

Table 1. Area, production, and productivity of chickpea in India.¹

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Area ('000 ha)	7974	7708	6985	6984	7868	7399	7161	6904	7805	6781
Production ('000 t)	5410	5139	3357	4328	4642	5290	4751	4561	5780	4455
Yield (kg ha ⁻¹)	678	745	481	657	590	715	663	661	742	657

1. Source: FAO Production Year Books.

Suggestions to increase chickpea production

Efforts should be made to increase area under chickpea cultivation, especially to utilize marginal lands. A pilot project under National Wasteland Development Board (NWDB) may be initiated to identify areas suitable for chickpea cultivation and incentives given to farmers to cultivate chickpea on these lands.

Major inputs, such as good quality seeds of improved varieties, fertilizers, efficient *Rhizobium* cultures, pesticides, and plant protection, should be made available. The requirement of phosphorus and zinc should also be adequately met.

Since chickpea is cultivated mostly as a rainfed crop, drought-tolerant varieties with high yield may be introduced. Resistance to pod borer needs to be incorporated and the diseases of blight and wilt overcome. Surveillance and monitoring of pests and timely recommendations of appropriate control measures should contribute to increase in production. The integrated pest management (IPM) approach for the control of *Helicoverpa armigera* needs to be seriously pursued. Irrigation systems, such as, drip and sprinkler systems may be popularized for economizing irrigation resources and to ensure uniform irrigation.

Farmers feel that chickpea is only a subsidiary crop compared to staple cereals, that it has inherently a low yield potential, and that the market rates fluctuate. This situation needs rectification if a breakthrough in chickpea production is to be brought about.

Measures such as crop insurance would give the marginal farmers confidence to grow chickpea

which is strongly affected by climatic fluctuations. Legislations to procure the produce at farmers' doors and its marketing may be thought of as another incentive to encourage farmers.

Research Reports

Economics

Status of Chickpea in the World

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Area and Production. Chickpea is one of the most important legumes, especially so in Asia. The total world production of chickpea is around 7.1 million t produced on nearly 10 million ha of land (average of 1985-87). Despite its limited share in the total world area under cereals and pulses chickpea accounts for nearly 15% of the world area on which pulses are grown. It is grown in about 35 countries of the world. However, it is a major crop in Asia and Africa. Asia alone (represented by 13 countries) produces 92% of the total world chickpea. Africa (represented by nine countries) produces 4%, and Americas (north, central, and south represented by five countries) 3% of total world production of chickpea (Table 1).

Table 1. Regional distribution of area, production, and yield of chickpea in different countries of the world, average of 1985-87.

Region/ country	Area (1000 ha)	Share of world area (%)	Production (1000 t)	Share of world production (%)	Average yield (t ha ⁻¹)	Per capita consumption (kg)
Asia	9223	91.94	6450	91.19	0.7	N.A.
Africa	451	4.49	294	4.16	0.65	N.A.
Americas	192	1.91	203	2.87	1.13	N.A.
Europe	131	1.31	91	1.29	0.7	N.A.
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Developed countries	169	1.68	132	1.87	0.78	N.A.
Developing countries	9863	98.32	6944	98.17	0.7	N.A.
World total	10032	100.00	7073	100.00	0.7	N.A.
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India	7163	71.65	4919	69.91	0.69	6.51
Pakistan	1043	10.43	564	8.02	0.54	4.89
Turkey	533	5.33	593	8.43	1.1	3.22
Myanmar	203	2.03	180	2.56	0.88	3.73
Ethiopia	180	1.80	135	1.92	0.75	3.41
Mexico	150	1.50	177	2.51	1.18	1.48
Iran	101	1.01	73	1.03	0.72	1.48
Spain	90	0.90	60	0.85	0.66	2.16
Morocco	81	0.81	55	0.78	0.68	1.57
Syria	67	0.67	42	0.59	0.6	3.13
Algeria	63	0.63	17	0.25	0.27	2.32
Bangladesh	48	0.48	36	0.52	0.76	0.41
Nepal	42	0.42	18	0.26	0.44	1.35
Tunisia	41	0.41	31	0.44	0.75	4.60
Malawi	33	0.33	22	0.31	0.67	3.09
Tanzania	31	0.31	10	0.14	0.32	N.A.
Portugal	25	0.25	13	0.18	0.5	1.20
Colombia	23	0.23	11	0.16	0.48	0.51
Iraq	16	0.16	13	0.18	0.79	N.A.
Chile	13	0.13	10	0.14	0.76	N.A.
Uganda	10	0.10	8	0.11	0.8	N.A.
Italy	9	0.09	11	0.16	1.2	0.25
Egypt	9	0.09	15	0.21	1.61	N.A.
Greece	5	0.05	5	0.07	1.12	1.05
Israel	4	0.04	6	0.08	1.56	0.72

