.9)	5.0 (2.2)	3.6 (2.2)	4.0 (2.2)
Germany, FR	2.5 (1.5)	2.9 (1.6)	5.0 (2.2)	3.7 (2.2)	3.0 (1.7)
Netherlands	1.5 (0.9)	1.9 (1.1)	1.5 (0.7)	1.8 (1.1)	0.6 (0.3)
France	0.9 (0.5)	0.9 (0.5)	0.7 (0.3)	0.6 (0.4)	0.4 (0.2)
Hong Kong	- -	0.4 (0.2)	0.6 (0.3)	0.3 (0.2)	0.4 (0.2)
Japan	1.1 (0.7)	0.7 (0.4)	0.8 (0.4)	0.4 (0.2)	0.4 (0.2)
UK	0.4 (0.2)	0.8 (0.5)	0.5 (0.2)	0.4 (0.2)	0.3 (0.2)
Total	157.6(96.1)	176.1(99.5)	219.4(97.6)	156.3(95.0)	166.1(93.1)
Others	6.4 (3.9)	0.8 (0.5)	5.4 (2.4)	8.3 (5.0)	12.3 (6.9)
World total	164.0 (100)	176.9 (100)	224.8 (100)	164.6 (100)	178.4 (100)

Source: Oil World

Table C-4 Castor Oil Imports by Main Country

(1,000 MT, %)

	1976/77	1977/78	1978/79	1979/80	1980/81
USA	51.1(30.3)	46.3(30.5)	52.5(23.3)	46.0(28.0)	46.0(26.9)
France	36.7(21.7)	27.1(17.8)	48.5(21.5)	35.1(21.4)	40.0(23.4)
USSR	29.0(17.2)	25.2(16.6)	45.5(20.2)	27.7(16.9)	29.0(17.0)
Germany, FR	8.3 (4.9)	10.4 (6.8)	21.2 (9.4)	12.1 (7.4)	15.0 (8.8)
UK	15.8 (9.4)	13.4 (8.8)	19.6 (8.7)	10.2 (6.2)	9.0 (5.3)
Poland	4.6 (2.7)	5.5 (3.6)	3.7 (1.6)	5.5 (3.3)	5.0 (2.9)
Japan	0.6 (0.4)	2.0 (1.3)	9.8 (4.3)	4.8 (2.9)	5.0 (2.9)
Spain	2.5 (1.5)	2.2 (1.4)	3.1 (1.4)	3.0 (1.8)	2.5 (1.5)
Italy	1.3 (0.8)	1.6 (1.1)	3.8 (1.7)	3.3 (2.0)	2.5 (1.5)
Netherlands	2.9 (1.7)	3.4 (2.2)	2.8 (1.2)	2.7 (1.6)	2.0 (1.2)
Yugoslavia	1.7 (1.0)	1.8 (1.2)	2.0 (0.9)	2.0 (1.2)	1.9 (1.1)
Benelux	2.3 (1.4)	1.2 (0.8)	1.9 (0.8)	1.6 (1.0)	1.7 (1.0)
Canada	1.1 (0.7)	1.5 (1.0)	1.8 (0.8)	1.4 (0.9)	1.5 (0.9)
Total	157.8(93.5)	141.6(93.2)	216.2(95.8)	155.4(94.6)	161.1(94.4)
Others	11.0 (6.5)	10.3 (6.8)	9.4 (4.2)	8.9 (5.4)	9.6 (5.6)
World total	168.8 (100)	151.9 (100)	225.6 (100)	164.3 (100)	170.7 (100)

Source: Oil World

IV. Castor Oil Demand

Castor oil demand [1] after the adjustment of castor oil exports and imports is shown in Table C-5. The total world demand is about 340,000 tons, and there has been no major change in the last five years.

Since castor oil is used for industry, demand comes from industrialized countries, and the EC, the United States and the USSR hold the largest share, as shown in Table C-5. These industrialized countries meet their demand by importing the oil or the bean. Although the USSR is one of the major producing countries of castor bean, demand there is met by supplementing domestic production with imports.

Brazil, China and India, which are major producing countries of both castor bean and oil, meet their own domestic demand and export their surplus oil. In these countries, domestic demand has tended to gradually increase along with the advance of industrialization, in contrast to the stagnation or decrease in demand seen in the industrialized countries.

1) The demand by country was estimated by using the formula:
Beginning stock + Output + Imports - Exports - Ending stock.

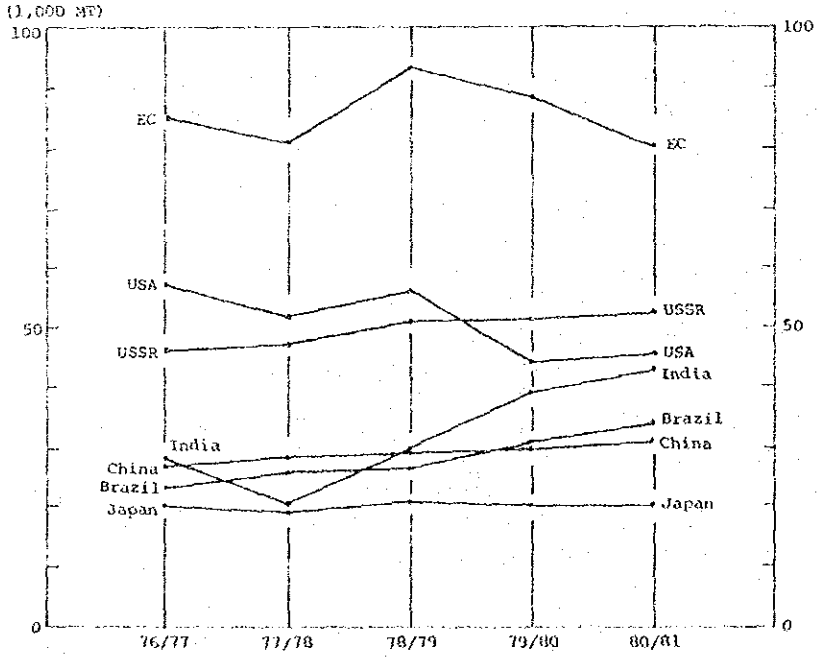
Table C-5 Castor Oil Demand by Main Country

(1,000 MT, %)

	1976/77	1977/78	1978/79	1979/80	1980/81
EC	85 (26.0)	81 (23.4)	93 (27.3)	88 (25.7)	80 (23.5)
Other Western European countries	4 (1.2)	5 (1.5)	5 (0.4)	5 (1.4)	4 (1.1)
Total of Western Europe	89 (27.2)	86 (24.9)	98 (28.7)	93 (27.1)	84 (24.6)
Poland	5 (1.5)	6 (1.7)	4 (1.2)	6 (1.7)	5 (1.5)
USSR	46 (14.1)	47 (13.6)	51 (15.0)	51 (14.9)	52 (15.2)
USA	57 (17.4)	52 (15.0)	56 (16.4)	44 (12.8)	45 (13.2)
Brazil	23 (7.0)	26 (7.5)	27 (7.9)	31 (9.0)	34 (10.0)
China	27 (8.3)	28 (8.1)	29 (8.5)	30 (8.7)	31 (9.1)
India	28 (8.6)	21 (6.1)	30 (8.8)	39 (11.4)	43 (12.6)
Japan	20 (6.1)	19 (5.5)	21 (6.2)	20 (5.8)	20 (5.9)
Total	295 (90.2)	285 (82.4)	316 (92.7)	314 (91.5)	314 (92.1)
Others	32 (9.8)	61 (17.6)	25 (7.3)	29 (8.5)	27 (7.9)
World total	327 (100)	346 (100)	341 (100)	343 (100)	341 (100)

Source: Oil World

Fig. C-2 Castor Oil Demand by Main Countries



Source: Table C-5

A comparison of the total world production and demand for castor oil is shown in Table C-6 and Fig. C-3. In the last five years, production has changed by a factor of 6.1%, whereas demand has only slightly changed by a factor of 1.93%. This indicates that castor oil demand has been stable during that five-year period.

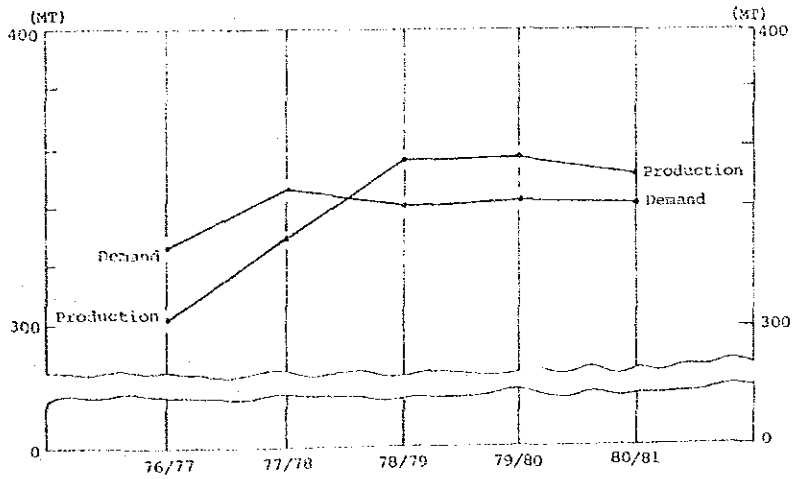
Table C-6 Total World Castor Oil Production and Demand

(1,000 MT)

	Castor oil output	Castor oil demands
1976/77	303	327
1977/78	331	346
1978/79	356	341
1979/80	358	343
1980/81	351	341
Average	339.8	339.6
Maximum	358	346
Minimum	303	327
Range	55	19
%	16.18%	5.59%
Standard deviation	20.74	6.56
Change factor	6.10%	1.93%

Source: Oil World

Fig. C-3 World Castor Oil Production and Demand



Source: Table C-6

D. CASTOR OIL PRICE

Ex-tank price at Rotterdam is generally used as the standard international market price of castor oil. Monthly and annual average prices since 1969 are shown in Appendix Table 2. These prices and world castor oil production are graphed in Appendix Fig. 2.

As shown in the price graph, there was an unusual rise in 1973, which was the result of a chain reaction of the oil crisis, a rise in the prices of petroleum products having a substitutive relationship with castor oil, and difficulty in procuring transport tankers. This price increase stimulated production, which soared to more than 1 million tons in 1974. The excessive supply which resulted from this increased production caused the price to fall, resulting in production dropping to a low of 620,000 tons in 1976. Subsequenly, both the price and the production level recovered, and have shown no major change since.

There are strong substitutive relationships between the various vegetable oils, and the price of soybean oil in particular has a large influence on the prices of other oils, as already mentioned. Since castor oil is, however, not used for food but only in industry, it has little substitutive relation with other oils, and hence its price is independent of the prices of other oils.

In attempts which were made to estimate the correlation coefficient in the monthly average price between October 1979 and September 1980, no correlation was found between soybean oil and castor oil (chosen to represent vegetable oils), as shown in Table D-1.

Castor oil is an expensive oil, second only to olive oil in price among the vegetable oils. Average prices of oils in 1980 were as follows:

Olive oil	$2,500/MT
Castor oil	1,114
Peanut oil	863
Palm oil	674
Coconut oil	673
Cottonseed oil	657
Sunflower oil	632
Soybean oil	598

Source: Excerpted from Appendix Table 3 in General Description of Oilseeds and Oils.

Table D-1 Castor Oil Monthly Average Price and Soybean Oil Price in 1979/80

	Soybean oil (1)	Castor oil (2)
1979/10	671	1,184
11	670	1,156
12	647	1,175
1980/ 1	609	1,171
2	610	1,168
3	580	1,163
4	552	1,170
5	562	1,128
6	570	1,021
7	635	1,025
8	636	1,036
9	615	970
Annual average	613	1,114

Note: USDA-FAS (US$/MT)
(1) CIF Rotterdam
(2) CIF Rotterdam
Coefficient of correlation of (1) to (2) = -0.013156*

E. CONCLUDING REMARKS

As mentioned above, castor oil has a specialized demand from industry because of its properties, and since there is little substitutive relationship with other oils (vegetable and animal oils), castor oil demand is relatively stable.

