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Instability in Production and Trade of Pulses: A Global Analysis.

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PREFACE

Pulses are the main source of protein for masses in the Asian countries. These are also valuable for the crop systems due to their nitrogen fixing capacity. However, scant attention has been paid to the study of pulse crops. Inadequate research has hindered policy initiatives in the globalised agricultural scenario. This study aims to bridge the research gap by providing current evidence on growth and instability of global pulse production and trade.

Findings suggest that global pulse production grew at a slow rate of 0.48% per annum between 1985 and 2005. A mixed performance has been observed across the developed, developing and emerging economies. Canada and Myanmar achieved a spectacular growth rate in pulse production (14.03 & 10.05% per annum) during this period. But, it was found negative in France, Ukraine, Russia and Turkey. India, the leading producer and consumer of pulses has witnessed a marginal growth in pulse production (0.34% per annum). World pulse trade has increased significantly between 1985 and 2005. Peas are the largest traded pulse variety and constituted around 50% of world pulse trade in 2005. The international trade through an analysis of exports and imports was found quite instable. India's share in global Imports was around 62% in 2005. On an average, India imported 2-3 million tonnes per year of pulses in the recent past.

Given the uncertainty of global supply of pulses and rising domestic demand in India, it would be prudent to plan future domestic pulse production in such a way that major share of demand is fulfilled by domestic production. Reducing over dependence on global pulse supply would increase overall welfare of the farmers in rainfed areas and will improve access to consumers. This is possible through innovation in pulse farming which requires investment in research and transferring these results to farmers' field.

I am thankful to the Ministry of Agriculture for providing the support. I would like to express gratitude to the Prof. (Dr.) P.N. Mehrotra, Prof. & Hony. Director, AER Centre, Allahabad for giving useful comments on the draft report. Thanks and appreciation is due to Mr. Narinder Singh for collection and analysis of secondary data required for this study. Mr. Sri Chand deserves appreciation for typing the report with patience. Those who provided invisible service towards completion of this study deserve heartfelt, gratitude and thanks.

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Chapter-1

Introduction

It is widely acknowledged that world has experienced a dramatic increase in the globalisation of economic activity over the last 20 years. This has facilitated greater integration with the world economy. International trade, cross border investment, portfolio capital flows and migration increased. As a consequence, countries have become more open and inter dependent. These developments have made national welfare more sensitive to events and developments beyond national frontiers. That is why globalisation has become a controversial issue. There is widespread acknowledgement that a longer run net benefit of globalisation is positive but its potential/success depends on international cooperation.

Globalisation and agricultural trade are closely linked. On one hand, more globalisation could provide a boost to production and productivity of agricultural commodities through transfer of improved technology. On the other hand, improved production of these commodities could promote competition and provide an edge to enter global markets. Thus, it can deliver long-term growth in production and price stability of agricultural commodities. India's economic reforms and liberalization since 1991 that were pursued at slow pace in agriculture, have not delivered much but India's economic and financial interactions with the outside world have multiplied several fold. Foreign trade has grown almost 20 times in value whereas the agricultural trade grew at a slower pace.

The year 2008 has been turbulent for the global economy, First came the food crisis in early 2008 and countries realised the value of growing food locally. Thereafter, even as food prices stabilised, oil prices jumped to exceptionally high levels and the whole world was badly hit. By Sept. 2008, financial crisis beginning from the US started engulfing the whole world including emerging economies like India and China. This resulted in slow down in economic growth and sectors dependent on exports have been badly hit in terms of demand, shrinking output and job losses.

In these circumstances, the governments, which pushed integration of global economies, started realising how vulnerable this makes them to external collapses. Export oriented economies are the worst hit in this recession. Some observers have attributed the current economic crisis to a failure of the theory of the free market. The Indian economy has also been experiencing a slowdown but it has proved resilient to a great extent due to domination of public sector banks and regulation. These experiences have facilitated a better understanding of the process of development and trade. But, this understanding has not helped effectively tackle the problems of food shortages and insecurity in sizeable countries of the world. It seems that protectionist policies of the countries would also not solve these problems.

This notion has led to an anti market backlash and a belief that protectionism is key. I tend to disagree with this belief. On the contrary, efforts to resist protectionism and pursue timely and appropriate policy reforms should be priority. It will help economies across the globe to emerge from this crisis. The crisis, however, offers an opportunity for emerging countries to use their increased economic weight and take the lead in International policy. These countries have benefited by opening up their economies and realized gains from the competitiveness of their enterprises in the global markets. Consequently, share of emerging economies in world trade and foreign investments has risen sharply over the years.

World trade has grown at a rapid rate after 1970, but the trade in agriculture has not grown at the same rate as merchandise trade and consequently, share of agricultural trade in total world merchandise trade has declined from 14.5% during the eighties to 8.8% during 2004. However, agricultural trade plays an important role in global food security, meeting food deficits of countries during lean years.

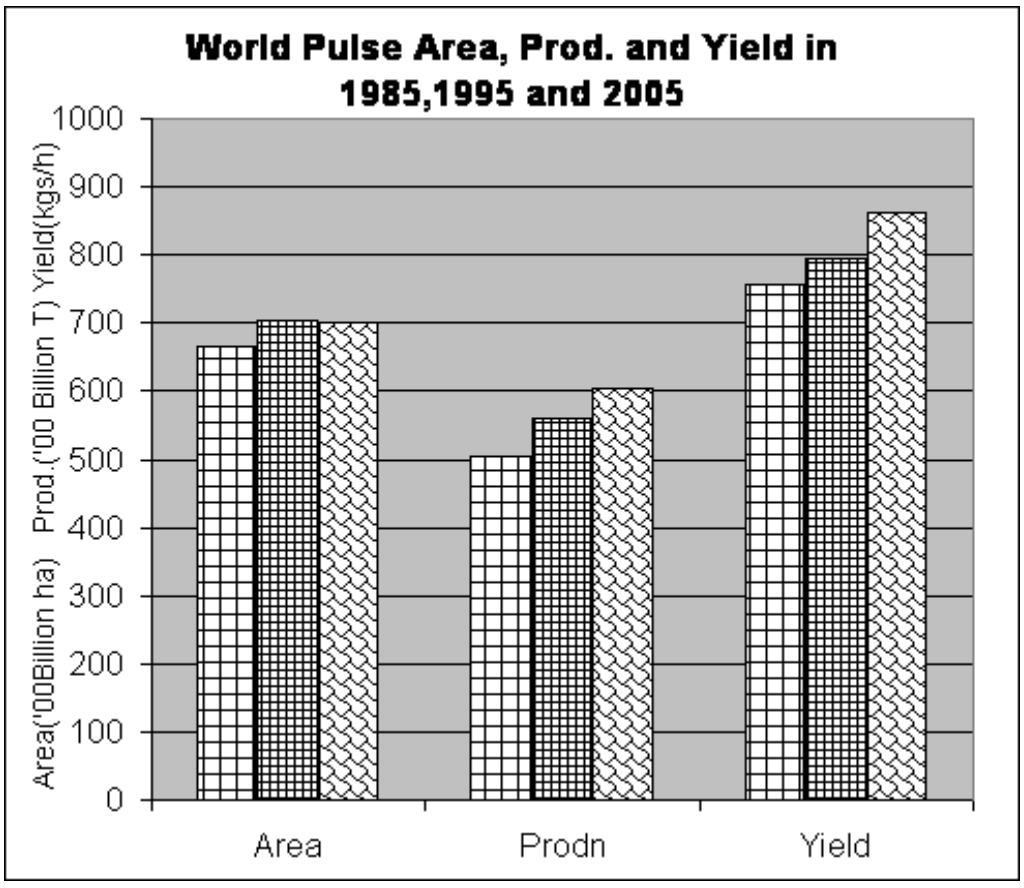
Among the agricultural goods traded internationally, food products make up more than half of the total, the other main category being raw materials. Another major change is the emergence of high value processed agricultural products as the most important component of world agricultural trade accounting for more than half of total trade in agriculture by the end of 1990's. The relative importance of

bulk agricultural products such as cereals, oilseeds, cotton and unprocessed tropical products has declined perceptibly and that of semi-processed products like vegetable oils, flour and refined sugar has remained constant.

Status of Pulse Production at the Global Level:

Pulses are the main source of protein for masses in the Asian countries. These are also valuable for the crop systems due to their nitrogen fixing capacity. Pulse crops are cultivated in large number of countries covering around 69 million hectares with a production of almost 60 million tonnes. Area under these leguminous crops remained almost stagnant between 1985 and 2005, but production grew at the slow rate of 0.48% per annum due to positive growth of yield ,0.50% per annum during this period. It may be highlighted that around 60% of pulse production is contributed by 10 countries of the world. India with 30% of global area under pulses is the leading producer.

Figure-1.1



Global level data related to pulse crops on FAO website are available for beans, peas, chickpeas and lentil. Beans followed by chickpeas occupied the largest share of cultivated area and yielded around 58% of world pulse production. But, peas with a share of 13% in area contributed almost double in production. It was due to yield enhancement. In the array, next were lentil and broad beans, which shared around 14% global pulse area and produced almost 18% of total pulse production.