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Table 1. *Continued*

Region/ country	Area (1000 ha)	Share of world area (%)	Production (1000 t)	Share of world production (%)	Average yield (t ha ⁻¹)	Per capita consumption (kg)
Argentina	3	0.03	3	0.04	1	N.A.
Peru	3	0.03	2	0.04	0.83	
N.A. Lebanon	2	0.02	3	0.04	1.27	N.A.
Yugoslavia	2	0.02	2	0.03	1.13	N.A.
Jordan	2	0.02	1	0.02	0.53	N.A.
Sudan	1	0.01	1	0.02	1.1	N.A.

In Asia, India is the single largest producer of chickpea, contributing more than 70% of the total world production. The other important chickpea-producing countries in the world are Pakistan, Turkey, Myanmar, Mexico, Ethiopia, and Iran. The actual estimates of area under chickpea are often under reported because it is also sown in intercropping systems with other postrainy season crops, such as wheat, particularly in dryland areas.

Increase in Area and Production. It is clear from Table 2 that during last 5 to 6 years (1979-81 to 1985-87) the total production of chickpea in the world increased by 19% (from 5947000 t to 7073000 t). This increase was primarily because of an increase in yield, which increased by 13% (from 624 to 705 kg ha⁻¹) and marginally due to increase in the area under chickpea cultivation, which increased by only 5% (from 5930000 t to 10032000 t). Chickpea production suffered a setback after the Green Revolution, particularly in India in the traditional chickpea-growing areas. The major reason for this was a shift from chickpea to wheat cultivation by farmers because of improvement in irrigation facilities, because chickpea is rarely irrigated in most parts of India and Pakistan. Chickpea cultivation was thus forced into more marginal land (Anonymous 1973; Hawtin 1976; Singh 1984; and Jodha and Subba Rao 1987). Besides this, severe damage by *Ascochyta rabiei* also caused drastic reduction in chickpea area in Pakistan (Malik 1984).

Decline in chickpea production associated with the yield and price-induced increases, profitability of competitive crops, were not a phenomenon confined to the areas experiencing green revolution in India. Similar factors were responsible for the decline in the area of chickpea in Europe as well. As observed

by Cubero (1976) in Spain, and some other European countries the decline in chickpea area in zones of greater affluence where crops of higher economic value have replaced chickpea. In environments which are marginal and in the areas where farmers cannot afford the inputs, chickpea is a preferred crop. Change in the income and improvement in the standard of living have led to substitution of vegetable protein by animal protein and a consequent reduction of chickpea production for human consumption (Jodha and Subba Rao 1987).

However, in India a recent announcement of substantial increase in the support prices of chickpea is most likely to prove to be an incentive to farmers to increase chickpea production. This measure would be more effective if accompanied with some breakthrough in the development of disease-resistant, high-yielding varieties of chickpea.

Contributions to increase in chickpea production during the last 6-7 years have been mostly from India (43%), Turkey (32%), and Pakistan (15%). The largest share of India is because it is the single largest chickpea-producing country of the world. However, if the percentage change in the production of chickpea is compared then Uganda, Turkey, and Myanmar become the most important countries with an increase of 130 to 430% in production from 1979-81 to 1985-87. The increase was not only in yield but also in area under chickpea which had risen from a very low level' (Table 2).

This suggests that there is a good scope to expand chickpea cultivation in countries such as Turkey, Myanmar, Morocco, Uganda, Iran, Malawi, Tanzania, and Egypt. It may also be profitable to pay greater attention to those areas of Americas and Africa where the yield levels are high

Table 2. Percentage change in area, production, and yield of chickpea during 1985-87 over 1979-81.