In terms of its uses in industry, however, castor oil has a substitutive relationship with petrochemical products, and in some areas,

castor oil demand increases or decreases accoridng to its price relative to that of petroleum products. For example, 11-Nylon, made from castor oil, has a competitive relationship with 12-Nylon made from petroleum, because they have common uses. The uses of castor oil, however, have been diversified over the years as already stated, and castor oil appears to have potential for new uses through future development.

On the other hand, the production in the world and in the main producing countries has tended to increase slowly. As shown recently in the Philippines, there is a possibility of rapid growth of production in the tropical developing countries provided that they can secure markets.

Thus, it may be considered that world production and demand for castor bean will continue to increase slowly in the future.

Appendix Table 1 Area under Cultivation, Yield and Production of Castor Bean

	Area under Cultivation 1,000 ha				Yield kg/ha				Production (1,000 MT)			
	1969-71	1979	1980	1981	1969-71	1979	1980	1981	1969-71	1979	1980	1981
WORLD	1434	1411	1467	1490	* 589	633	551	544	844	894	808	810
AFRICA	104	74	77	77	548	572	574	573	57	43	44	44
ANGOLA	11	12F	12F	12F	253	250	250	250	3	3F	3F	3F
BENIN	1	1F	1F	1F	550	600	600	600		1F	1F	1F
BURUNDI					200	200	200	200				
CAPE VERDE					4077	3000	3000	3000				
ETHIOPIA	22	11F	12F	12F	581	1000	1000	1000	13	11F	12F	12F
KENYA	11	9F	9F	9F	273	278	293	315	3	3F	3F	3F
LIBYA					866							
MADAGASCAR	6	5F	5F	5F	178	260	260	260	1	1F	1F	1F
MOROCCO					983	958	958	958				
MOZAMBIQUE	5	1F	1F	1F	393	385	385	385	2	1F	1F	1F
SOUTH AFRICA	8	8F	8F	8F	609	625	625	625	5	5F	5F	5F
SUDAN	16	10F	10F	11F	1020	1000	1000	952	16	10F	10F	10F
TANZANIA	19	14F	15F	15F	597	556	533	533	11	8F	8F	8F
TOGO	1	1F	1F	1F	437	500	500	500				
UGANDA	4	2F	2F	2F	469	209	208	208	2	1F	1F	1F
N C AMERICA	23	12	12	13	691	673	674	661	16	8	8	8
DOMINICAN RP					382	467	489	500				
EL SALVADOR		1F	1F	1F	396	430	400	364				
HAITI	2	3F	3F	3F	347	520	520	520	1	1F	1F	1F
MEXICO	9	8*	8*	8F	500	750	750	732	5	6*	6*	6F
USA	11	1F	1F	1F	935	663	675	675	10	1F	1F	1F
SOUTH AMERIC	415	408	484	469	984	875	668	665	408	357	310	312
ARGENTINA	7				815	500			5			
BRAZIL	373	375	437	433	973	858	647	642	363	325	283	278
ECUADOR	23	10	7	14*	1078	906	905	807	25	9	6	11*
PARAGUAY	12	23	20	22F	1249	988	1050	1045	15	23	21	23F
PERU					2000	2059	2111	2111				
ASIA	681	721	715	780	414	581	575	517	282	419	412	403
BANGLADESH				1F	634	566	747	760				
CHINA	180F	190F	200F	200F	485	606	565	600	87F	115F	113F	120F
INDIA	411	447	438	501	304	513	519	420	125	229	227	210
INDONESIA	10	1	1	1F	353	384	429	469	4	1	1	1F
IRAN	17	4F	4F	4F	529	1000	1000	1000	9	4*	4F	4F
KAMPUCHEA DR					1353	1030	1071	1077				
KOREA REP	2	1F	1F	1F	769	350	350	350	2			
PAKISTAN	17	23	23	24F	760	775	779	787	13	18	18	19F
PHILIPPINES		4*	6F	6F	2915	3294	3333	3333		14*	20F	20F
SYRIA					571	250	300					
THAILAND	39	46F	38F	38F	1021	780	684	691	40	36	26*	26F
VIET NAM	4	4F	4F	4F	500	500	500	500	2	2F	2F	2F
EUROPE	21	12	13	13	726	398	200	200	15	5	3	3
BULGARIA	1				1308				1			
HUNGARY												
ITALY												
ROMANIA	19	12	13	13F	663	398	200	200	13	5	3	3F
YUGOSLAVIA	1				1675				1			
USSR	191	184	185	139	349	337	168	288	67	62	31	40F
DEV.PED M E	10	9	9	9	838	628	633	630	16	6	6	6
N AMERICA	11	1	1	1	935	663	675	675	10	1	1	1
W EUROPE	1				1675				1			
OTH DEV.PED	8	8	8	8	609	625	625	625	5	5	5	5
DEV.PENG M E	1020	1013	1056	1126	645	696	619	568	658	705	654	640
AFRICA	60	56	59	59	448	489	495	499	26	28	29	29
LAT AMERICA	427	420	476	481	920	870	663	665	415	365	318	320
NEAR EAST	33	14	14	15	765	996	959	966	25	14	14	14
FAR EAST	480	523	508	572	381	570	576	484	193	298	293	277
CENTR PLANNO	395	390	402	356	430	472	370	461	170	185	149	165
ASIAN CPE	184	194	204	204	487	604	564	598	90	117	115	122
E EUR+USSR	211	196	198	152	381	341	170	281	80	67	34	43
DEV.PED ALL	230	205	206	160	420	353	189	300	97	72	39	48
DEV.PENG ALL	1204	1207	1260	1310	621	681	610	573	748	822	769	762

Source: FAO, Trade Yearbook

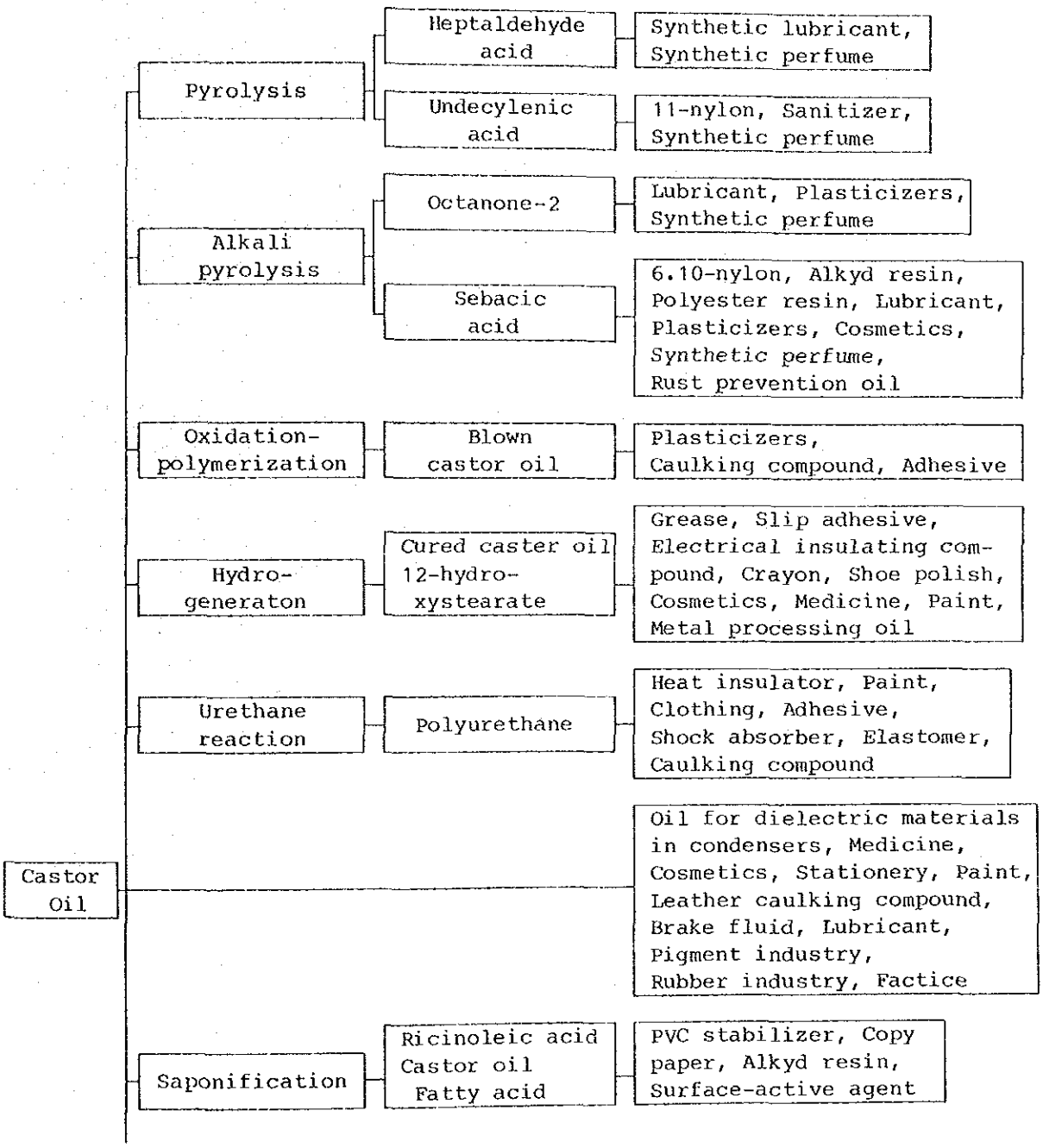
Appendix Table 2 Trends in Castor Oil Internatioal Market Price
(Brazilian Castor Oil #1)

(ex-tank Rotterdam US$/MT)