Figure-1.2

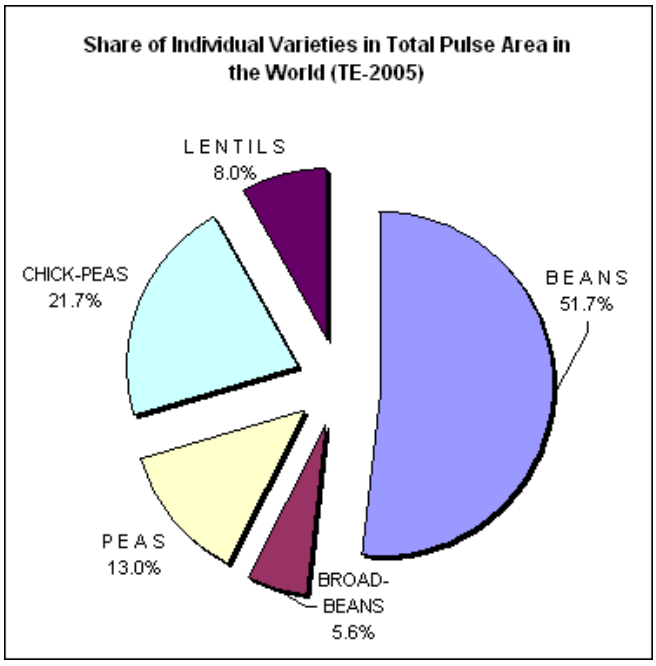
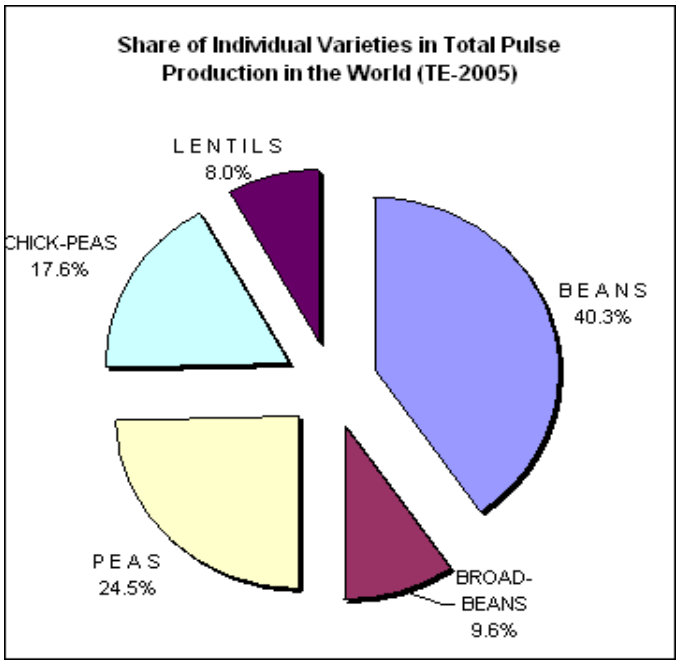


Figure-1.3



Note: Total pulses in above figures indicate sum of referred varieties.

Objectives and Research Methodology:

Economists have extensively investigated the growth performance of rice and wheat during the past four decades. It has been widely researched at global, regional, national, state and household levels. Nonetheless, scant attention has been paid to the study of pulse crops, which play an important role in sustaining crop systems and in maintaining the nutritional security of the poor population in the Asian countries. Although, some evidence is available at the individual country level for 1960s, 1970s and 1980s, inadequate recent information at the macro level has impaired the policy initiatives in the globalised agricultural scenario. Therefore,

it is urgent to provide current evidence on temporal and spatial dimensions of the global pulse development. The specific objectives of the study are following:

(i) to measure growth and instability in global pulse production.
(ii) to analyse growth and instability in global pulse trade.
(iii) to suggest policy initiatives.

The present research is devoted to the analysis of growth performance and instability in the area, production and yield of important pulse crops (beans, peas, chick-peas, broad-beans and lentil) along with total pulses at the global level and in major producing countries between 1985 and 2005. In addition, imports, exports and their instability have also been examined.

The study is based on the secondary data collected from FAO website for the decades of eighties nineties and recent period. The analysis of area, production and yield has included all pulse varieties (beans, broad beans, chickpeas, lentil, peas and total pulses) for which data are available. However, data on imports and exports are disaggregated at a different level of crop varieties. These are available for green and dry beans, green and dry peas, lentil and total pulses which constrains comparability in trade analysis. Individual countries, which contribute more than one percent, are included in the analysis.

The entire study period is sub-divided into two periods. The first period relates to 1980s beginning from 1985 to 1995 and the second period extends from 1995 to the latest available period. These represent pre- and post- WTO periods. The cut-off point of 1995 has special significance since multilateral trade agreements under the aegis of the WTO were signed during this year. Given this framework, two hypotheses are proposed for testing. First, pulse production performance at the global level is poor due to low growth of acreage and yield in the study period. Second, world trade in pulses is low and instable.

The methodology followed for each aspect is different. For measuring the growth rates of area, production, yield, exports and imports of the above mentioned pulse crops for the first, second and entire study period at the

country level, the semi-log equation of the form log y = a + bt was used where-

y = area/production/yield/exports/imports of the crop

a = intercept

b = slope

t = time

Instability indices of area/production/yield/exports/imports of the considered pulse crops were estimated by applying Coppock's methodology of log variance (Coppock, 1962). The details of the methodology used are given in the relevant section.

Organization of the Study

This report is organized as follows. Chapter-1 presents objectives, data, research methodology and organization of the study. The Chapter-2 examines the country wise growth performance of major pulses in the world in order to assess the nature of development in pulse production. Instability in global pulse production is also examined in this chapter. Chapter-3 is devoted to the analysis of exports, imports and their instability for the referred pulses. The final Chapter presents summary, conclusions and policy implications.

Chapter-2

Growth Performance and Instability in Pulse Production in Important Countries of the World

Now, we would examine growth performance and instability in the pulse production in major producing countries of the world. The pulse varieties included are beans, peas, chickpeas, broad beans, lentil and total pulses. The analysis covers a period from 1985 to 2005, which is divided into two sub periods. First period extends from 1985 to 1995 and signifies pre WTO period and second period from 1995 to 2005, represents post WTO period. Present chapter is divided into two sections. Section-1 presents an analysis of growth performance while second section reviews instability in pulse production.

Section-I

Growth Performance

I. Beans

The most important pulse crops in the world are beans, which include green gram, black gram and pigeon pea. These occupied an area of about 25 million hectares during TE 2005. These constitute more than one third share of total area under pulses. Being leguminous crops, beans utilize atmospheric nitrogen through their root nodules. Primary survey evidence (Tuteja 1999, 2000) suggests that these crops are neither manured nor fertilized by most of the farmers in India. The information on share of global area, production and yield in important countries during triennium ending 2005 is given in Table 2.1.

Table 2.1
Share of Important Countries in Global Area and Production of Beans (TE-2005)

Yield: kg/ha

CROP: BEANS

COUNTRY	Area %	Prod %	Yield	Yield (Rank)
Brazil	15.93	16.97	786	12
India	29.08	14.93	379	19
China	4.96	9.95	1480	5
Myanmar	6.59	8.47	948	6
Mexico	6.53	6.90	780	13
United States of America	2.25	5.60	1833	3
Uganda	3.26	2.70	610	16
Kenya	3.67	1.99	400	18
Indonesia	1.33	1.70	943	7
Tanzania, United Rep of	1.52	1.65	799	11
Canada	0.62	1.60	1916	2
Korea, Dem People's Rep	1.39	1.58	843	10
Turkey	0.62	1.32	1582	4
Burundi	1.01	1.25	914	8
Iran, Islamic Rep of	0.45	1.21	1958	1
Rwanda	1.33	1.16	644	15
Thailand	1.41	1.16	609	17
Nicaragua	1.06	1.12	779	14
Cameroon	0.91	1.10	885	9
All (above Countries)	83.94	82.38	738	-

Source: faostat.fao.org/

Table 2.2**Growth Performance of Beans in Important Countries of the World (1985-2005)**

(% per annum)