Region/ country	Share in increase in area (%)	Share in increase of production (%)	Change in production in 1985-87 over 1979-81 (%)	Change in area in 1985-87 over 1979-81 (%)	Change in yield in 1985-87 over 1979-81 (%)
Asia	95	97	20.30	5.45	14.08
Africa	14	4	17.27	18.29	-0.86
Americas	-10	-3	-15.77	-21.31	6.98
Europe	-5	-1	-6.29	-17.09	13.03

Developed countries	1	3	30.10	4.32	24.71
Developing countries	99	97	18.78	5.28	12.82
World total	100	100	18.93	5.27	12.98

India	15	43	10.62	1.01	9.52
Pakistan	-5	15	42.43	-2.07	45.43
Turkey	68	32	142.30	150.08	-3.97
Myanmar	16	9	133.43	60.10	45.80
Mexico	-10	-3	-17.72	-23.08	6.96
Ethiopia	6	1	5.74	16.88	-9.53
Iran	11	2	38.41	109.72	-34.00
Spain	0	1	14.76	-1.81	16.87
Morocco	6	2	64.37	53.46	7.11
Syria	0	0	-11.01	3.08	-13.67
Bangladesh	-2	0	-8.70	-16.37	9.18
Tunisia	-6	0	4.12	-38.81	70.14
Malawi	1	0	26.23	26.92	-0.55
Nepal	-2	0	-12.41	-16.00	4.28
Algeria	5	0	4.76	50.79	-30.53
Egypt	0	0	39.32	33.33	4.49
Iraq	-1	0	0.01	-20.00	25.01
Portugal	-2	0	9.24	-28.57	52.93
Italy	-1	0	-30.85	-33.33	3.73
Tanzania	1	0	34.58	14.81	17.21
Chile	-1	0	5.69	-29.63	50.20
Uganda	1	1	433.33	233.33	60.00
Israel	0	0	9.95	-8.33	19.94
Greece	-2	-1	-66.60	-68.89	7.34
Argentina	0	0	-26.29	-40.00	22.85

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Table 2. Continued

Region/ country	Share in increase in area (%)	Share in increase of production (%)	Change in production in 1985-87 over 1979-81 (%)	Change in area in 1985-87 over 1979-81 (%)	Change in yield in 1985-87 over 1979-81 (%)
Lebanon	0	0	10.87	0.00	10.87
Peru	0	0	6.43	0.00	6.43
Yugoslavia	0	0	11.88	0.00	11.88
Sudan	0	0	-35.57	-33.33	-3.35
Jordan	0	0	-11.98	0.00	-11.98

but area cultivated is quite small. The introduction of chickpea in new areas such as Australia, South-East Asia, and Pacific regions where the environment is quite favorable as demonstrated by the work in these areas (Corbin 1976; Singh 1984) will be of help.

Yield. The world productivity of chickpea (0.7 t ha^{-1}) is very low compared to cereals such as wheat (1.9 t ha^{-1}), rice (2.8 t ha^{-1}), maize (3.32 t ha^{-1}), and even sorghum (1.4 t ha^{-1}), and millet

(0.67 t ha^{-1}). Yield of chickpea is not only lower than cereals but also lower compared to pulses such as faba beans (1.16 t ha^{-1}) and lentil (0.63 t ha^{-1}). However, it is not true across all countries. In some countries chickpea yields are quite high but in most of the major chickpea growing countries it is low (Table 3).

The lowest average yield of 356 kg ha^{-1} was an average of four countries which accounted for 1% of the total world area under chickpea cultivation. The average chickpea yield in many countries

Table 3. Distribution of chickpea producing countries by level of yield average of 1985-87.

Range of yield (t ha^{-1})	Number of countries	Area (1000 ha)	Share in total (%)	Production (100 t)	Share in total (%)	Yield (t ha^{-1})
> 0.5	4 ¹	159	1.59	57	0.80	0.36
0.5-0.75	13	8828	88.00	5914	83.62	0.67
0.75-1	7	296	2.95	252	3.57	0.85
< 1	10 ²	749	7.47	850	12.02	1.13
World total	34	10032	100.00	7073	100.00	705

1. Countries with low yield levels are Nepal, Algeria, Colombia, and Tanzania.

2. Countries with high yield levels are Egypt, Israel, Lebanon, Italy, Mexico, Yugoslavia, Sudan, Greece, Turkey, and Argentina.