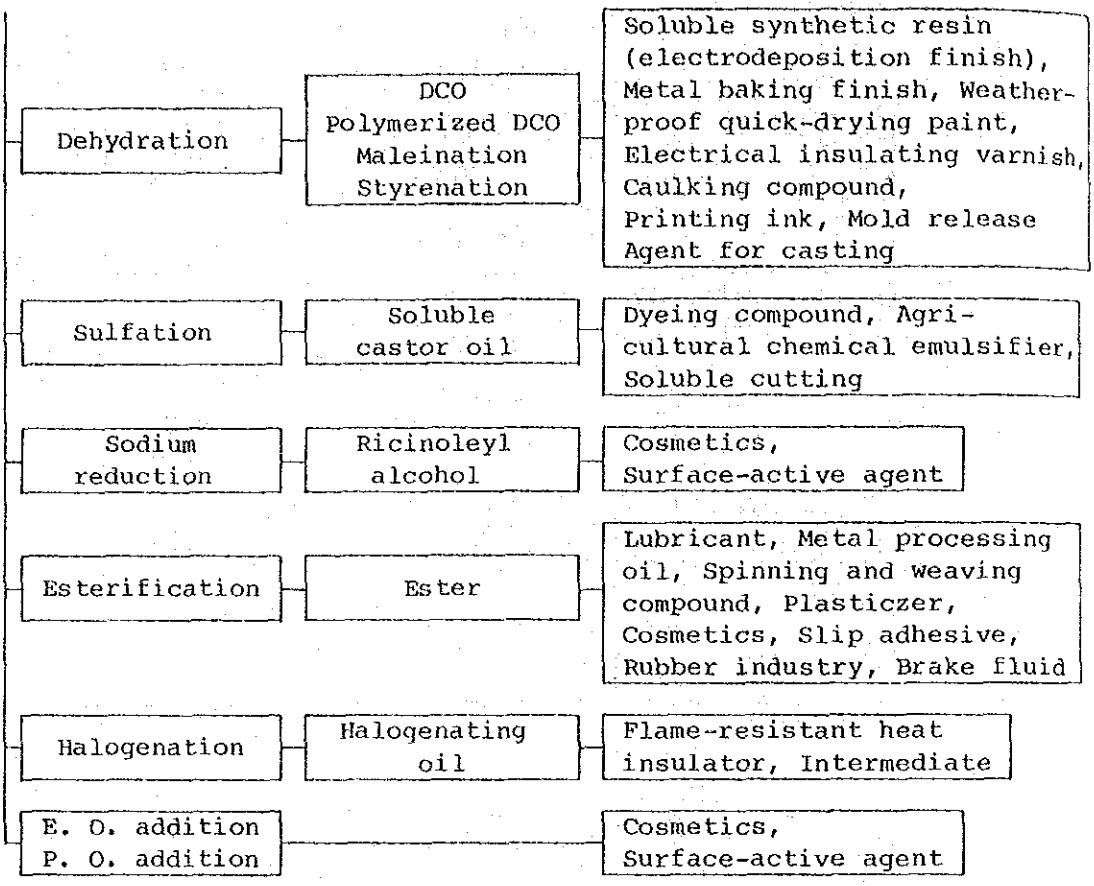
	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
January	-	267	360	407	870	925	650	505	845	970	820	1,190	1,050	940
February	-	268	355	365	1,220	965	625	535	875	985	860	1,170	980	965
March	-	265	340	355	1,615	900	590	535	910	955	835	1,175	995	945
April	270	255	320	383	1,200	850	600	535	1,085	870	810	1,160	980	945
May	275	270	320	435	1,150	910	610	700	1,020	880	810	1,100	905	945
June	260	291	338	480	1,150	890	595	730	950	820	870	1,000	925	970
July	268	320	338	545	1,175	800	600	870	865	830	1,000	1,000	920	965
August	282	290	325	450	1,275	700	600	860	970	815	1,150	975	965	935
September	278	315	320	540	1,210	690	585	820	1,000	780	1,200	970	940	920
October	270	360	350	755	1,075	670	530	760	1,010	865	1,125	970	920	980
November	266	350	360	875	1,080	660	495	820	950	795	1,180	990	900	970
December	273	360	365	865	1,100	640	480	820	960	775	1,180	1,090	865	925
Average	271	301	341	538	1,176	800	580	707	953	862	987	1,066	945	950
Bean price	(151)	(137)	(140)	(185)	(488)	(408)	(242)	(279)	(376)	(392)	(423)	(460)	(434)	

Source: 1969-73 Reuter
1974- Oil World
Bean price: CIF Japan (Ministry of Finance, Customs and Tariff Bureau)

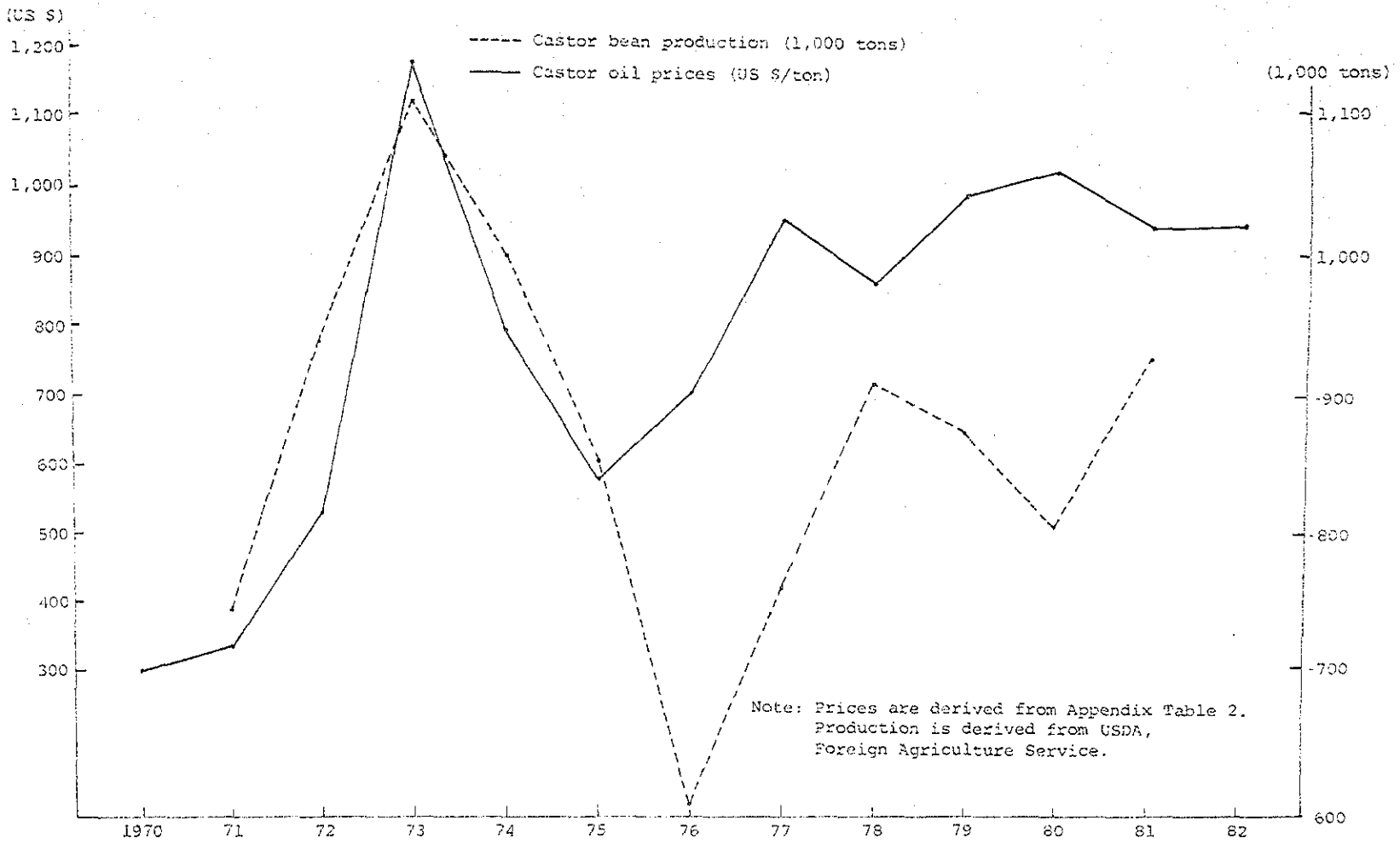
Appendix Fig. 1 Uses of Castor Oil



Appendix Fig. 1 (cont'd.)



Appendix Fig. 2 Trends of Castor Bean Production and Castor Oil Prices



[1-3] STRUCTURE OF PROJECTION MODEL AND PROJECTED RESULTS

[1-3-1] EXISTING PROJECTION MODELS CONCERNING FATS AND OILS

Among the models that examine agricultural products, particularly oil crops and their products, there are a small number that make projection of production, consumption and trade on a worldwide scale. Of these models, those developed by the World Bank and USDA will be outlined here.

A. THE WORLD BANK; WORLD FATS AND OILS ECONOMY

The World Bank has developed simulation models for the world covering a number of primary products. Of these models, that which examined oilseeds and their products will be reviewed here. The outline is as follows:

1. Objectives of the Model

Forecast of long-term movements of oils and fats, and of high-protein meals in the world markets.

2. Basic Factors of the Model

Before a model is constructed, it is necessary to identify the complex variables that interact in the current market of the commodity that is to be examined. To a great extent, the degree of emphasis that is placed on the numerous relationships within a model depends on the subjective judgment of the designer of the model.

In the construction of this model, emphasis was placed on the following factors:

First, most oilseeds have, in generalized terms, two products — fats and oils, and high-protein meals. The demand for fats and oils and that for high-protein meals can be considered as virtually independent. The two levels of demand influence the production of oilseeds independently. In view of the result, however, demand for both commodities and production of oilseed are closely related.

Secondly, in terms of their use as stock feed, high-protein meals and other feed crops are closely related.

Thirdly, as fats and oils are used for a variety of purposes, there is substitutability among oilseeds to some extent.

Fourthly, vegetable fats and oils are extracted from either annual or perennial (tree) crops. These two crop varieties differ in the way their production reacts to the market prices.

3. Agricultural Products Examined

a. Oilseeds (five annual crops and three perennial crops)
b. Fats and oils (those obtained from the oilseeds under examination)
c. High-protein meal (those obtained from the oilseeds under examination)

Also, animal fats and oils and their meals are briefly discussed.

4. Classification of the Regions

The world is divided into eight regions, as follows:

Developing countries
- East Africa
- West Africa
- Middle and Near East, North Africa
- Latin America
- East Asia
- South Asia

Developed countries
Countries with centrally planned economies

5. Data Used in the Model

Data on oilseed crops published by FAO and USDA are used. These data are converted into an oil base and a meal base to meet the convenience of mutual comparison between crops and between fats and oils

and meals. Each conversion factor assumes the same numerical value regardless of time or region. The conversion factors are listed in Table A-1.

Table A-1 Oil and Meal Yields

Oilseed Crop	Oil Yield	Meal Yield
	(percent)	
Soybeans	18.0	79.5
Sunflower Seeds	42.0	55.0
Cottonseeds	17.5	59.0
Groundnuts	44.5	55.0
Rapeseeds	38.5	59.0
Copra	63.5	36.0
Palm Kernels	46.5	52.5
Linseeds	34.0	63.0

The same oil and meal contents were used to convert oilseed supplies into their oil and meal equivalents. Thus, world fats and oils supplies is the total of the oil equivalents of the various oilseeds and the world supplies of oils, such as palm oil or olive oil, which are extracted from a raw material that has no significant meal component.

Source: Oil World Weekly as cited by the World Bank

6. Model Structure

This model describes three markets; oilseeds, oils and fats and high-protein meals. Sub-models are constructed for these three markets. Each sub-model consists of three blocks (demand block, supply block and trade block) with the same basic structure (Fig. A-1).

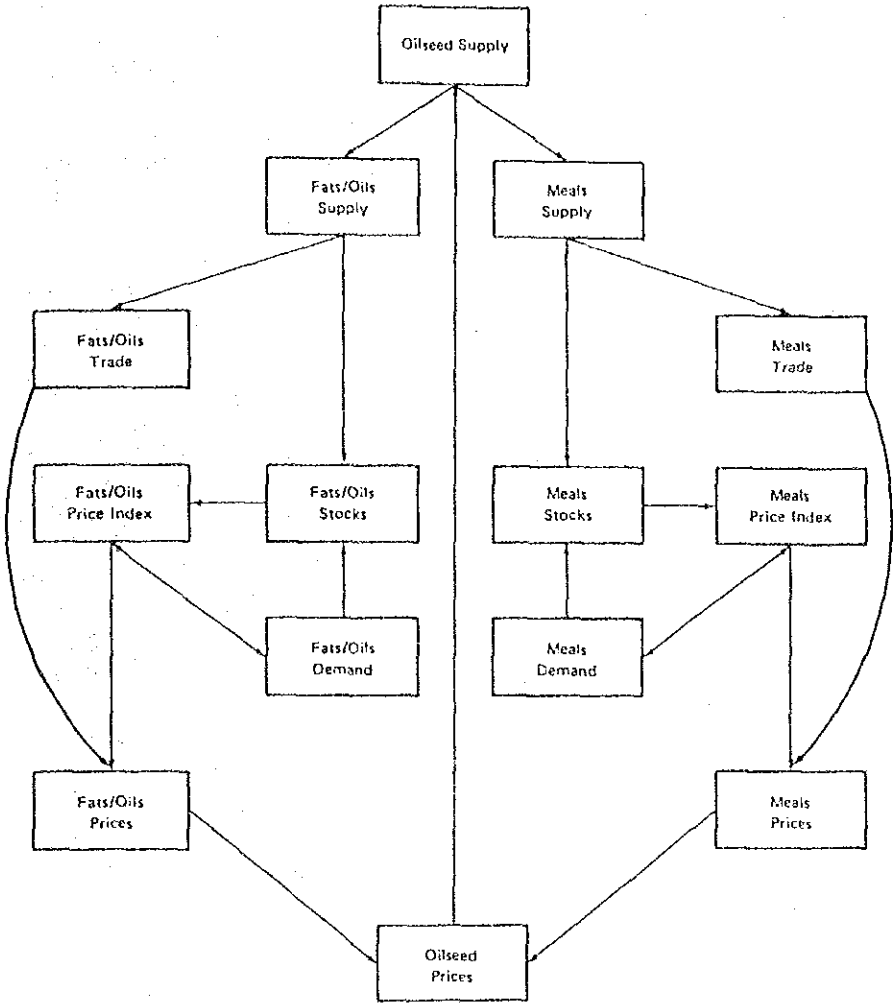
Nerlovian type supply function is employed in the supply block as follows:

$$Qos_t^i = f^i(pos_{t-k}^i, Qos_{t-1}^i, Zt)$$

where

Qos^i = world production of i oilseed
Pos^i = price of i oilseed
Zt = quantity of supply shift
k = time lag