Country		**--------- A R E A --------**			**------- PRODUCTION --------**			**--------- Y I E L D --------**		
		Period-1	**Period-2**	**Period-3**	**Period-1**	**Period-2**	**Period-3**	**Period-1**	**Period-2**	**Period-3**
Brazil	G.Rate	-1.24	-1.54	-2.04*	2.95*	1.72	1.33*	4.24*	3.31*	3.44*
India	G.Rate	-1.45*	-1.50	-2.21*	0.27	-2.18	-1.99*	1.74*	-0.70	0.22
China	G.Rate	-2.62	0.53	0.02	-3.45	2.83*	1.74	-0.86	2.29*	1.73*
Myanmar	G.Rate	11.87*	3.90*	10.14*	8.20*	7.40*	10.81*	-3.28*	3.37*	0.61
Mexico	G.Rate	0.90	-2.52	-0.36	3.46	0.62	1.54**	2.53**	3.22*	1.91*
United States of America	G.Rate	2.16**	-3.41*	-0.46	2.46	-3.35**	0.11	0.29	0.06	0.57*
Uganda	G.Rate	5.61*	3.51*	4.17*	4.36*	6.92*	2.49*	-1.18	3.29	-1.61*
Kenya	G.Rate	3.15	3.11	3.21	1.48	3.48	-0.16	-1.61	0.36	-3.27
Indonesia	G.Rate	2.11**	-0.53	-1.90*	2.37	-1.44	-4.94*	0.25	-0.91	-3.10*
Tanzania, United Rep of	G.Rate	-2.58**	0.61	-0.38	-2.67**	2.28*	0.69	-0.09	1.66*	1.07*
Canada	G.Rate	9.78*	7.21*	8.30*	12.52*	7.57*	9.13*	2.50	0.34	0.77
Korea, Dem People's Rep	G.Rate	0.00	0.73*	-0.12	-0.81	1.21*	-0.44**	-0.81	0.47	-0.33*
Turkey	G.Rate	0.44	-1.35*	-0.11	1.35	0.53	1.53*	0.91	1.90*	1.64*
Burundi	G.Rate	-1.01	-1.25	-1.20*	-0.18	-3.02*	-1.93*	0.83	-1.79*	-0.74*
Iran, Islamic Rep of	G.Rate	-0.06	0.87	0.05	6.10**	4.63*	4.69*	6.17*	3.73*	4.63*
Rwanda	G.Rate	-11.00*	5.80*	0.75	-12.91*	5.66*	-0.84	-2.15*	-0.14	-1.59*
Thailand	G.Rate	-5.49*	-0.28	-3.06*	-2.78*	-0.52	-2.33*	2.86*	-0.25	0.75*
Nicaragua	G.Rate	4.88*	8.46*	6.84*	6.46*	11.60*	8.72*	1.51**	2.89*	1.76*
Cameroon	G.Rate	6.27*	5.23*	6.64*	9.50*	5.47*	8.29*	3.04*	0.23**	1.55*
WORLD***	G.Rate	-0.41	-0.26	-0.49*	1.13*	1.17*	0.83*	1.54*	1.43*	1.32*

Period-1 : Year 1985-1995, Period-2 : Year 1995-2005, Period-3 : Year 1985-2005
Significant at below 5% (*) and below 10% (**) level of probability
*** Includes minor producing countries.
Source:Ibid

It may be noticed that beans are extensively cultivated as pulse crops in the countries of Brazil (15.93%), India (29.08%), China (4.96%) and Myanmar (6.59%). These countries together accounted for 66% of global area under beans. These are also leading countries in terms of production but India produced only 14.93% of global production against 29% share in area due to low productivity. Further, disparities in yield rates were also found significant. Iran and Canada were leading with a yield rate of 1958 kg/ha. and 1916 kg/ha. Other countries with good yield were Mexico (1833 kg/ha), Turkey (1582 kg/ha) and China (1480 kg/ha). These yield rates are closer to the potential yield of 15-20 qtl/ha. Remaining countries exhibited a productivity level of below 10 qtl./ha. One/two irrigations are essential for reaping good yield. It is possible that farmers in these countries could not manage even minimum requirement due to extremely limited availability of irrigation, which they reserve for superior cereals with assured returns. It could be due to low proportion of irrigated area to total cultivated area. It is a useful indicator but could not be analysed due to non-availability of country level data.

After analyzing the geographical spread of beans cultivation in the world, it is imperative to examine growth performance in terms of area, production and yield in period-I, period-II and period-III. It may be observed from Table 2.2 that growth rate of area under beans during the study period was found negative at the world level. It declined at the rate of 0.41%, 0.26% and 0.49% per annum during I, II and the entire study period. It appears that available technology did not make any impact to incentivise farmers to grow beans. Performance of beans was specifically found poor in Thailand, India, Brazil, Indonesia and Burundi.

The largest decline in area under beans was noticed in case of Thailand (3.06% per annum) followed by India and Brazil. Evidence for India shows (Mahendradev, 1997; Joshi and Saxena, 2002) that after the success of green revolution, farmers shifted to wheat and rice, which yielded relatively higher profitability per unit of land in irrigated regions. In rain fed areas, oilseeds replaced beans. This has happened due to low growth of beans yield. It has risen at the rate of 1.32% per annum during the study period. Increase in yield has partially compensated for area decline and therefore, global production of beans has

increased at the rate of 0.83% per annum between 1985-2005. In India, area declined at the rate of 2.31 per cent per year and yield growth was also marginal and hence, production declined at a rate of 1.99% per annum during the study period. The drop in beans production was higher in the II period while it grew at the marginal rate of 0.27% per annum during the first period.

On the other hand, gainer countries such as Myanmar, Canada, Uganda, Nicaragua and Cameroon have exhibited a significant expansion in the area under beans. The growth in area was as high as 10.14% per year in Myanmar and 8.30% per annum in Canada during the study period. The clear-cut- shift of production base from traditional asian countries to new countries such as Canada, Nicaragua, Cameroon, Uganda and Kenya was noticed. But, yield performance was found mixed across the countries. Moreover, production grew at the rate of 10.81% in Myanmar, 9.13% in Canada, 8.72% in Nicaragua and 8.29% per annum in Cameroon during the reference period and these growth rates were found significant at below 5% level of probability. But, production of beans in Indonesia has exhibited a decline due to negative growth in area as well as in yield. Higher rate of beans production in Myanmar could be attributed to high growth in area. In fact, beans competitive edge has weakened in India due to shift towards the more profitable crops like paddy in irrigated areas and oilseeds in un-irrigated areas.

In a nutshell, production of beans grew in eleven countries out of twenty analysed cases primarily due to area expansion. Yield, as a source of production growth was found most prominent in Iran. Results show that productivity growth was most impressive in Iran and Brazil where it rose at more than 3% per year during the study period.

II. Peas

Peas are grown for use as a fresh or processed, sun dried, canned or frozen food. This is an irrigated pulse crop grown extensively in Canada, China, Russia, India and France. However, Canada alone accounted for more than 20% of area and 26% of world production. The area and production of peas have shown negative growth at the global level in both periods. Area has declined at the rate of 2.73% per annum but the rate of decline in production was lower due to positive

growth in yield. Specially, first period with 3.16% per annum growth was commendable. The yield of peas was 1785 kg/ha at the global level during 2005. France with an exceptional high level of 4452 kg./ha attained the first rank while Australia with 1063 kg/ha attained the lowest rank. India's rank was also low as it exhibited a yield level of 1442 kg/ha that was below the world average. The global yield has increased at the rate of 1.07% per cent during the study period.

It may be noticed that peas were grown on 6.2 million hectares of area in the world. The crop is more extensively cultivated in the countries of Canada (21.07%), China (14.71%), Russia (11.53%) and India (9.21%). Their shares in world production were 25.68%, 10.68%, 10.26% and 7.44% respectively during triennium ending 2005. Canada is a leading country by showing more than 20% of global area and production. The yield rate for the globe as a whole was 1785 kg/ha. France was leading in productivity with a yield of 4452 kg/ha. Among the major producing countries, UK was far ahead in productivity than Germany, India and China. The country wise proportion of irrigated area to cropped area however, is not available.

Table 2.3

Share of Important Countries in Global Area and Production of Peas (TE-2005)

Yield: kg/ha

CROP: PEAS

COUNTRY	**Area %**	**Prod %**	**Yield**	**Yield (Rank)**
Canada	21.07	25.68	2176	5
France	5.57	13.88	4452	1
China	14.71	10.68	1295	9
Russian Federation	11.53	10.26	1589	7
India	9.21	7.44	1442	8
Ukraine	4.86	4.87	1790	6
United States of America	3.47	4.26	2189	4
Australia	6.32	3.76	1063	11
Germany	1.97	3.61	3269	3
United Kingdom	0.96	1.99	3713	2
Ethiopia	3.80	1.61	757	12
Spain	2.08	1.42	1218	10
All (above Countries)	85.54	89.44	1785	

Source: Ibid

Table-2.4

Growth Performance of Peas in Important Countries of the World (1985-2005)
(% per annum)

Country		--------- A R E A --------			------- PRODUCTION --------			--------- Y I E L D --------		
		Period-1	Period-2	Period-3	Period-1	Period-2	Period-3	Period-1	Period-2	Period-3
Canada	G.Rate	20.64*	7.49*	15.04*	22.12*	6.92*	16.00*	1.22	-0.54	0.72
France	G.Rate	10.46*	-6.53*	-0.64	11.51*	-7.78*	-0.74	0.95	-1.34	-0.10
China	G.Rate	-8.79*	3.79*	-1.26	-6.90*	1.33	-1.37	2.06**	-2.37**	-0.11
Russian Federation	G.Rate	-8.14*	-4.51	-8.12*	-21.31	0.97	-5.73*	-14.35	5.73*	2.61**
India	G.Rate	5.12*	-3.65*	1.36*	6.86*	2.14*	4.29*	1.66**	6.01*	2.89*
Ukraine	G.Rate	-5.30**	-10.72*	-12.02*	-19.80	-7.30*	-12.87*	-15.31	3.83	-0.97
United States of America	G.Rate	-2.01	9.57*	4.66*	0.77	7.55**	3.93*	2.84	-1.85	-0.70
Australia	G.Rate	3.87**	1.12	0.75	1.16	-1.52	-0.67	-2.60	-2.61	-1.41
Germany	G.Rate	4.54	3.85	9.65*	8.24	2.98	11.68*	3.54*	-0.84	1.85*
United Kingdom	G.Rate	-2.96*	-4.35**	-1.69*	1.34	-3.80	-0.77	4.43*	0.57	0.93
Ethiopia	G.Rate	8.12	4.39*	4.42*	19.62	4.40*	5.24*	10.64	0.00	0.79
Spain	G.Rate	29.91*	7.92**	21.11*	26.72*	10.84*	21.16*	-2.46**	2.70	0.04
WORLD***	G.Rate	-3.20*	-0.88	-2.73*	-0.14	-0.73	-1.69*	3.16*	0.16	1.07*