(about 40%) was 670 kg ha⁻¹ which produced more than 83% of the total chickpea and accounted for 88% of the area. There were few countries (30%) with a very high average yield (1135 kg ha⁻¹) which accounted for only 7% of the chickpea area but 12% of the total world production. This suggests that substantial increases in chickpea production can be brought about without increasing the area by increasing average yield of major chickpea-producing countries (Table 3).

Import and Export of Chickpea. There are many diverse uses of chickpea ranging from baby food to delicacies for the rich. It is used as animal feed also, which accounts for 14% of the domestic supplies in the world. But the share of chickpea as animal feed is as high as 40% in North and Central America. About 5-10% of the domestic production is used as seed, 2-7% goes as waste at different stages of processing and storage. On an average, per capita annual consumption of chickpea is about

Table 4. Import and export of chickpea in different countries of the world, and export and import prices, average of 1981-95.

Country	Imports		Country	Exports	
	Quantity in (1000 t)	Prices in (US \$ t ⁻¹)		Quantity in (1000 t)	Prices in (US \$ t ⁻¹)
Algeria	34.8	657	Turkey	152.6	418
Spain	33.2	713	Mexico	51.1	656
Iraq	14.4	632	Singapore	2.3	564
India	12.2	408	Syria	2.2	364
USA	11.5	621	Morocco	2.2	477
Lebanon	10.4	881	Chile	2.1	635
Jordan	8.4	482	India	1.1	488
Saudi Arabia	6.4	506	Cyprus	1.0	747
Pakistan	5.2	579	Greece	0.7	499
Iran	5.0	463	Spain	0.5	802
Colombia	3.2	537	Tunisia	0.5	738
Malaysia	2.8	511	Ethiopia	0.4	340
Singapore	2.4	519	Portugal	0.4	538
Greece	2.4	589	Argentina	0.2	403
Venezuela	2.2	560	Jordan	0.1	403
Portugal	1.8	569	Malaysia	0.1	
Tunisia	1.5	594	Pakistan	0.1	575
Libya	1.3	863			
Brazil	1.2	727			
Kuwait	1.2	701			
Cyprus	1.2	727			
Developing countries	115.2	606		237.2	471
Developed countries	49.1	680		1.6	651
World total	164.3	628		238.8	473

3-4 kg in most of the major chickpea-producing countries. Even in some of the small chickpea-producing countries like Tunisia, Malawi, Algeria, Syria, and Iran, the human consumption of chickpea is quite high (Table 1).

Increased demand of chickpea by many countries are met by imports from other countries. A list of major chickpea-importing and chickpea-exporting countries is given in (Table 4). Major chickpea-importing countries are Algeria, Spain, Iraq, India, USA, and Lebanon. Annual import of chickpea ranges from 10 to 35 million t. There are many other countries, who on average, import 1000-8000 t annually. The major chickpea-exporting countries are Turkey and Mexico, which on average export 152200 and 52200 t of chickpea annually to other countries. There are several other countries exporting chickpea but in limited quantity ranging from 1000 t to 2000 t. In general, import prices are 1.4 times higher than the export prices, with a few exceptions.

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Breeding/Genetics

Genetics of Some Quality Components in a "Desi x Kabuli" Cross

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Desi and kabuli chickpeas differ not only in morphology, but also in nutrition. In fact, remarkable differences were reported in parameters such as crude fiber (Jambunathan and Singh 1980; Singh 1984), acid detergent fiber (ADF), and neutral detergent fiber (NDF) (Singh 1984). The contents of other nutritional components such as protein and oil were similar in these two groups (Jambunathan and Singh 1980). In our study, the ranges of variation within kabuli were from 3.9% to 7.7% for ADF, from 6% to 12.7% for NDF, and from 20.6% to 27.3% for protein content; within desi, the ranges of variation were from 10.4% to 17.5%, for ADF from 13.6% to 20.7% for NDF, and from 19.9% to 26.8% for protein content. These data support the results of the previous studies.

To estimate the inheritance of these traits, a cross between a desi (P 678 from ICRISAT, to