Fig. A-1 Structure of Model



When the formula is applied for soybeans, the result is as follows:

$$SOYS_t = -11824.9 + 73.1638\ SOYP_{t-1} + 0.9133 SOYS_{t-1} - 10658.9\ D_{75} + 12440.8\ D_{76}$$

($R^2 = 0.97$ S.E.E. = 2242 D.W. = 1.23)

where

SOYS = world production of soybeans (1,000 MT)

SOYP = soybean price

D_{75} = dummy variable set to 1 for 1975

D_{76} = dummy variable set to 1 for 1976

Furthermore, a distinction is made between annual crops and tree crops whereby the price variable from the previous year is used in the supply function for annual crops, and a price variable taken from

several years previously is used in the supply function for tree crops (Price variables from nine years time lag for olive and palm kernel oils; and price variables from six years time lag for palm oil and seven years for copra oil).

In the demand block, the demand functions are formulated for each commodity in each regional bloc.

The estimation of consumption is computed from disappearance per capita. Per capita disappearance of fats and oils is obtained by the following method. Firstly, the domestic supply is estimated by adding the imports to and subtracting the exports from the overall regional production of oilseeds. Then, the overall quantity of oil available for domestic consumption is calculated from the quantity of oilseeds for extraction and the yield rate. The overall quantity is further adjusted by incorporating export and/or import figures for oil, and the final quantity of oil available for domestic consumption is derived. Therefore, the quantity per capita is found by dividing the final quantity of oil available by population and can be called, per capita disappearance, which is used as a proxy for per capita consumption.

In this model, another important factor to capture the behavior of the fats and oils markets is considered the demand for high protein meals, which is largely a reflection of the demand for animal feeds by the livestock industry. Income is the main economic factor determining the demand for livestock products together with meal prices. This relationship for high protein meal demand is presented below.

$$D_{mt} = \alpha + \beta P_{t-1} + \gamma G + \delta D_{m,t-1}$$

where

D_{mt}: demand for high-protein meals (protein equivalent)
P : price index of high-protein meal (1974 = 100)
G : GNP
$\alpha, \beta, \gamma, \delta$: estimated parameters

Besides the supply and demand blocks, another characteristic of this model is the inclusion of the total stock of fats and oils and meal. Corresponding to the first consideration in the construction of the model, as mentioned in Section 2, this factor has been included to observe the way demands for fats and oils and high-protein meals influence production. It aims at evaluating movements in demand for fats and oils and high-protein meal in terms of the fluctuations in the stock of each commodity, thereby assessing how the demands influences production and price levels.

Regarding the third consideration in the construction of the model - the substitutability among different kinds of fats and oils - substitutability is finally adjusted by the relative price (price index) between the different fats and oils. Most fats and oils can be substituted for another but the degree of substitution depends upon their refining cost and exactly the type of oil or fat wanted by the

consumer. Fats and oils have specific properties, physical (odor, color, and melting point, etc.) and chemical (fatty acid content, etc.) which indicate their advantages and disadvantages from the viewpoint of competition with other fats and oils. Consequently, each fat and oil has two markets: firstly, the market in which quality (low substitutability) is the reason for purchase, and secondly, the market in which the fat and oil is sold in competition with other fats and oils. Price elasticity is considered to be smaller in the first market than in the second.

Theoretically, the demand for each fat and oil is calculated by the following formula:

$$Q_1 = F_1 (P_1, P_2, \cdots P_k, z_1)$$
$$Q_2 = F_2 (P_1, P_2, \cdots P_k, z_2)$$
$$\vdots$$
$$Q_k = F_k (P_1, P_2, \cdots P_k, z_k)$$

where

Q_i: demand for the ith fat or oil
P_i: price of the ith fat or oil
z_i: demand shift of i equation

Parameters estimated by this equation system are cross price elasticity values. Some fats and oils and meal, however, show strong interdependence as indicated in Tables A-2 and A-3. As a result, the problem of multicolinerarity makes it difficult to estimate these parameters. To overcome this problem in the model, the prices of individual fats and oils are incorporated into a single comprehensive price index.

$$P_{it} = F_i (QFOX_{it}, PFO_t)$$

where

P_i : price of i fat or oil for t period
$QFOX_{it}$: international market quantity of i fat or oil for t period
PFO_t : price index of all fats and oils for t period

PFO_t is indicated by the following formula;

$$PFO_t = \frac{P_{it} \cdot QFOX_{it}}{P_{i,74} \cdot QFOX_{i,74}} = \frac{VFOX_t}{VFOX_{74}}$$

where

$P_{i,74}$: price of i fat or oil in 1974
$VFOX_t$: export value of fat or oil for t period

7. Projected Results

One of the projected results is shown in Tables A-4 and A-5. It is said that the validity of the basic model was confirmed quantitatively, after investigating the projected results. It was shown that

Table A-2 Correlation Matrix of Prices for Selected Fats and Oils /a

	Soybean	Sunflower	Cottonseed	Groundnut	Rapeseed	Olive	Coconut	Palm	Palm Kernel	Fish	Butter	Lard
Sunflower	.9893											
Cottonseed	.9534	.9621										
Groundnut	.9623	.9828	.9760									
Rapeseed	.9799	.9748	.9165	.9292								
Olive	.8850	.9048	.9260	.9381	.8444							
Coconut	.7934	.7869	.8119	.7833	.7584	.6143						
Palm	.9637	.9731	.9434	.9498	.9520	.8559	.8662					
Palm Kernel	.8377	.8368	.8276	.8236	.8092	.6570	.9845	.9007				
Fish	.9384	.9476	.9177	.9361	.9245	.8492	.8362	.9680	.8695			
Butter	.6448	.7061	.6992	.7611	.6047	.8546	.3015	.6327	.3549	.6520		
Lard	.9295	.9341	.8893	.9023	.9566	.8725	.6696	.9141	.7139	.9243	.6926	
Tallow	.9278	.9311	.9278	.9345	.8933	.9032	.7727	.9399	.7993	.9664	.7089	.9214

/a Computed from prices in the European market for the period 1960-75.

Source: Oil World

Table A-3 Correlation Matrix of Prices for Selected High-Protein Meals /a

Meal	Soybean Meal	Sunflower Pellets	Cottonseed Expeller	Groundnut Meal	Rapeseed Meal	Coconut Pellets
Sunflower Pellets	.9879					
Cottonseed Expeller	.9605	.9842				
Groundnut Meal	.8585	.8694	.8234			
Rapeseed Meal	.9613	.9801	.9888	.8098		
Coconut Pellets	.8569	.8781	.9090	.6800	.9031	
Fish Meal	.9811	.9770	.9589	.8376	.9626	.8208

/a Computed from prices in the European market for the period 1960-75.

Source: Oil World

the demand for high-protein meal exceeds that for fats and oils, increases stocks when demand increases, and creates a situation in which the overall price level of the fats and oils is lowered. As a result, the production of oil crops with high oil content falls. Further, the demand for fats and oils in the developing countries increases. The World Bank believes this reduces the stock level of fats and oils and, towards the end of the projection period, raises the overall price level of fats and oils.

As indicated in Tables A-4 and A-5, for the period 1981-85, the production of fats and oils exceeds consumption world-wide but, conversely, in the period 1986-90, consumption overtakes production.

The Tables also show production of vegetable oils will reach 39,485,000 tons in the 1981-85 period and 42,334,000 tons in the 1986-90 period. The World Bank revised its forecast by using the model based on the revised input data (see, "Fats and Oils" of Price Prospects for Major Primary Commodities, Vol II: Food Products and Fertilizers, 1982). The main results are shown in Tables A-6, A-7 and A-8. These tables show that by 1990, oilseed production will reach 62.6 million tons (oil-base), of which 20.9 million tons (33.4% of world production) will be produced in the developed countries, 37.0 million tons (59.1% of world production) in the developing countries and 4.7 million tons (7.5%) in the countries with centrally planned economies.

Similar to projections of the Study Team outlined later, the World Bank's forecast of world production will remain at virtually the same level until 1985 but, thereafter, its forecast of production is higher than our projection.

Table A-4 World Production of Fats and Oils 1971-75 (Actual) and 1976-90 (Projected) by Major Groups - Five-Year Averages

	1971-75		1976-80		1981-85		1986-90	
	'000 Tons	% Share	'000 Tons	% Share	'000 Tons	% Share	'000 Tons	% Share
VEGETABLE OILS	27,209	65.1	30,970	70.0	39,485	75.3	42,334	76.7
From: Oilseeds	20,227	48.4	22,900	51.8	28,700	54.7	28.730	52.1
Soybean	7,796	18.6	9,730	22.0	15,190	29.0	15,300	27.7
Sunflower	3,886	9.3	3,865	8.7	3,870	7.4	3,870	7.0
Cottonseed	2,783	6.7	3,170	7.2	3,210	6.1	3,231	5.9
Groundnut	3,275	7.8	3,365	7.6	3,420	6.5	3,370	6.1
Rapeseed	2,487	6.0	2,770	6.3	3,010	5.7	2,960	5.4
From: Tree Crops	6,982	16.7	8,070	18.2	10,785	20.6	13,604	24.7
Olive	1,532	3.6	1,550	3.5	1,280	2.4	1,150	2.1
Coconut	2,460	5.9	1,985	4.5	2,240	4.3	2,500	4.5
Palm	2,406	5.8	3,860	8.7	6,650	12.7	9,625	17.4
Palm Kernel	584	1.4	675	1.5	615	1.2	329	0.6
ANIMAL FATS AND MARINE OILS	14,564	34.9	13,265	30.0	12,980	24.7	12,860	23.3
Fish	1,059	2.5	1,210	2.7	925	1.8	775	1.4
Butter	4,641	11.1	3,975	9.0	4,090	7.8	4,245	7.7
Lard	4,077	9.8	2,870	6.5	2,890	5.5	2,940	5.4
Tallow	4,787	11.5	5,210	11.8	5,075	9.7	4,900	8.9
TOTAL FATS AND OILS	41,773	100.0	44,235	100.0	52,465	100.0	55,195	100.0

Source: U.S. Department of Agriculture (actual); IBRD, Economic Analysis and Projections Department (projected).