Period-1:Year 1985-1995, Period-2 : Year 1995-2005, Period-3 : Year 1985-2005
Significant at below 5% (*) and below 10% (**) level of probability
*** Includes minor producing countries.
Source: Ibid

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Having looked into the geographical spread of area and production, we proceed to examine country wise growth performance of area, production and yield of peas between 1985 and 2005. It may be observed from Table 2.4 that growth of peas area in the world during the study period was negative (2.73% per annum). The first period was major causality when area declined at the rate of 3.20% per annum. Some countries indicated the reverse trend. The gainer countries included Spain (21.11%), Canada (15.04%), Germany (9.65%), the US (4.66%) and Ethiopia (4.42%). However, countries such as Ukraine (12.02%) and Russia (8.12%) were found to be loosers in terms of area during the study period. Some countries, which have gained in area, also exhibited positive growth rates in production. Spain followed by Canada and Germany gained significantly in terms of production primarily due to area expansion. India has also achieved an impressive growth in peas production during the reference period and it could be attributed primarily to yield growth that was found highest among the analysed countries. The rate of increase in production was observed to be lower in second period as compared to the first period in all these cases except in the US where production grew at the rate of 7.55% per year between 1995-2005. The second period showed significant growth rate in yield in Russia, Ukraine, Spain and India. It may be noted that performance of most of the countries was found dismal in terms of yield growth. Thus, growth of peas production was negative at the global level due to significant decline in area and slow growth in yield.

III. Chickpeas

Chickpeas are fairly important as a pulse crop at the global level. These contributed 15% in area and 13% per cent in production of total pulses at the world level.

The global area under chickpeas was around 10 million hectares in TE 2005. India (63.26%), Pakistan (9.76%), Iran (7.52%) and Turkey (5.93%) together cropped more than 80% of world area. Besides, these are grown in Myanmar, Ethiopia, Australia and Mexico as well. India and Pakistan contributed more than

70% of total production of the world. Surprisingly, Iran had higher share in area but due to dismal performance in the yield, its proportion in production declined. Share of Pakistan declined by almost 1%. The yield of chickpeas at the global level was observed to be as low as 770 kg/ha in TE 2005. It could be due to lack of technological break through or due to low adoption of available improved varieties by the farmers . It is not possible to analyse irrigation status due to non-availability of data on this aspect.

Table-2.5

Share of Important Countries in Global Area and Production of Chickpeas (TE-2005)

Yield:kg/ha.

CROP: CHICK-PEAS

COUNTRY	Area %	Prod %	Yield	Yield (Rank)
India	63.26	64.37	783	6
Pakistan	9.76	8.99	709	7
Turkey	5.93	7.63	990	4
Iran, Islamic Rep of	7.52	3.75	384	9
Myanmar	1.80	2.44	1043	3
Ethiopia	1.71	2.04	916	5
Australia	1.31	1.88	1100	2
Mexico	0.92	1.59	1333	1
Iraq	1.72	1.25	559	8
All (above Countries)	93.94	93.94	770	

Source: Ibid

Table-2.6

Growth Performance of Chickpeas in Important Countries of the World (1985-2005)

(% per annum)

Country		--------- A R E A --------			------- PRODUCTION --------			--------- Y I E L D --------		
		Period-1	Period-2	Period-3	Period-1	Period-2	Period-3	Period-1	Period-2	Period-3
India	G.Rate	-0.53	-1.68	-0.26	1.23	-1.68	0.77	1.76*	16.00	1.04*
Pakistan	G.Rate	0.52	-1.17	0.00	-1.22	0.09	1.42	-1.74	1.27	1.42**
Turkey	G.Rate	4.93*	-2.25*	-0.15	3.14	-1.87**	-0.60	-1.71**	0.39	-0.45
Iran, Islamic Rep of	G.Rate	15.79*	0.91	7.12*	14.15*	-0.28	5.07*	-1.42	-1.18	-1.91*
Myanmar	G.Rate	-3.70**	4.38**	0.32	-7.85*	11.54*	1.02	-4.32*	6.87*	0.70
Ethiopia	G.Rate	27.67	2.26	3.66*	43.95	3.58*	7.42*	12.75	1.29	3.62*
Australia	G.Rate	20.56*	-7.85*	6.00*	16.35*	-7.18*	5.05*	-3.50	0.72	-0.90
Mexico	G.Rate	-3.47	-2.48	-0.63	0.53	-3.92	0.76	4.14*	-1.47	1.39*
Iraq	G.Rate	15.80	14.00*	25.08*	11.72	13.93*	22.04*	-3.53*	-0.06	-2.43*
WORLD***	G.Rate	0.66	-1.23**	0.35	1.48	-1.05	1.10*	0.82	0.19	0.75*

Period-1 : Year 1985-1995, Period-2 : Year 1995-2005, Period-3 : Year 1985-2005
Significant at below 5% (*)and below 10% (**) level of probability
*** Includes minor producing countries.
Source: Ibid

The growth rates in area, production and yield of chickpeas for the world and important growing countries between 1985 and 2005 are given in Table 2.5 The global area grew at the marginal rate of 0.35% per annum during the reference period. The first period indicated a positive growth of 0.66% while it was observed to be negative in the second period. At the country level, Iraq (25.08%) followed by Iran (7.12%) and Australia (6.0%) were the major gainers while India (0.26%) and Mexico (0.63%) were the major loosers in chickpeas area during the study period. Production of chickpeas in India has increased at the rate of 0.77% per annum during the study period due to yield improvement but production performance was found poor in the second period with a negative growth rate of 1.68% per annum in area and stagnant status of yield. The production performance of Iraq (22.4%) followed by Ethiopia (7.42%) and Australia (5.05%) was commendable. But, these gains partially compensated for the losses in some other countries and world production grew at around 1 per cent per year during the study period.

Like earlier analysed pulse varieties, productivity has been the greatest challenge in the case of chickpeas, which increased at the rate of 0.75% per annum during the reference period. Although, it grew at the rate of 0.82% in the first period, dismal performance of the second period with a marginal growth rate of 0.19% became responsible for the overall sluggishness in the growth of yield. To conclude, growth performance of chickpeas between 1985 and 2005 had been below the expectation because neither area nor yield favoured this crop.

IV. Broad-beans

Broad beans (kidney beans and cowpea) are fourth ranking pulse crops in terms of area allocation at the global level. These crops are mainly grown for its beans, which are used as a whole. The geographical distribution of area and production along with yield at the global level in TE 2005 is presented in Table 2.7. It may be observed that broad beans were grown on 2.67 million hectares of area in the world. The leading countries in area allocation are China (40.89%), Ethiopia (17.78%), Australia (6.25%) and Morocco (5.61%). Besides, these are also

cultivated in Egypt (3.95%), France (3.22%), Sudan (2.33%), Spain (1.78%) and Peru (1.60%). China with 44.01% share in global production is the leading country. Ethiopia, Egypt and France together grew around 27% of global production. The yield level of broad beans was found high in comparison to beans and chickpeas at global level (1628 kg/ha). The highest yield of 3926 kg/ha was reported in France. On the other hand, countries like Morocco and Spain exhibited yield of broad beans between six to ten quintals per hectare.

Table-2.7

Share of Important Countries in Global Area and Production of Broad beans (TE-2005)

CROP: BROAD-BEANS Yield:kg/ha

COUNTRY	Area %	Prod %	Yield	Yield (Rank)
China	40.89	44.01	1752	6
Ethiopia	17.78	11.17	1023	10
Egypt	3.95	7.79	3207	4
France	3.22	7.76	3926	1
Australia	6.25	5.93	1543	8
Sudan	2.33	3.49	2439	5
United Kingdom	1.47	3.21	3550	3
Morocco	5.61	2.18	634	12
Italy	1.70	1.79	1709	7
Germany	0.64	1.41	3599	2
Peru	1.60	1.16	1181	9
Spain	1.78	1.08	988	11
All (above Countries)	87.23	90.98	1628	

Source: Ibid

The estimates of growth rates of area, production and yield of broad beans at the global level and in major growing countries indicate (Table 2.8) that area under broad beans declined at the rate of 0.83% per annum during the study period. Second period was favourable by indicating a growth rate of 2.16% per annum but the negative growth (4.26%) in the first period became responsible for overall decline in area. Major countries with positive growth in area were Australia (10.01%), Peru (4.91%) and Sudan (5.38%). The

Table-2.8

Growth Performance of Broad-beans in Important Countries of the World (1985-2005)

(% per annum)