Table A-5 Consumption of Selected Fats and Oils in Major Regions
1971-75 (Actual) and 1976-90 (Projected)

Region	1971-75 '000 Tons	1971-75 % Share	1976-80 '000 Tons	1976-80 % Share	1981-85 '000 Tons	1981-85 % Share	1986-90 '000 Tons	1986-90 % Share
DEVELOPING COUNTRIES	12,383	30.0	13,718	31.3	16.250	32.5	19,601	33.4
East Africa	774	1.9	833	1.9	950	1.9	1,174	2.0
West Africa	1,176	2.9	1,359	3.1	1,700	3.4	2,113	3.6
Middle East, North Africa	1,572	3.8	1,709	3.9	2,100	4.2	2,641	4.5
Latin America	2,740	6.6	3,112	7.1	3,800	7.6	4,753	8.1
East Asia Pacific	1,278	3.1	1,534	3.5	2,000	4.0	2,347	4.0
South Asia	4,843	11.7	5,171	11.8	5,700	11.4	6,573	11.2
INDUSTRIALIZED COUNTRIES	18,318	44.4	18,538	42.3	20,198	40.4	22,711	38.7
CENTRALLY PLANNED ECONOMIES	10,601	25.7	11,570	26.4	13,549	27.1	16,373	27.9
WORLD TOTAL	41,302	100.0	43,825	100.0	49,995	100.0	58,685	100.0

Source: FAO Statistics (actual); IBRD, Economic Analysis and Projections Department (projected).

Table A-6 Oilseeds (oil equiv.) - Summary of World Production, Apparent Consumption and Trade by Economic Regions

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED			GROWTH RATES/A				
	1961	1970	1975	1980	1985	1990	1995	61-80	70-80	80-85	85-90	90-95
	(MILLION TONS)							(% PER ANNUM)				
PRODUCTION												
INDUSTRIAL	5.6	8.4	11.0	13.9	17.0	20.9	25.2	5.6	6.0	4.3	4.2	3.9
CENTRALLY PLANNED	3.4	4.6	4.5	4.7	4.7	4.7	4.7	1.8	0.4	0.1	0.0	0.0
DEVELOPING	14.0	17.7	22.0	27.2	31.3	37.0	43.5	3.3	4.1	2.8	3.4	3.3
WORLD	23.0	30.7	37.6	45.7	53.0	62.6	73.5	3.8	4.2	3.0	3.4	3.3
MEMO ITEM:												
INDUSTRIAL												
& DEVELOPING	19.6	26.1	33.1	41.0	48.3	57.6	68.8	4.1	4.8	3.3	3.7	3.5
APPARENT CONSUMPTION												
INDUSTRIAL	7.9	10.2	13.4	13.7	15.0	16.5	17.0	3.9	3.8	1.9	1.9	0.6
CENTRALLY PLANNED	3.9	4.8	4.2	5.3	5.9	6.5	7.1	2.3	2.3	1.7	2.4	1.6
DEVELOPING	11.8	16.0	19.7	26.4	32.0	39.5	49.4	4.0	5.0	3.9	4.3	4.6
WORLD	23.2	30.5	37.4	45.4	53.0	62.6	73.5	3.7	4.2	3.1	3.4	3.3
MEMO ITEM:												
INDUSTRIAL												
& DEVELOPING	19.7	26.2	33.1	40.1	47.0	56.0	66.4	4.0	4.5	3.2	3.6	3.5
GROSS EXPORTS												
INDUSTRIAL	0.7	1.6	2.2	3.7	4.3	5.6	6.7	8.4	8.2	4.2	4.3	3.6
CENTRALLY PLANNED	0.2	0.6	0.7	0.4	0.4	0.3	0.3	2.6	-5.9	-0.1	-0.2	-0.3
DEVELOPING	1.5	2.5	3.8	7.8	9.1	12.3	17.0	9.6	11.0	4.3	6.3	6.6
WORLD	2.4	4.7	6.7	11.4	13.9	18.2	24.0	8.0	8.7	4.1	5.5	5.6
MEMO ITEM:												
INDUSTRIAL												
& DEVELOPING	2.2	4.0	6.0	11.0	13.6	17.9	23.6	8.5	10.0	4.2	5.7	5.7
GROSS IMPORTS												
INDUSTRIAL	1.5	2.7	3.8	4.2	4.9	5.7	6.5	6.5	4.0	3.2	2.9	2.5
CENTRALLY PLANNED	0.2	0.3	0.3	0.7	0.8	0.9	0.9	3.3	4.9	2.9	2.5	1.2
DEVELOPING	0.8	1.5	2.4	6.0	8.2	11.7	16.6	10.2	15.0	6.5	7.3	7.3
WORLD	2.6	4.5	6.5	10.9	13.9	18.2	24.0	7.8	8.7	5.1	5.5	5.6
MEMO ITEM:												
INDUSTRIAL												
& DEVELOPING	2.3	4.2	6.2	10.2	13.2	17.4	23.1	8.2	8.9	5.2	5.7	5.8

/A LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-80); END-POINT FOR PROJECTED PERIODS (1980-95).
SOURCES: FAO, PRODUCTION & TRADE YEARBOOK TAPES (ACTUAL);
WORLD BANK, ECONOMIC ANALYSIS & PROJECTIONS DEPARTMENT (PROJECTED).

Table A-7 Oilseeds (oil equiv.) - Production by Main Countries and Economic Regions

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED			GROWTH RATES/A				
	1961	1970	1975	1980	1985	1990	1995	61-80	70-80	80-85	85-90	90-95
	('000 TONS)							(% PER ANNUM)				
INDUSTRIAL	5,624	8,406	11,040	13,792	16,998	20,885	25,237	5.6	6.0	4.3	4.2	3.9
N. AMERICA	4,550	7,149	9,317	11,582	14,343	17,707	21,603	5.9	6.4	4.4	4.3	4.1
UNITED STATES	4,416	6,459	8,566	10,420	12,904	15,931	19,436	5.5	6.3	4.4	4.3	4.1
EEC-10	793	1,094	1,442	1,845	2,105	2,371	2,626	4.3	3.2	2.7	2.4	2.1
CENTRALLY PLANNED	3,385	4,614	4,499	4,710	4,729	4,733	4,726	1.9	0.4	0.1	0.0	0.0
USSR	2,684	3,582	3,231	3,289	3,173	3,097	3,061	1.1	-0.4	-0.7	-0.5	-0.2
DEVELOPING	14,005	17,715	22,037	27,173	31,258	36,956	43,533	3.3	4.1	2.8	3.4	3.3
ASIA	5,319	10,335	12,627	15,465	18,256	22,001	26,333	3.1	3.7	3.4	3.8	3.7
CHINA	3,115	3,763	4,159	5,215	5,667	6,200	6,832	1.9	2.2	1.7	1.8	2.0
INDIA	2,496	2,999	3,552	3,258	3,370	3,475	3,557	1.5	1.1	0.7	0.6	0.5
MALAYSIA	235	602	1,417	2,976	3,920	5,370	6,775	15.9	16.4	5.7	6.5	4.8
INDONESIA	873	940	1,384	1,644	2,002	2,460	2,959	3.9	6.0	3.8	4.2	3.8
PHILIPPINES	830	1,059	1,115	1,300	1,491	1,737	2,049	2.4	2.9	2.8	3.1	3.4
AFRICA	3,277	3,808	4,186	4,105	4,142	4,208	4,243	1.0	0.6	0.2	0.3	0.2
NIGERIA	1,231	1,196	895	1,032	937	844	758	-2.1	-1.4	-1.9	-2.1	-2.1
AMERICA	1,380	2,171	3,571	5,610	6,980	8,618	10,565	7.5	10.2	4.5	4.3	4.2
BRAZIL	427	877	2,174	3,141	3,946	4,918	6,087	11.8	12.7	4.7	4.5	4.4
S. EUROPE	846	1,219	1,403	1,656	1,880	2,129	2,392	4.4	3.2	2.6	2.5	2.4
WORLD	23,014	30,735	37,575	45,675	52,985	62,574	73,496	3.8	4.2	3.0	3.4	3.3
MEMO ITEM: INDUSTRIAL & DEVELOPING	19,630	26,121	33,077	40,969	48,256	57,841	68,770	4.1	4.8	3.3	3.7	3.5

/A LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-80); END-POINT FOR PROJECTED PERIODS (1980-95).
SOURCES: FAO, PRODUCTION YEARBOOK TAPES (ACTUAL);
WORLD BANK, ECONOMIC ANALYSIS & PROJECTIONS DEPARTMENT (PROJECTED).

Table A-8 Oilseeds (oil equiv.) - Apparent Consumption by Main Countries and Economic Regions

COUNTRIES/ ECONOMIES	ACTUAL				PROJECTED			GROWTH RATES/A				
	1961	1970	1975	1980	1985	1990	1995	61-80	70-80	80-85	85-90	90-95
	('000 TONS)							(% PER ANNUM)				
INDUSTRIAL	7,935	10,210	13,436	13,669	15,032	16,535	17,000	3.9	3.8	1.9	1.9	0.6
N. AMERICA	3,933	4,630	7,144	5,403	6,101	6,378	6,583	3.8	4.2	2.5	0.9	0.6
UNITED STATES	3,732	4,054	6,504	4,860	5,279	5.703	5.905	3.6	4.1	1.7	1.6	0.7
EEC-10	3,175	4,106	4,579	6,031	6,329	6,717	6,915	3.4	2.8	1.0	1.2	0.6
ITALY	743	1,057	1,257	1,376	1,449	1,531	1,588	3.3	1.2	1.0	1.1	0.7
GERMANY, F.R.	713	942	1,014	1,476	1,536	1,609	1,655	3.1	3.4	0.8	0.9	0.6
JAPAN	507	984	1,151	1,539	1,738	1,923	2,072	6.2	4.6	2.5	2.0	1.5
CENTRALLY PLANNED	3,492	4,316	4,258	5,327	5,793	6,532	7,071	2.3	2.3	1.7	2.4	1.6
USSR	2,557	3,181	2,893	3,685	4,090	4,366	4,765	2.1	2.3	2.1	1.3	1.8
E. EUROPE	801	949	1,167	1,419	1,598	1,738	1,868	2.7	2.8	2.4	1.7	1.5
DEVELOPING	11,751	15,993	19,700	26,419	31,980	39,507	49,425	4.0	5.0	3.9	4.3	4.6
ASIA	7,304	9,479	10,491	14,914	17,529	21,432	25,869	3.4	4.6	3.3	4.1	3.8
CHINA	3,106	3,785	4,279	5,614	6,599	7,804	9,016	2.5	3.0	3.3	3.4	2.9
INDIA	2,578	3,086	3,566	4,627	5,566	6,772	8,320	3.0	4.8	3.8	4.0	4.2
AFRICA	2,009	3,076	4,065	4,726	5,650	7,131	8,942	4.3	4.2	3.6	4.8	4.6
AMERICA	1,418	2,134	2,934	4,386	5,269	6,573	8,110	5.8	7.5	3.7	4.5	4.3
BRAZIL	421	782	1,275	2,069	2,558	3,194	4,026	8.3	9.5	4.3	4.5	4.7
S. EUROPE	1,015	1,286	2,159	2,287	2,629	3,080	3,490	4.4	4.8	2.8	3.2	2.5
WORLD	23,178	30,519	37,394	45,416	52,985	62,574	73,496	3.7	4.2	3.1	3.4	3.3
MEMO ITEM: INDUSTRIAL & DEVELOPING	19,686	26,203	33,136	40,089	47,012	56,042	66,425	4.0	4.5	3.2	3.6	3.5

/A LEAST SQUARES TREND FOR HISTORICAL PERIODS (1961-80); END-POINT FOR PROJECTED PERIODS (1980-95).
SOURCES: FAO, PRODUCTION & TRADE YEARBOOK TAPES (ACTUAL);
WORLD BANK, ECONOMIC ANALYSIS & PROJECTIONS DEPARTMENT (PROJECTED).