Country		--------- A R E A --------			------- PRODUCTION --------			--------- Y I E L D --------		
		Period-1	**Period-2**	**Period-3**	**Period-1**	**Period-2**	**Period-3**	**Period-1**	**Period-2**	**Period-3**
China	G.Rate	-6.74*	1.46	-1.88*	-4.03	1.42	-0.63	2.90*	-0.04	1.27*
Ethiopia	G.Rate	7.19	3.92*	3.70*	9.56	4.27*	4.63*	2.21	0.34	0.90
Egypt	G.Rate	0.02	-2.96*	-1.29*	3.03**	-2.65	0.28	3.01	0.32	1.59*
France	G.Rate	-16.14*	32.41*	2.95	-15.00*	32.67*	3.70	1.36**	0.20	0.73*
Australia	G.Rate	12.69*	6.52*	10.01*	8.65*	6.03*	10.32*	-3.58	-0.46	0.29
Sudan	G.Rate	0.41	6.69*	5.38*	1.40	6.76*	7.35*	0.98	0.07	1.88*
United Kingdom	G.Rate	8.63*	-0.95	1.40	6.69**	0.70	1.46	-1.79**	1.67**	0.07
Morocco	G.Rate	-6.28*	1.33	-2.12*	-16.29*	2.55	-4.52**	-10.68**	1.20	-2.45
Italy	G.Rate	-6.64*	-1.85**	-6.23*	-4.86*	-0.81	-4.85*	1.91	1.06	1.47*
Germany	G.Rate	-5.16	-4.64*	-4.57*	-5.75	-4.26*	-4.17*	-0.62	0.40	0.42
Peru	G.Rate	0.67	5.58*	4.91*	1.27	6.32*	5.78*	0.60	0.70**	0.82*
Spain	G.Rate	-12.43*	18.64*	-2.81	-15.76*	19.14*	-4.26**	-3.80*	0.42	-1.49
WORLD***	G.Rate	-4.26*	2.16*	-0.83**	-2.62**	2.40*	0.16	1.72*	0.24	1.00*

Period-1 : Year 1985-1995, Period-2 : Year 1995-2005, Period-3 : Year 1985-2005

Significant at below 5% (*)and below 10% (**) level of probability

*** Includes minor producing countries.

Source: Ibid

looser countries constituted Italy (6.23%), Germany (4.57%) and Spain (2.81%). Despite negative growth in area, production of broad beans grew at the marginal rate of 0.16% per annum due to yield growth of 1% per year during the reference period. The major contributors were Australia (10.32%), Peru (5.78%), Sudan (7.35%), Ethiopia (4.63%), and France (3.70%). It could happen due to largely good performance of area in the first four cases and area pulse yield in the case of Sudan. The growth of yield in the world was 1.72% per annum in the first period, but the growth rate of yield in the study period was merely 1% per annum due to low growth of yield (0.24%) in the second period. Among the high yield performers, Sudan and Italy were most important. On the contrary, yield of broad beans in Morocco declined at the rate of 2.45% per annum during the study period.

V. Lentil

Lentil is recognized as a valuable pulse crop. It is known to be the most nutritive of the pulses due to high protein content. In most of the asian countries, it is grown as a winter crop and sowing time extends from October to December. Since, it is a short duration crop, it becomes ready for harvest in about three months. The crop is harvested from February to April depending upon the time of sowing.

The information on area, production and yield of lentil presented in Table 2.9 shows that lentil grew on 3.85 million hectares of area and gave a production of 3.62 million tonnes in the world during TE 2005. India with 36.32% of global area and 27.46% of production is the key country. Next in the array are Canada (18.61%) and Turkey (11.44%), which produced around 25.43% and 15.07% of total lentil of the world. China is a minor player in lentil cultivation but its yield was as high as 1799 kg/ha during the triennium ending 2005. The productivity in Iran was less than 6 qtl/ha. Amazingly, India, a first ranking country in area and production has exhibited a low productivity of 711 kg/ha. It may be highlighted that yield of lentil was observed to be the third highest among the major pulse crops of the world.

Table-2.9
Share of Important Countries in Global Area and Production of Lentil (TE-2005)

CROP: LENTIL Yield:kg/ha

COUNTRY	Area %	Prod %	Yield	Yield (Rank)
India	36.32	27.46	711	9
Canada	18.61	25.43	1285	3
Turkey	11.44	15.07	1238	4
United States of America	3.52	4.93	1315	2
Nepal	4.85	4.33	839	7
Syrian Arab Republic	3.63	4.12	1068	6
China	1.98	3.80	1799	1
Australia	2.93	3.37	1083	5
Bangladesh	3.80	3.28	811	8
Iran, Islamic Rep of	5.72	3.13	514	11
Ethiopia	1.79	1.23	649	10
All (above Countries)	94.59	96.16	940	

Source: Ibid

Lentil has exhibited best growth performance among referred pulses by indicating around 1.42% growth in area and 0.88% per annum increases in yield during the study period. The acreage under lentil grew at the rate of 1.42% per year during this period but production has increased at more than this pace, i.e., 2.31% per annum. It could happen due to good performance of area but yield growth was below 1% per year. For enhancement of yield, post WTO period was favourable period but the first period was less important. Some of the major growing countries have indicated yield growth of above 1% per annum during the study period. It was higher than 2% per year in Nepal where yield increased at the rate of 0.84 and 1.96% per annum in first period and second period respectively. As a result, production of lentil in Nepal increased at the rate of 5.94% in the first period and 4.41% per year during the second period. The area expansion along with yield was responsible for production growth in Nepal. The exceptional growth of lentil production in Australia, Canada, China, the US, Ethiopia and Iran was due to high rate of area expansion. In Australia, area expanded at 34. 28% per annum during the reference period.

Table-2-10
Annual Growth Rate of Area, Production and Yield of LENTIL

(% per annum)

Country		A R E A			PRODUCTION			Y I E L D		
		Period-1	Period-2	Period-3	Period-1	Period-2	Period-3	Period-1	Period-2	Period-3
India	G.Rate	1.66*	1.65*	1.92*	3.11*	2.80*	2.61*	1.43*	1.13	0.68*
Canada	G.Rate	14.60*	9.82*	10.56*	18.58*	8.53	11.58	3.47	-1.17	0.92
Turkey	G.Rate	-1.34	-3.82*	-3.60*	-2.29	-0.97	-2.71*	-0.96	2.96	0.93
United States of America	G.Rate	3.54	9.52*	5.66*	7.05**	9.08*	6.60*	3.39**	-0.41	0.88
Nepal	G.Rate	5.06*	2.40*	3.44*	5.94*	4.41*	5.52*	0.84	1.96*	2.02*
Syrian Arab Republic	G.Rate	4.00	0.50	2.51*	6.59	2.31	3.81*	2.49	1.80	1.26
China	G.Rate	10.33*	-2.06	5.30*	13.59*	2.15*	6.81*	2.95	4.29**	1.43**
Australia	G.Rate	18.31*	25.95*	34.28*	27.40**	18.91*	36.65*	7.68	-5.58	1.77
Bangladesh	G.Rate	-0.93*	-4.37*	-2.27*	0.47	-4.42*	-1.64*	1.42*	-0.06	0.64*
Iran, Islamic Rep of	G.Rate	15.01*	-0.16	5.61*	13.38*	0.87	3.72*	-1.41	1.03	-1.79*
Ethiopia	G.Rate	17.18	1.36	3.29**	23.05	2.75	4.97*	5.01	1.37	1.62
WORLD***	G.Rate	1.66*	1.69*	1.42*	2.59*	3.24*	2.31*	0.91	1.53*	0.88*

Period-1 : Year 1985-1995, Period-2 : Year 1995-2005, Period-3 : Year 1985-2005
Significant at below 5% (*)and below 10% (**) level of probability
*** Includes minor producing countries.
Source: Ibid

Thus, lentil emerged as the most important pulse crop in terms of growth at the global level during the study period.

Total Pulses

Table 2.11 provides country wise information on area, production and yield of pulse crops taken as a whole. Pulses were grown on around 69 million hectares of area that produced nearly 60 million tonnes of grain in TE 2005. It is clear that while pulses are widely grown in India, other countries are not so important as producers of these protein rich foods. China, Canada, Brazil and Nigeria are important pulse producing countries in that order and accounted together for nearly 25% of the total production in the world. Myanmar and Australia come next, contributing over 7% of total production. Yield levels across the countries show that average yield of pulses in the world (862 kg/ha) is much below the potential yield of 10-15 qtl/ha. This is true for some major countries as well. All India yield of pulses in TE 2005 was 636 kg/ha and ranked 17th in the world. It was above this level in France (4237 kg/ha), UK (3631 kg/ha), the US (1824 kg/ha) and Canada (1851 kg/ha). The exceptional level of yield of pulses in France and UK could be attributed to larger share of peas in total pulse cultivation and peas are the highest yielders among pulse crops.