B. USDA MODEL; WORLD SUPPLY AND DEMAND PROSPECTS FOR OILSEEDS AND OILSEED PRODUCTS IN 1980 (with emphasis on trade by less developed countries)

The United States is the largest agricultural producer in the world and therefore any fluctuations in its annual harvest, or changes in agricultural policy exert an enormous influence on the world food supply. The situation is the same for oil crops. The United States has always been huge supplier of the main oilseeds such as soybean, peanut, and cottonseed. The USDA has, from its early days, sought to develop a model of world agriculture in line with its position as the major supplier of agricultural products. The data collected and analysed in the USDA are regarded with equal significance as the FAO data. One aspect of those data will now be discussed viz., the projection model of production and trade for oilseeds and their byproducts.

1. Objectives of the Model

One of the main reasons that this projection model was constructed, as indicated earlier, is to obtain projections for the production of and trade in, oilseeds in developing countries.

2. Basic Factors of the Model

Investment, and increases or reductions, in oilseed production depend on the size of the return producers expect. Agricultural policies, particularly, price-support ones adopted by individual countries are a very important factor in oilseed production.

The first basic consideration, therefore, is to develop a model that reflects these policies.

The second consideration, though negative, involves the difficulty of estimating the relationship between price and supply of oilseeds. In detail, methods to utilize price elasticity values for supply are inappropriate for commodities such as oilseed which have a variety of uses. Therefore, the projection of oilseed production is based on the analysis of trends in the period 1955-68 by crop and by region (The projection based on the trend in the period 1962-68 is also made, when necessary). An assumption taken in this case is that the forces influencing the past trend of cultivated area and unit yield will continue in the same direction and dimension in the future also. Furthermore, when values extrapolated from the trends are

judged to be inappropriate, correction is made by introducing institutional and economic factors of the production level in the region in question (see Table B-2 concerning the projection of trends and adjusted results).

The third consideration, as mentioned earlier, involves determining the prospects of production of, and trade in, oilseeds and oilseed products in the developing countries, as well as estimating the profits the developing countries obtain from the trade in fats and oils, by investigating and comparing price, production, consumption and trade levels assuming three different situations.

The three different situations are classified as Projection Set I, Set II and Set III.

Projection Set I

On the assumption that the present policy for production and trade continues into the future, this set assumes that productivity in developing countries will rise steadily.

Projection Set II

This set fixes agricultural productivity and economic growth rates in the developing countries in 1980 higher than those in Set I.

Projection Set III

The agricultural productivity and economic growth rates in the developing countries in 1980 are fixed lower than those in Set I.

As for economic development and agricultural productivity in the developed countries and countries with centrally planned economies, a single set of assumptions was applied in the three classifications above.

The "projection sets" are based on the third consideration which, naturally, must include the policies undertaken by developing countries. As such, the first consideration is also incorporated into the projection sets.

The fourth consideration is the effect of aid, provided in the U.S. Public Law 480, which exerts on the international price. Through PL 480, a large quantity of vegetable fats and oils is granted to the developing countries. For example, a large quantity of oil (about 350,000 tons) was despatched in 1965 as a concessional shipment. The amount of the aid, taken into consideration with the substitutability of fats and oils, has a big bearing on the world trade in fats and oils.

3. The Agricultural Products Examined

Oilseeds:
soybean, peanut, cottonseed, sunflower seed, rapeseed, copra and oil palm

Fats and Oils:
soybean, peanut, cottonseed, sunflower seed, rapeseed, coconut, palm, palm-kernel and olive

Oil Meal:
Meals obtained after extraction of oils indicated above.

4. Classification of the Regions

For vegetable oils, the world is divided into eighteen regions as indicated in Table B-1. Furthermore, subtotals are provided for the developed countries, the centrally planned economies and the developing countries respectively. For oil cake, the eighteen regional divisions used for vegetable oils are reclassified into thirteen (By the numbers in Table B-1, regions 7 + 8, 12 + 13, 14 + 15, 16 + 17 + 18 are combined).

Table B-1 Regional Division (USDA Model)

Developed

1.	United States	
2.	Canada	
3.	European Community	Belgium-Luxembourg, France, Federal Republic of Germany, Italy, and the Netherlands.
4.	United Kingdom	
5.	Other Western Europe	Austria, Denmark, Finland, Greece, Iceland, Ireland, Malta, Norway, Portugal, Spain, Sweden, and Switzerland.
6.	Japan	
7.	Australia and New Zealand	
8.	Republic of South Africa	

Central Plan

9.	Eastern Europe	Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and Yugoslavia.
10.	USSR	
11.	Communist Asia	Mainland China, Mongolia, North Korea, and North Vietnam.

Table B-1 (cont'd.)

Less Developed

12.	Central America and Mexico	British Honduras; Carribbean including Cuba, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama.
13.	South America	Argentina, Bolivia, Brazil, French Guiana, Paraguay, Surinam, Uruguay, Venezuela, Chile, Colombia, Ecuador, Peru, and Guyana.
14.	East and West Africa	Botswana, Burundi, Ethiopia, Kenya, Lesotho, Malagasy Republic, Malawi, Mauritius, Mozambique, Rhodesia, Rwanda, Somalia, Swaziland, Tanzania, Uganda, and Zambia.
		Angola, Cameroon, Central African Republic, Chad, Congo (Kinshasa), Congo (Braz.), Dahomey, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Portuguese Guinea, Senegal, Sierra Leone, Togo, Upper Volta and Other Portuguese West Africa.
15.	North Africa and West Asia	Algeria, U.A.R. (Egypt), Libya, Morocco, Sudan, Tunisia, Bahrein, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Muscat and
		Oman, Qatar, Saudi Arabia, South Yemen, Syria, Trucial States, Turkey, and Yemen.
16.	South Asia	Afghanistan, Bhutan, Ceylon, India, Nepal, and Pakistan.
17.	Southeast Asia	Burma, Cambodia, Laos, South Vietnam, and Thailand.
18.	East Asia and Pacific Islands	Brunei, China (Taiwan), Hong Kong, Indonesia, South Korea, Macao, Malaysia, New Guinea, Pacific Islands, Papua, Philippines, and Singapore.

5. Data Used in the Model

The basic data have been taken from both the USDA and FAO.

For soybean production, estimates from the University of Minnesota are used. For cottonseed production, the projected values from Economic Research Service of USDA are used (World Demand Prospects for Cotton in 1980, USDA, Economic Research Service, Foreign Agriculture Report, January 1971).

Table B-2 Projection Results of Oilseed Production by USDA

Region and item 1/	Trend analysis 2/		Time period	1980 trend estimate 3/	1980 adjusted estimate 3/
	Constant	Coefficient			
United States:					
Peanuts (1,000 acres)	1,440.1	-9.1	1955-68	1,280	
Peanuts (1,000 acres)	1,420.0	5.04	1962-68	1,482	1,450
Peanuts (lbs./acre)	1,339.4	33.2	1955-68	2,499	
Peanuts (lbs./acre)	1,574.0	92.0	1962-68	2,871	2,510
Soybeans (1,000 acres)	23,272.6	843.7	1955-68	37,803	
Soybeans (1,000 acres)	34,062.4	2400.4	1962-68	61,668	49,000
Soybeans (bu./acre)	23.9	0.15	1955-68	26.6	
Soybeans (bu./acre)	24.6	0.36	1962-68	29.7	29.7
Flaxseed	751.7	-23.1	1955-68	515	585
Canada:					
Soybeans	185.5	6.5	1955-68	299	300
Rapeseed	274.1	36.0	1955-68	904	900
Rapeseed	386.7	67.9	1962-68	1,337	
Sunflowerseed	12.6	0.85	1962-68	28	30
Flaxseed	518.4	5.7	1955-68	412	450
EC:					
Peanuts	9.8	-0.4	1955-68	3	3
Rapeseed	311.9	33.3	1955-68	*928	
Rapeseed	428.6	63.3	1962-68	*1,378	*1,200
Sunflowerseed	19.2	1.6	1955-68	47	50
Olive Oil	350.2	16.2	1955-68	633	600
Flaxseed	70.0	1.6	1955-68	100	100
O.A.E.:					
Peanuts	13.5	-0.13	1955-68	11	15
Rapeseed	290.1	11.4	1955-68	*412	
Rapeseed	242.7	15.1	1962-68	*521	*500
Sunflowerseed	2.7	0.45	1955-68	9	10
Olive Oil	587.6	5.4	1955-68	682	650
Flaxseed	7.6	-0.63	1955-68	0	0
Japan:					
Rapeseed	200.1	-20.0	1955-68	0	0
Flaxseed	3.1	-0.17	1955-68	0	0

Region and item 1/	Trend analysis 2/		Time Period	1980 trend estimate 3/	1980 adjusted estimate 3/
	Constant	Coefficient			
Central America & Mexico:					
Peanuts	159.6	+2.6	1955-68	204	200
Rapeseed	6.4	-0.8	1955-68	4	5
Soybeans	57.1	19.2	1955-68	323	450
Soybeans	86.4	34.3	1962-68	569	
Copra	208.6	3.6	1955-68	*276	*275
Palm kernels	24.9	0.7	1955-68	*39	*40
Palm oil	20.7	1.1	1955-68	*41	*40
Flaxseed	17.8	0.1	1955-68	21	21
South America:					
Peanuts	832.4	60.8	1955-68	*1,556	*1,900
Rapeseed	39.2	5.0	1955-68	127	100
Soybeans	366.7	55.7	1955-68	*1,397	
Soybeans	563.6	78.8	1962-68	*1,746	*1,500
Sunflowerseed	815.6	33.7	1955-68	*1,438	
Sunflowerseed	909.3	86.4	1962-68	*2,205	*1,800
Copra	14.9	0.3	1955-68	*21	*20
Olive Oil	8.0	0.4	1955-68	*15	*13
Palm kernels	192.2	8.2	1955-68	*280	*300
Palm oil	3.8	0.4	1955-68	*12	*20
Flaxseed	727.4	0.6	1955-68	740	740
East and West Africa:					
Peanuts	3,900.6	129.9	1955-68	6,173	
Peanuts	4,421.0	39.1	1962-68	4,968	6,400
Rapeseed	10.4	-1.4	1955-68	0	—
Soybeans	27.3	-0.5	1955-68	36	35
Sunflowerseed	36.6	2.2	1955-68	76	75
Copra	137.1	1.7	1955-68	*169	*200
Palm kernels	775.7	-15.0	1955-68	*498	*690
Palm oil	945.4	-14.6	1955-68	*673	
Palm oil	893.3	-31.2	1962-68	*426	*1,150
Flaxseed	51.1	0.5	1955-68	60	65

Table B-2 (cont'd.)

Region and item 1/	Trend Analysis 2/		Time Period	1980 trend estimate 3/	1980 adjusted estimate 3/
	Constant	Coefficient			
North Africa and West Asia:					
Peanuts	306.3	22.7	1955-68	704	750
Peanuts	395.3	9.6	1962-68	530	
Rapeseed	4.7	0.3	1955-68	15	15
Soybeans	4.8	0.6	1955-68	6	10
Sunfloverseed	139.1	4.4	1955-68	280	
Sunfloverseed	158.9	27.5	1962-68	544	440
Olives	220.5	4.8	1955-68	305	
Olives	229.6	6.8	1962-68	325	310
Flaxseed	54.0	-0.2	1955-68	50	50
South Asia:					
Peanuts	4,868.6	77.5	1955-68	6,225	9,625
Peanuts	5,114.6	28.3	1962-68	5,511	
Rapeseed	1,492.3	34.7	1955-68	2,092	2,500
Copra	780.3	-12.8	1955-68	*1,017	1,000
Flaxseed	403.3	-0.1	1955-68	401	400
Southeast Asia:					
Peanuts	484.1	19.8	1955-68	830	850
Soybeans	37.4	0.3	1955-68	43	50
Copra	237.4	0.5	1955-68	*227	250
East Asia and Pacific Is.:					
Peanuts	472.6	14.6	1955-68	728	725
Rapeseed	7.9	1.0	1955-68	26	25
Soybeans	613.9	11.9	1955-68	822	850
Copra	2,975.1	59.6	1955-68	*4,078	
Copra	3,232.3	17.6	1962-68	*3,496	*4,500
Palm kernels	64.4	2.6	1955-68	*112	*150
Palm oil	273.6	-14.5	1955-68	*543	
Palm oil	323.3	28.9	1962-68	*756	*900

1/ Except for the U.S., unit is 1,000 MT.
2/ t = 0 at midyear
3/ Mainly 1979 production which will be crushed in 1980 unless designated by an asterisk.

6. Model Structure

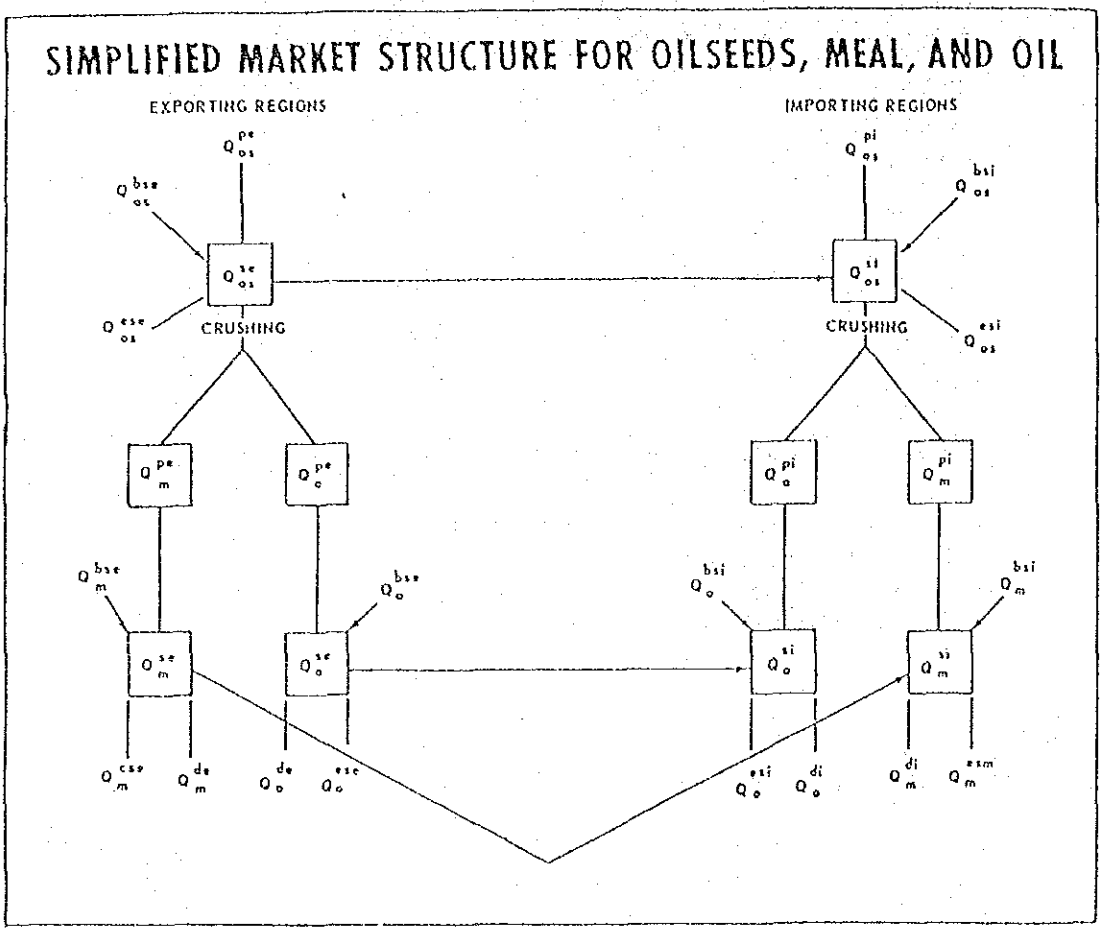
The overall structure of this model is indicated in Fig. B-1. In the group of objective variables, the innitial figures of production are obtained by conducting trend projection based on a linear regression formula. Values of trend projection of adjusted projection are shown in Table B-2.

The model is a linear simultaneous equation model and, as indicated in Table B-5, is composed of behavioral, technical and equilibrium equations for both exporting and importing regions. Tables B-3 and B-4 describe all endogeneous and exogeneous variables used in the model.

As indicated in Fig. B-1, the model incorporates a simplified structure to represent the market by dividing it into exporting and importing regions, and computing the demand for fats and oils as well as for meal by region. The variables in this model, however, are numerous and the exogeneous variables, in particular, cover a vast range of factors. It is noted that among the exogeneous variables,

the quantity of aid, provided through PL 480, is included as PL^i, and also that the beginning stocks of oil and meal are put in.

Fig. B-1 Structure of USDA Model



For symbols, see Tables B-3 and B-4.

Since the export and import functions of oilseeds, fats and oils and meals are represented by the equilibrium equations, projected figures for them alway agree each other.

Table B-3 Description of Endogenous Variables

1. Q_o^{di} = Quantity of oil demanded in importing regions.
2. Q_m^{di} = Quantity of meal demanded in importing regions.
3. Q_{os}^{pi} = Quantity of oilseed produced in importing regions.
4. Q_m^{esi} = Ending stock of meal in importing regions.
5. Q_o^{esi} = Ending stock of oil in importing regions.
6. Q_{os}^{ci} = Quantity of oilseeds crushed in importing regions.
7. Q_o^{de} = Quantity of oil demanded in exporting regions.
8. Q_m^{de} = Quantity of meal demanded in exporting regions.
9. Q_{os}^{pe} = Quantity of oilseed produced in exporting regions.
10. Q_{os}^{ese} = Ending stock of oilseed in the exporting regions.
11. Q_o^{ese} = Ending stock of oil in the exporting regions.
12. Q_m^{ese} = Ending stock of meal in the exporting regions.
13. Q_{os}^{ce} = Quantity of oilseed crushed in the exporting regions.
14. P_o^i = Price of oil in the importing regions.
15. P_m^i = Price of meal in the importing regions.
16. P_{os}^i = Price of oilseed in the importing regions.
17. P_o^e = Price of oil in the exporting regions.
18. P_m^e = Price of meal in the exporting regions.
19. P_{os}^e = Price of oilseed in the exporting regions.
20. Q_m^{pi} = Quantity of meal produced in importing regions.
21. Q_o^{pi} = Quantity of oil produced in importing regions.
22. Q_m^{pe} = Quantity of meal produced in exporting regions.
23. Q_o^{pe} = Quantity of oil produced in exporting regions.
24. Q_m^{ee} = Quantity of meal exported in exporting regions.
25. Q_o^{ee} = Quantity of oil exported in exporting regions.
26. Q_{os}^{ee} = Quantity of oilseed exported in exporting regions.
27. Q_m^{ii} = Quantity of meal imported in importing regions.
28. Q_o^{ii} = Quantity of oil imported in importing regions.
29. Q_{os}^{ii} = Quantity of oilseed imported in importing regions.

Table B-4 Description of Exogenous Variables

1. P^{i}_{sb} = Price of substitute in importing regions.
2. I^{i} = Index of personal income in importing regions.
3. PL^{i} = PL 480 shipments to importing regions.
4. Q^{ii}_{f} = Quantity of fat imported for importing regions.
5. Q^{bsi}_{f} = Beginning stock of fat in importing regions.
6. A^{i} = Number of animal units in importing regions.
7. Q^{pi}_{fd} = Quantity of feedgrain produced in importing regions.
8. $P^{i}_{os\ t-1}$ = Price lag, oilseed.
9. P^{i}_{sb} = Price of substitute for oilseeds in importing regions.
10. M^{i}_{c} = Crushing margin, importing regions.
11. P^{e}_{sb} = Price of substitute in exporting regions.
12. I^{e} = Index of personal income in exporting regions.
13. A^{e} = Number of animal units in exporting regions.
14. Q^{pe}_{fd} = Quantity of feedgrain produced in exporting regions.
15. $P^{e}_{os\ t-1}$ = Last year price of oilseed in exporting regions.
16. Q^{bsi}_{m} = Beginning stock of meal in importing regions.
17. Q^{bsi}_{o} = Beginning stock of oil in importing regions.
18. Q^{bse}_{o} = Beginning stock of oilseed in exporting regions.
19. M^{e}_{c} = Crushing margin, exporting regions.
20. T_{os} = Transfer costs for oilseeds.
21. T_{m} = Transfer costs for meal.
22. T_{o} = Transfer costs for oil.
23. T = Time (trend variables).
24. P^{i}_{t} = Price of tankage.
25. Q^{si}_{os} = Supply of commercial oilseeds.

Table B-5 World Model for Oilseeds, Meal, and Oil

Importing Regions

Behavioral Relationship

1. Demand for oil: $f(Q_o^{di}, P_o^i; P_{sb}^i, I^i, PL^i, Q_f^{ii}, Q_f^{bsi} \ldots\ldots\ldots\ldots\ldots\ldots e_1) = 0$
2. Demand for meal: $f(Q_m^{di}, P_m^i; A^i, Q_{fd}^{pi}, P_t^i, Q_{fd}^i \ldots\ldots\ldots\ldots\ldots\ldots e_2) = 0$
3. Production of oilseeds: $f(Q_{os}^{pi}; P_{os\ t-1}^i, P_{sb}^i, T \ldots\ldots\ldots\ldots\ldots\ldots e_3) = 0$
4. Crushing equation: $f(Q_{os}^{ci}, P_{os}^i, P_m^i, P_o^i; M_c^i \ldots\ldots\ldots\ldots\ldots\ldots e_4) = 0$
5. Ending stock of meal: $f(Q_m^{esi}, P_m^i; Q_{os}^{si} \ldots\ldots\ldots\ldots\ldots\ldots e_5) = 0$
6. Ending stock of oil: $f(Q_o^{esi}, P_o^i; Q_{os}^{esi}, PL_o^i \ldots\ldots\ldots\ldots\ldots\ldots e_6) = 0$

Technical Relationship

7. Production and import for oilseed: $Q_{os}^{pi} + Q_{os}^{ii} = Q_{os}^{ci}$
8. Crushing for oilseed: $Q_{os}^{ci} = bQ_m^{pi} + (1-b)\ Q_o^{pi}$
9. Market clearing for meal: $Q_m^{pi} + Q_m^{bsi} + Q_m^{ii} = Q_m^{di} + Q_m^{esi}$
10. Market clearing for oil: $Q_o^{pi} + Q_o^{bsi} + Q_o^{ii} = Q_o^{di} + Q_o^{esi}$
11. Price linkage: $P_{os}^i + M_c^i = bP_m^i + (1-b)\ P_o^i$

Exporting Regions

Behavioral Relationship

12. Demand for oil: $f(Q_o^{de}, P_o^e; P_{sb}^e, I^e, Q_f^{ii}, Q_f^{bsi} \ldots\ldots\ldots\ldots\ldots\ldots e_{14}) = 0$
13. Demand for meal: $f(Q_m^{de}, P_m^e; P_{sb}^e, A^e, Q_{fd}^{pe}, P_{fd}^e, P_t^e \ldots\ldots\ldots\ldots\ldots\ldots e_{15}) = 0$
14. Production of oilseeds: $f(Q_{os}^{pe}; P_{os\ t-1}^e; P_{sb}^e, T \ldots\ldots\ldots\ldots\ldots\ldots e_{16}) = 0$
15. Crushing equation: $f(Q_{os}^{ce}, P_{os}^e, P_o^e, P_m^e; M_c^e \ldots\ldots\ldots\ldots\ldots\ldots e_{17}) = 0$
16. Ending stock of oilseeds: $f(Q_{os}^{ese}, P_{os}^e, Q_{os}^{se} \ldots\ldots\ldots\ldots\ldots\ldots e_{18}) = 0$
17. Ending stock of oil: $f(Q_o^{ese}, P_o^e; Q_o^{se} \ldots\ldots\ldots\ldots\ldots\ldots e_{19}) = 0$
18. Ending stock of meal: $f(Q_m^{ese}, P_m^e; Q_m^{se} \ldots\ldots\ldots\ldots\ldots\ldots e_{20}) = 0$

Technical Relationship

19. Supply for oilseed: $Q_{os}^{pe} + Q_{os}^{bse} = Q_{os}^{ce} + Q_{os}^{ee} + Q_{os}^{ese}$
20. Crushing for oilseed: $Q_{os}^{ce} = aQ_m^{pe} + (1-a)\ Q_o^{pe}$
21. Market clearing for meal: $Q_m^{pe} + Q_m^{bse} = Q_m^{de} + Q_m^{ee} + Q_m^{ese}$

Table B-5 (cont'd.)