Table-2.11
Share of Important Countries in Global Area and Production of total Pulses (TE-2005)

CROP: TOTAL PULSES Yield:kg/ha

COUNTRY	Area %	Prod %	Yield Kgs	Yield (Rank)
India	30.71	22.66	636	17
China	4.88	8.74	1544	7
Canada	3.25	6.98	1851	3
Brazil	5.76	5.24	783	13
Nigeria	5.90	4.51	660	16
Myanmar	3.70	4.09	952	10
Australia	2.46	3.39	1186	8
France	0.66	3.24	4237	1
Russian Federation	1.61	2.89	1549	6
United States of America	1.36	2.88	1824	4
Turkey	2.22	2.63	1022	9
Mexico	2.53	2.54	865	12
Ethiopia	1.91	1.95	883	11
Pakistan	2.29	1.86	702	14
United Kingdom	0.35	1.48	3631	2
Ukraine	0.60	1.20	1716	5
Iran, Islamic Rep of	1.71	1.16	585	18
Uganda	1.44	1.11	669	15
All (above Countries)	73.36	78.57	862	

Source: Ibid

Table-2.12

Growth Performance of Total Pulses in Important Countries of the World (1985-2005)

(% per annum)

Country		AREA			PRODUCTION			YIELD		
		Period-1	Period-2	Period-3	Period-1	Period-2	Period-3	Period-1	Period-2	Period-3
India	G.Rate	-0.30	-1.06	-0.78*	1.17	-0.67	0.34	1.47*	0.40	1.14*
China	G.Rate	-5.32*	1.58**	-0.83	-4.14	1.96**	0.20	1.25	0.38	1.04*
Canada	G.Rate	16.77*	8.71*	13.02*	19.19*	7.84*	14.03*	2.07	-0.80	0.90
Brazil	G.Rate	-1.38	-1.61	-2.14*	2.81*	1.71	1.26*	4.25*	3.36*	3.47*
Nigeria	G.Rate	10.15*	-0.10	5.96*	11.22*	4.37*	6.99*	0.98	4.48*	0.98
Myanmar	G.Rate	9.19*	5.46*	9.15*	5.85**	9.57*	10.05*	-3.06*	3.90*	0.82
Australia	G.Rate	7.21*	-2.82*	2.53*	7.26*	-3.78**	2.81*	0.04	-0.98	0.27
France	G.Rate	8.21*	-3.56*	-0.15	10.01*	-5.278	-0.20	1.66**	-1.77**	-0.06
Russian Federation	G.Rate	-7.06*	-2.86	-6.06*	-20.03	2.80	-3.63	-13.95	5.84*	2.59
United States of America	G.Rate	1.70	0.37	0.98*	2.36	0.12	1.39*	0.65	-0.24	0.40*
Turkey	G.Rate	1.35	-2.06*	-1.41*	-0.03	-1.44	-1.51*	-1.36	0.63	-0.10
Mexico	G.Rate	0.55	-2.45**	-0.41	2.49	0.01	1.19	1.93**	2.52*	1.61*
Ethiopia	G.Rate	14.62**	4.44*	4.83*	16.81	4.82*	6.37*	1.91	0.36	1.46
NA From 1985 to 1992										
Pakistan	G.Rate	-0.37	-1.40*	-0.76*	-0.90	-0.15	0.43	-0.53	1.27	1.19*
United Kingdom	G.Rate	3.27**	3.24*	1.47*	4.35	4.54*	2.158	1.05	1.26**	0.67**
Ukraine	G.Rate	-5.13*	-8.60*	-10.15*	-18.32	-5.67*	-11.08*	-13.90	3.21	-1.03
Iran, Islamic Rep of	G.Rate	10.71*	0.64	4.90*	9.27*	1.12	3.85*	-1.30	0.48	-0.99**
Uganda	G.Rate	4.65*	3.15*	3.67*	4.50*	5.99*	2.92*	-0.15	2.75	-0.72
WORLD***	G.Rate	0.23	-0.12	-0.02	0.69	0.90*	0.48*	0.46	1.03*	0.50*

Period-1 : Year 1985-1995, Period-2 : Year 1995-2005, Period-3 : Year 1985-2005
Significant at below 5% (*)and below 10% (**) level of probability
*** Includes minor producing countries.
Source: Ibid

During the study period from 1985 to 2005, production of pulses in the world has registered a slow growth rate of 0.48% per annum. However, countries such as Canada and Myanmar have shown more than 10% per year growth in pulse production. In addition, Nigeria, Ethiopia, Iran and Uganda recorded between 3-7% growth in the same period. Area expansion was primarily responsible for production growth in these countries. On the other hand, India, China, the US and Mexico have exhibited poor growth in pulse production. If we consider two sub-periods, our conclusions change. In particular, second period covering 1995-05 with 0.90% per year growth in pulse production in the world appeared to be better than first period with a growth of 0.48% per annum. The country wise change in production of pulses in the sub-periods shows that rate of growth of total pulse production in the first period was more than one per cent in 13 countries out of 18 major countries. But, in second period, this number has been reduced to 11.

The differential growth rates in the pulse production have brought some important changes in the locational pattern of pulse production in the world. The lower growth of production in countries such as India and China implies that growth centres of pulse production are gradually shifting from these countries to countries like Canada and Myanmar. In most of these countries, acceleration in production was primarily due to area expansion Especially; countries like Canada and Myanmar exhibited an area growth of more than 5% per annum in the study period. Also, yield improvement in these countries was also around one per cent per year. At the global level, whatever little growth has been achieved in pulse production, it came primarily from yield growth. Contribution of yield growth to production growth was higher in the first period. However, yield growth itself was low. The yield growth of total pulses between 1985 and 2005 was merely 0.50 per cent per annum. Agricultural scientists believe that yield of pulses can be easily raised to above 10 qtl/ha even in rain fed areas. Therefore, efforts should be made to raise yield levels by popularising available improved technology for pulse cultivation through implementation of pragmatic policies.

What could be the plausible explanation for marginal decline in global pulse area. First, pulses are high-risk crops being rainfed and prone to damage due to pests and diseases, often, relegated to marginal and sub-marginal lands. Second, pulses often receive inadequate extension support because priority is not accorded to these crops in foodgrain production system of various countries. Third, no major genetically break through like wheat and rice has yet taken place. Fourth, pulse growers in the largest producing country of India do not get desired price support even if prices are falling below the minimum support price level. NAFED is the only agency for purchases under price support and commercial purchases but its operations are extremely limited to a few markets and do not have overall impact.

It is imperative to popularise pulse crops in different regions of the world in lean seasons so that these crops could become part of crop rotation without disturbing existing major crops. It is feasible because pulses are known for low water requirement and adaptability over a wide range of agro-climatic conditions. It would enhance income of the farmers by utilizing the available land in the lean periods and increasing sustainability in agriculture. It would make a significant contribution to total production of pulses and also help to evolve a sustainable cropping pattern particularly in the regions with paddy, wheat rotation.

Now, we discuss profitability of pulse crops vis-à-vis competing crops and level of technology in terms of input use for pulse crops in India. Relative profitability is one of the most important determinants of production of agricultural commodities governing the behaviour of producers. In reality, perceptions of profitability drive crop options. Farmers grow crops, which offer highest returns per unit of their scarcest resources such as land and dearer inputs. Over time, choice of crop may change as individual plots of land shift to their best use in response to a changed relationship between profits of different crops. Normally, area shifts take place on the basis of competitiveness in terms of profitability. It is proposed to examine the same for important pulse crops with principal competing crops in major producing states during 2005-06.

Table-2.13
Comparative Profitability of Important Pulse Crops vis-à-vis Competing Crops in India during 2005-06

Crop	State		
	Madhya Pradesh	**Uttar Pradesh**	**Maharashtra**
Pulse Crop			
Chickpeas	11757	18293	7629
Lentil	5804	18486	NA
Pigeon pea	8912	6772	-
Green Gram	NA	NA	-164
Black Gram	1025	4056	1013
Competing Crop			
Mustard	7008	13750	NA
Jowar	2387	NA	2873
Bajra	NA	6264	2948

Source: Reports of the Commission for Agricultural Costs and Prices, 2008-09, Ministry of Agriculture, Government of India, New Delhi, 2009

The profitability of important pulse crops and their competing crops in major states during 2005-06 is presented in Table-2.13. A comparison of profitability of chickpeas and mustard suggests that first was superior in both Madhya Pradesh and Uttar Pradesh. Lentil was equally profitable in Uttar Pradesh and was found superior to mustard. Further, pigeon pea was observed relatively profitable than its competing crops such as jowar and bajra in these states. The status of black gram was found inferior to bajra in Uttar Pradesh as well as in Maharashtra. The performance of green gram was found poor even in Maharashtra which ranks first in terms of share in all India area. Thus, an examination of profitability per hectare of pulse crops in core states revealed that chickpeas and lentil yielded higher returns than competing crops. Pigeon pea also enjoyed better status than its competing crops. Results were found dismal for green gram.

Technology offers an opportunity to enlarge total agricultural production through a more productive use of resources in crop enterprises. The measurement of the level of technology is a difficult task and different approaches are used for this purpose. The magnitude of technological change can be assessed either by estimating the increase in output attributed to modern inputs or by measuring the growth or quantum in the use of modern inputs.

Table 2.14 presents information on the use of improved seeds, chemical fertilizer, pesticides, manure, weedicides and tractor for cultivation of pulse crops. The following major points emerge from the analysis of the state-wise data. (i) the estimates corroborate the widely held view that the progress of adoption of improved technology in pulse farming has been uneven in different parts of the country. The states of Gujarat, Tamil Nadu, Andhra Pradesh and West Bengal have progressed better than rest of the country. At the other end, major pulses growing states like Madhya Pradesh and Uttar Pradesh are lagging far behind (ii) Gujarat and Andhra Pradesh demonstrated a close association between adoption rate of improved seeds and use of fertilizer but in Tamil Nadu, area fertilized was much lower than the area covered by improved seeds. Unfortunately, in the progressive states like Punjab and Haryana, percentage of pulse area covered by improved seeds was lower than the national average, but in the first case area fertilized was above 90 per cent. (iii) a very low coverage of pulse area by pesticides and weedicides at the all India level as well as in the major growing states emerged as a serious constraint despite their importance as quantity and quality savers. (iv) the use of tractor for tilling was extensive in states like Rajasthan and Haryana but it was low in Gujarat, Tamil Nadu and Andhra Pradesh.