22. Market clearing for oil: $Q_o^{pe} + Q_o^{bse} = Q_o^{de} + Q_o^{ee} + Q_o^{ese}$

23. Price linkage: $P_{os}^e + M_c^e = aP_m^e + (1-a)\ P_o^e$

Regional Relationships

Equilibrium Conditions

24. $Q_{os}^{ee} = Q_{os}^{ii}$

25. $Q_m^{ee} = Q_m^{ii}$

26. $Q_o^{ee} = Q_o^{ii}$

27. $P_{os}^i = P_{os}^e + T_{os}$

28. $P_m^i = P_m^e + T_m$

29. $P_o^i = P_o^e + T_o$

7. Projected Results

Projection Set I

Under the assumption of the Projection Set I, the results are as follows:

a. The South America region shifts from being a net exporter to net importer.

b. Exports from the region of East and West Africa, and East Asian/ Pacific region increase at the annual rate of 1.0% and 2.1% respectively.

c. Japan, Central America, North America, West Asia and South Asia increase their demands for imports.

d. Eastern Europe is a medium-sized importing region.

e. The USSR, a major exporter in the 1960s is in the 1980s neither an exporter nor importer.

f. The Asian countries with centrally planned economies, exporters in the 1963-65 period, become importers.

g. Canada, an importer in the 1963-65 period becomes an exporter of vegetable fats and oils in the 1980s.

h. South Africa, an exporter in the 1963-65 period becomes an importer of vegetable fats and oils in the 1980s.

i. The developed countries who are importers are still a major market for vegetable fats and oils but the growth rate falls to as low as 1.9% annually.

j. The increase in exports from the United States is assessed at 7.2% annually. That is, 1.2 million tons in the 1963-65 period to 3.6 million tons by 1980.

Projection Set II

Projection Set II assumes that the projected growth rate of oilseed production in the developing countries is 40% higher than that of Set I. Under this assumption, the results are as follows:

a. The increase in oilseed production in the developing countries contributes to the reduction in the world prices for vegetable fats, oils and oil cakes to a greater extent than in the Set I.

b. The rise in incomes in the developing countries is assumed to be greater than in Set I so that the demand for vegetable oils increases. In the developed countries, the demand for them increases only slightly.

c. In world trade, importing countries increase their volume of imports. Exports rise only slightly in the developed countries, but rise rapidly in the developing countries.

Projection Set III

Projection Set III assumes that agricultural production and economic growth in the developing countries are at a lower level than in Set I (Agricultural production is 30% lower). Under this assumption, the results are as follows:

a. The production of vegetable fats and oils declines almost to the production level of Set I. Demand for vegetable fats and oils is low in the developing countries.

b. The effects of higher prices caused by the reduction in vegetable fats and oils production are to some extent offset assuming a reduction in earnings in the developing countries. World prices for vegetable fats and oils, however, are assessed higher than in Set I.

c. The level of trades among regional blocs is close to that in Set I.

Tables B-6 and B-7 indicate the results projected by Set I and Table B-8 shows the comparison between the results projected by Sets I, II and III.

The aid to the developing countries arising from US Public Law 480 is judged to have significant effects on world prices for fats and oils.[1)]

With regards to earnings and expenditures related to the trade in fats and oils in the developing countries, it was shown that, under the conditions prevailing in Projection Set II, the earnings of the exporting regions are just slightly higher than under Projection Set I. This is because the growth in domestic consumption nearly offsets the increase in production. On the other hand, for the developing countries who are importers, the level of demand is greater than domestic production, and the amount of money required to purchase imports increases dramatically to exceed the revenue from exports. In Projection Set III, however, the above results is reversed.

By assuming the earnings and outlays of foreign currency by fats, oils and oil cake trade in the period 1963-65 to be $905 million and $92 million respectively, the overall earnings and outlays of developing countries for the three sets are as follows:

Projection Set I	Earnings	$1,058	million
	Outlays	$607	"
Projection Set II	Earnings	$,1269	"
	Outlays	$697	"
Projection Set III	Earnings	$952	"
	Outlays	$522	"

1) In the case of oversupply, the supply is tightened relative to the demand by reducing the stock by providing the aid, and by the lowering of the quantity able to be supplied through ordinary transactions so that a conspicuous decline in price can be avoided.

Table B-6 Vegetable Oil: World Supply, Demand, and Trade, by Region, Average 1963-65, and Producted to 1980 under Projection Set I 1/

Region	Average 1963-65				1980				Share of 1980 trade		Rates of change 1963-65 - 1980		
	Supply	Demand	Export	Import	Supply	Demand	Export	Import	Import	Export	Supply	Demand	Trade
	1,000 metric tons								Percent		Percent		
United States	4,267	3,094	1,173	--	7,939	4,434	3,565	--	--	52.2	4.0	2.3	7.2
Canada	95	171	--	76	336	285	51	--	--	7.8	8.2	3.2	--
EC	511	2,327	--	1,816	992	3,239	--	2,247	32.9	--	4.2	2.1	1.3
United Kingdom	2	497	--	495	--	644	--	644	9.4	--	--	1.7	1.7
E.F.T.	710	1,134	--	424	869	1,450	--	581	8.5	--	1.3	1.6	2.0
Japan	39	443	--	404	--	824	--	824	12.1	--	--	4.0	4.6
Australia-New Zealand	21	54	--	33	13	127	--	114	1.7	--	-3.0	5.5	8.1
South Africa	76	57	19	--	115	134	--	19	.3	--	2.6	5.5	--
Total	5,721	7,777	1,192	3,048	10,304	11,137	3,616	4,429	64.9	53.0	3.8	2.3	-5.6
Eastern Europe	561	758	--	197	1,250	1,306	--	56	.8	--	5.1	3.5	-7.6
USSR	2,159	1,960	199	--	3,866	3,866	--	--	--	--	3.7	4.3	1.5
Communist Asia	1,121	1,033	88	--	1,411	1,568	--	157	2.3	--	1.5	2.6	--
Total	3,841	3,751	287	197	6,527	6,740	--	213	3.1	--	3.4	3.7	6.8
Central America and Mexico	355	397	--	32	521	846	--	325	4.8	--	2.3	4.8	15.5
South America	800	858	--	58	1,776	1,753	23	--	--	.3	5.1	4.6	--
East and West Africa	2,348	1,067	1,281	--	3,489	1,979	1,510	--	--	22.1	2.5	3.9	1.0
North Africa and West Asia	642	845	--	204	1,257	1,743	--	486	7.1	--	4.3	4.6	5.6
South Asia	2,176	2,197	--	21	3,522	4,779	--	1,257	18.4	--	3.1	5.0	--
Southeast Asia	149	160	--	11	179	298	--	119	1.7	--	1.1	4.0	16.0
East Asia and Pacific Islands	2,392	1,185	1,198	--	4,055	2,375	1,680	--	--	24.6	3.4	4.4	2.1
Total	8,862	6,709	2,479	326	14,799	13,773	3,213	2,187	32.0	47.0	3.3	4.6	-4.5
World total	18,424	18,237	3,958	3,771	31,650	31,650	6,829	6,829	100.0	100.0	3.4	3.5	--

1/ Set I assumes a continuation of present production and trade (with some modification) and allows for moderate gain in productivity in the LDC's.

Table B-7 Oilcakes: World Supply, Demand, and Trade by Region, Average 1963-65, and Producted to 1980 under Projection Set I 1/

Region	Average, 1963-65				1980				Share of 1980 trade		Annual rate of chang 1963-65 - 1980		
	Supply	Demand 2/	Export	Import	Supply	Demand	Export	Import	Import	Export	Supply	Demand	Trad
	1,000 metric tons				1,000 metric tons				Percent		Percent per year		
United States	18,198	3/ 11,812	5,904	--	31,820	15,180	16,640	--	--	70.9	3.6	1.6	6.7
Canada	500	889	--	380	949	1,314	--	365	1.6	--	4.1	2.5	- .3
EC	262	5,269	--	5,007	742	10,429	--	9,687	41.2	--	6.7	4.4	4.2
United Kingdom	--	1,619	--	1,619	--	3,190	--	3,190	13.6	--	--	4.3	4.2
O.W.E.	289	2,479	--	2,190	454	5,074	--	4,620	19.7	--	2.9	4.6	4.8
Japan	70	1,915	--	1,845	--	4,866	--	4,866	21.7	--	--	6.0	6.2
Australia-New Zealand and South Africa	139	119	20	--	245	215	30	--	--	.1	3.6	3.8	2.6
Total	19,458	4/ 24,575	5,924	11,041	34,210	40,268	16,670	22,728	96.8	71.0	3.6	3.1	1.1
Eastern Europe	1,045	1,623	--	578	2,269	3,024	--	755	3.2	--	5.0	4.0	1.7
USSR	3,597	3,768	129	--	6,398	6,348	50	--	--	.2	3.1	3.3	-5.8
Communist Asia	3,415	3,333	82	--	4,057	4,507	450	--	--	1.9	2.4	1.9	11.2
Total	8,357	8,724	211	578	12,624	13,879	500	755	3.2	2.1	3.1	3.0	-3.2
Latin America	2,574	1,136	1,438	--	4,366	1,870	2,496	--	--	10.6	3.4	3.2	3.5
Africa and West Asia	2,501	933	1,068	--	4,805	1,335	3,470	--	--	14.8	3.4	3.0	3.6
Other Asia	5,416	4,254	1,162	--	9,080	8,733	347	--	--	1.5	3.3	4.6	-7.3
Total	10,791	6,323	4,668	--	18,251	11,938	6,313	--	--	26.9	3.3	4.2	2.0
World total	38,606	39,522	10,703	11,619	66,085	66,086	23,483	23,483	100.0	100.0	3.4	3.3	--

1/ Set I assumes a continuation of present production and trade policies (with some modification) and allows for moderate gain in productivity in the LDC's.
2/ All regions except U.S. are availabilities.
3/ Does not include stocks.
4/ Includes an allowance for U.S. stocks.

Table B-8 Alternative 1980 Projection of Vegetable Oil Production, by Commodity

Commodity	Set I	Set II			Set III		
	1980 production	1980 production	Quantity change from I	Percentage change from I	1980 production	Quantity change from I	Percentage change from I
	1,000 metric tons	1,000 metric tons		Percent	1,000 metric tons		Percent
Cottonseed oil	3,858	4,417	559	14.5	3,531	-327	-8.5
Peanut oil	4,670	5,557	887	19.0	4,167	-503	-10.8
Rapeseed oil	2,185	2,311	126	5.8	2,108	-77	-3.5
Soybean oil	7,470	7,590	120	1.6	7,414	-56	-.8
Sunflowerseed oil	4,710	5,080	370	7.9	4,527	-183	-3.9
Palm kernel oil	620	706	86	13.9	570	-50	-8.1
Coconut oil	4,078	4,656	578	14.2	3,694	-384	-9.4
Palm oil	2,480	3,362	882	35.6	2,018	-462	-18.6
Olive oil	1,579	1,610	31	2.0	1,558	-21	-1.3
Total	31,650	35,289	3,639	11.5	29,587	-2,063	-6.5