Table-2.14

Percentage of Pulse Area under Improved Variety Seeds, Fertilizer & Manure, Pesticides & Weedicides and Tractor Use in Major States of India during 1998

State	% of GCA under Pulses	% of Pulse Area under Improved Seeds	% of Pulse Area Treated with Fertilizer & Manure	% of Pulse Area Treated with Pesticides & Weedicides	% of Pulse Area Tilled with Tractor
Andhra Pradesh	17.11	70.96	69.3	25.8	25.0
Arunachal	1.63	44.68	2.0	0.10	6.1
Assam	2.08	25.47	27.8	7.5	5.0
Bihar	1.01	32.55	37.7	10.0	43.0
Gujarat	8.11	81.35	83.2	20.3	47.6
Haryana	9.50	26.90	22.5	18.6	84.3
Himachal Pradesh	15.12	25.72	32.5	0.5	3.3
Jammu & Kashmir	2.94	60.13	76.9	3.0	3.3
Karnataka	17.85	50.68	67.0	8.0	15.0
Kerala	3.22	28.74	28.7	-	-
Madhya Pradesh	14.49	30.91	44.4	13.3	36.3
Maharashtra	17.12	49.83	44.8	4.3	11.0
Orissa	12.70	59.10	49.9	18.5	10.7
Punjab	0.53	43.21	96.2	43.2	66.1
Rajasthan	14.44	62.01	36.1	3.1	88.3
Tamil Nadu	14.63	72.63	45.1	18.6	36.0
Uttar Pradesh	9.32	34.19	53.0	10.8	66.9
West Bengal	2.04	68.62	42.0	7.2	38.5
India	12.50	46.62	48.6	10.7	46.6

Source: Report No. 451, Survey Results on Cultivation Practices in India, NSS 54th Round (Jan. 1998-June 1998), National Sample Survey Organization, Government of India, New Delhi, 2000.

Section-2
Instability in Production

The preceding section highlights that growth performance of pulses at the global level has been poor during the reference period. In the leading country like India, slow pace of growth is further compounded by high instability arising out of yield and price variability. Wide fluctuations in crop output not only affect price and bring sharp fluctuations in them but also result in wide variations in disposable income of the farmers. Therefore, an analysis of instability is important for understanding the nature and stability of income. The estimation of instability also helps the producer and policy makers in choosing separate risk responses such as stabilization versus crop insurance programmes. The accurate measurement of sources of variability can help in targeting policies to reduce or offset the effects of instability. In India, scholars (Hazell, 1982; Ray, 1989; Jain and Singh, 1991; Mahendradev, 1997) have analysed instability in the production of food grains. In these studies, pulse crops are treated as a group and therefore, do not provide the estimates of instability in the area, production and yield of individual pulse crops over time. A large proportion of cropped area under pulses is rain fed which increases instability in the yield due to uncertainly of rainfall. But, degree of instability is expected to vary from crop to crop and from country to country. In irrigated areas, yield of pulses is less unstable while reverse may be true in dry areas. Given this background, country wise instability in the area, production and yield of five major pulse varieties (beans, peas, broad beans, chickpeas, lentil) and total pulses was estimated in three referred periods.

In constructing an instability index of a parameter, several methods such as moving averages, coefficient of variation and standard deviation of the annual growth rates are commonly used by the scholars. A scrutiny of results shows that different measures result in different numerical values for the same data series. Coppock (1962) measured international instability in exports and imports through log variance method. We have used this method to estimate instability in area, production and yield of the above-mentioned five individual pulse crops and total pulses during the earlier referred three periods at global level and in major

producing countries. The magnitude of index exhibits the degree of instability. The formula for calculating the Coppock instability index is as follows:

- Coppock's Instability Index

$$V\log = \frac{\sum (\log \frac{X_{t+1}}{X_t} - m)^2}{N}$$

$$InstabilityIndex = anti\log(\sqrt{V\log - 1})$$

X_t – variable (area, production and yield of the crop) in year 't'
m – arithmetic mean of the difference between the logs of X_t and X_{t+1}
Vlog – logarithmic variance of the series
N – number of years minus one (1)

The instability index (I-I) of selected pulse crops based on log variance in Table 2.15 shows that I-I of beans production in the world was only 5.8% during the period 1985-2005. The uncertainty in acreage and yield was almost the same. This is the outcome of offsetting impact of area and yield. Furthermore, yield I-I was also low but little higher than area. Among the sub-periods, first period has indicated slightly higher I-I for production. The yield I-I also increased marginally. This implies production of beans remained more or less stable at the global level. A look at the country-wise I-I indices of area makes clear that acreage fluctuations were of high degree in Rwanda (61.1%), Canada (28.2%), Mexico (25.9%), Iran (22.8%) and Nicaragua (20.9%). But, I-I of acreage in Korea (2.0%), Uganda (5.1%) and Turkey (5.7%) was lower than 10 per cent. These figures are indicative of relative stability in area under beans in these countries. In some cases, situation is compounded by higher yield uncertainty i.e. Canada (33.2%), Iran (27.6%), Kenya (24.2%) and Uganda (21.2%), Korea exhibited the lowest instability index for yield of beans (5.2%) during the study period.

The I-I of beans production in most of the countries exceeded acreage and yield. It implies that changes in area and yield did not offset each other, rather they moved together. A comparison of uncertainty in production of beans in the first period and second period in different countries indicated mixed results. Among the leading countries of Brazil, India and China, production instability during the

second period has remained almost same in the first case while it has increased in second case and it has declined significantly in the third case.

Production instability of peas (Table-2.16) was estimated higher than beans at the world level during the study period. The most notable feature in this case was small I-I of area (6.1%) although it increased marginally during the second period. The contribution of yield fluctuations in production instability was found higher in this case. It was around the double. The countries with very high instability in production of peas were Australia (65.9%) Spain (63.7%) and Germany (49.0%) but the countries like India has shown the lower I-I index (11.9%). The yield uncertainty was extremely high in Australia and I-I index crossed 70%. It implies wide year-to-year fluctuations in yield. The area I-I in Australia was not very high (20.3%). Like beans, production instability of peas in the first period was higher than the second period. The acreage and yield I-Is in the first period were 5.9% and 14.7% respectively as against 6.3% and 7.3% in the recent period. At country level, production instability was the highest in Spain in the first period and Australia during the second period. India emerged as an example of relatively higher production stability in peas production in the study period due to less than 20% I-I of area as well as yield. In fact, area and yield together provided stable production in this case.

Unlike peas and beans, the degree of production instability of chickpeas (Table-2.17) was also found relatively high at the global level. In this case, yield was more stable than area at the world level. The direction of results was almost uniform in both the periods. Among the major producing countries, Iraq (156.2%) followed by Australia (67.9%) has indicated the highest I-I of production due to higher area instability in the first case and both in the second case. The lowest instability in production was observed in Turkey (15.5%) due to low instability in area as well as in yield. In case of Iraq, primarily area reinforced production instability in the first and third periods, Turkey has shown the minimum instability in the production while Iraq has exhibited the maximum. The contribution of area instability in production was relatively higher in Iraq but in Australia, acreage and yield both revealed I-I more than 40%. After 1995, production of chickpeas was

found more stable in Turkey. On the other hand, Mexico with an I-I of 60.4% indicated extreme instability in production of chickpeas largely due to area uncertainty.

The production instability behaviour of broad beans (Table-2.18) converged with the earlier discussed three pulse crops. Here, area as well as yield was found relatively stable by indicating I-I equal to 8.6% and 10.9%. The low value of I-I for production is clearly the result of compensatory relations between area and yield as higher area was partly offset by lower yields while lower yields were partly offset by higher area. A complete offsetting would put I-I for production at zero. Between the two referred periods, the second period was better when acreage instability was as low as 5.9% and yield instability around 5.0%. In the first period, both were found relatively higher and resulted in higher instability in production. At the country level, production in Morocco was most unstable in the first, second and entire period. Second was Australia in the first period and Spain in the second period emerged as the countries with higher instability in the production of broad beans. Unexpectedly, the instability in the production of broad beans was found lowest (14.6%) in Italy between 1985 and 2005. Nonetheless, this was also around 15 per cent.

An examination of instability index of production of lentil (Table-2.19) at the world level indicates that it was around the same as for peas and broad beans. Nonetheless, it was more than beans. The I-I of lentil production was 14.0% in the first period, 9.4% in the second period and 11.9% for the entire period. The yield volatility has been higher than area uncertainty. It is evident from (Table 2. 19) that the area I-I was less than the yield I-I. Among important countries, Arab republic followed by Canada revealed highest production instability. The yield factor was more responsible for unstable production. On the other hand, Bangladesh (6.2%) followed by Nepal (11.7%) showed the lowest uncertainty due to area and yield factors. In the first period, production instability of lentil was found highest in Canada (102.9%) with high I-I for area as well as for yield. However, Bangladesh has exhibited the lowest instability that was 2.1% for area and 2.9% for yield. After

a decade, Australia outpaced Canada instability of lentil production but Nepal maintained the lowest position in this period too.

Table 2.20 reveals instability indices in the production of total pulses. It is interesting to note that global production of total pulses was almost stable during the study span. Neither, acreage nor yield was found unstable. It could be due to the same status of technology and extension services for pulse cultivation in major countries. Surprisingly, even yield instability of pulses was only 3.8%. The differences in the instability in production of total pulses in the two selected periods were narrow despite some fluctuations in area as well as in yield.

The instability indices for the production of total pulses in the world were estimated 4.6% in the first period, 3.0% in the second period and 3.9% during the entire study span. Out of the two (area and yield), yield contributed relatively more to instability in the first period but it has decreased during the second period. It may be mentioned that instability around the trend in case of area was relatively low in comparison to yield for the study period. Among important countries, highest uncertainty was found in China and the lowest in Nigeria in the first period but Australia crossed China in the second period. Particularly, instability indices of area as well as yield in Nigeria were found less than 20% during the study period. Efforts should be made to reduce production instability, which was found more than 10% in most of the cases.

It is found that instability in production of pulses at the global level was on the lower side. But, it was found mixed at the individual country level. Both area and yield were found important. Yield instability was crucial for five pulse varieties out of six analysed at the global level. This is because pulses are mostly grown in rain fed areas. The quantum of rainfall influences area allocation at the pre-sowing stage and later to the yield by receiving one or two irrigations. In the absence of irrigation support for the pulse crops, rains are the only solace, failing which yield falls by considerable percentage. Other factors, which cause instability in production of pulses, are price variability and adoption of technology.

The following important points emerge from the analysis of instability in the production of pulses at the global level:

- First, the I-I index of pulse production showed high uncertainty at individual country level barring a few exceptions when I-I index was below 10%. It was however, low at the aggregate level.
- Second, the instability behaviour of individual pulses is diverse. The crop of beans indicated lower production instability in comparison to other crops like broad beans and peas.
- Third, the evidences of higher instability in yield at the crop level are much more than area except chickpeas, which has indicated lower figure for yield. In five out of total six cases, yield variability is responsible for uncertain production.
- Fourth, the range of instability in production of total pulses is quite wide at the country level. It was estimated as high as 39% in Australia. In contrast, it was found around 7.9% in Nigeria.
- Fifth, majority of the analysed countries have indicated pulse production instability above the world level.

Finally, let us recall over proposed hypothesis that growth in global pulse production is poor due to low growth of acreage and yield. It was confirmed at the global level but Canada, Myanmar, Iran and Ethiopia experienced high production growth largely due to area expansion.

Table-2.15
C O U N T R Y - W I S E I N S T A B I L I T Y I N D I C E S

CROP: BEANS (%)

COUNTRY	1985-95			1995-05			1985-05		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
Brazil	17.7	20.5	12.2	16.7	19.1	5.6	17.2	19.8	9.4
India	5.0	12.1	12.8	10.2	15.0	16.8	8.1	13.8	15.2
China	30.4	52.0	24.6	9.1	12.0	8.4	21.9	35.9	18.1
Myanmar	16.2	23.2	11.2	12.0	8.8	10.3	14.6	17.3	11.1
Mexico	30.4	48.6	19.0	20.2	24.2	12.7	25.9	37.7	16.2
United States of America	16.0	24.6	10.3	20.2	29.3	9.6	18.3	27.1	10.0
Uganda	6.9	7.8	10.2	1.0	28.9	28.9	5.1	20.6	21.2
Kenya	13.5	19.6	21.6	14.3	38.8	26.5	13.9	30.3	24.2
Indonesia	12.1	22.7	15.4	11.4	19.4	11.2	11.8	21.1	13.4
Tanzania, United Rep of	20.1	21.0	8.8	7.7	13.4	8.9	15.2	17.6	8.9
Canada	28.4	49.4	47.0	27.7	36.1	13.1	28.2	43.3	33.2
Korea, Dem People's Rep	1.9	6.8	6.3	2.1	3.4	3.4	2.0	5.5	5.2
Turkey	6.2	11.5	8.8	4.6	5.1	4.4	5.7	8.9	6.9
Burundi	12.4	26.6	18.4	9.6	13.7	5.8	11.1	21.1	13.5
Iran, Islamic Rep of	28.0	33.2	39.3	16.3	22.1	9.7	22.8	28.1	27.6
Rwanda	91.7	82.3	12.0	16.7	22.6	10.1	61.1	57.4	11.1
Thailand	9.1	11.7	9.5	6.0	8.2	4.2	8.1	10.2	7.5
Nicaragua	25.1	30.0	7.9	15.9	30.8	17.3	20.9	30.4	13.4
Cameroon	18.8	22.5	8.7	4.0	3.8	1.9	13.3	15.7	6.3
W O R L D	4.3	6.1	4.5	3.7	5.5	4.2	4.0	5.8	4.4

Source: Ibid

Table-2.16

C O U N T R Y - W I S E I N S T A B I L I T Y I N D I C E S

CROP: PEAS (%)

COUNTRY	1985-95			1995-05			1985-05		
	Area	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**	**Area**	**Prod.**	**Yield**
Canada	44.0	36.4	22.4	31.2	36.7	25.8	39.8	37.6	24.3
France	20.2	22.9	13.1	11.8	15.2	12.3	19.1	21.8	12.7
China	33.2	43.5	16.7	7.2	18.2	15.0	23.9	32.7	16.1
Russian Federation	-	-	-	19.0	31.4	22.5	-	-	-
India	7.8	13.2	9.8	11.4	9.7	13.1	10.8	11.9	11.7
Ukraine	-	-	-	18.8	33.2	40.7	-	-	-
United States of America	17.7	43.0	27.3	28.0	44.9	30.9	24.4	44.0	29.9
Australia	25.4	59.4	61.0	13.3	71.5	82.6	20.3	65.9	72.2
Germany	71.5	62.2	24.2	21.1	32.4	17.4	50.0	49.0	21.2
United Kingdom	12.0	23.7	26.0	18.9	24.3	16.2	15.9	24.5	21.7
Ethiopia	-	-!	-	17.2	21.1	23.9	-	-	-
Spain	83.9	79.9	17.6	26.0	43.4	30.2	60.3	63.7	24.7
W O R L D	5.9	15.9	14.7	6.3	8.9	7.3	6.1	12.8	11.5

Source: Ibid

Table-2.17

C O U N T R Y - W I S E I N S T A B I L I T Y I N D I C E S

CROP: CHICK-PEAS (%)

COUNTRY	1985-95			1995-05			1985-05		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
India	17.3	25.7	11.6	17.1	26.1	12.4	17.2	26.1	12.1
Pakistan	11.9	24.7	20.8	5.9	32.9	28.2	9.3	29.1	24.8
Turkey	12.2	19.2	11.3	6.9	9.1	8.6	11.0	15.5	10.0
Iran, Islamic Rep of	33.1	29.3	21.0	14.8	22.8	18.9	26.1	27.2	20.0
Myanmar	31.3	39.7	9.9	23.3	27.6	20.7	27.8	35.1	16.6
Ethiopia	-	-	-	22.4	22.1	17.6	-	-	-
Australia	48.2	83.0	91.4	27.6	43.0	60.1	43.0	67.9	76.3
Mexico	49.8	60.9	11.1	53.7	60.4	12.4	51.8	60.7	12.1
Iraq	281.0	257.2	13.0	25.3	47.2	26.1	161.0	156.2	20.4
W O R L D	12.6	18.1	7.9	9.0	13.1	7.2	11.0	16.0	7.6

Source: Ibid

Table-2.18
C O U N T R Y - W I S E I N S T A B I L I T Y I N D I C E S

CROP: BROAD-BEANS (%)

COUNTRY	1985-95			1995-05			1985-05		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
China	21.0	37.4	23.1	8.2	10.4	7.0	16.1	26.5	16.9
Ethiopia	-	-	-	24.7	17.1	16.2	-	-	-
Egypt	20.2	15.1	33.0	14.4	22.8	15.7	17.5	19.3	25.5
France	15.5	17.1	6.4	33.5	33.2	15.1	34.2	34.4	11.5
Australia	25.9	67.2	62.3	19.4	46.3	56.9	23.1	57.3	59.6
Sudan	17.4	25.5	17.8	7.4	30.5	35.7	13.6	28.1	28.2
United Kingdom	74.2	65.1	12.2	49.0	50.2	12.9	63.3	58.5	12.9
Morocco	30.9	158.2	138.7	8.4	86.0	78.1	22.5	124.9	110.1
Italy	4.7	15.6	14.4	10.2	13.1	9.8	8.2	14.6	12.3
Germany	40.5	42.1	12.5	17.2	20.4	15.1	30.7	32.7	13.9
Peru	20.7	44.3	22.1	7.8	8.5	3.7	15.6	30.5	15.4
Spain	14.9	24.4	13.0	42.5	60.9	51.3	34.3	48.2	35.7
W O R L D	9.9	14.6	14.7	5.9	7.5	5.0	8.6	11.7	10.9

Source: Ibid

Table-2.19

C O U N T R Y - W I S E I N S T A B I L I T Y I N D I C E S

CROP: LENTIL (%)

COUNTRY	1985-95			1995-05			1985-05		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
India	4.3	9.4	6.5	6.3	17.8	13.7	5.4	14.1	10.7
Canada	45.1	102.9	62.6	29.2	42.0	20.9	37.8	75.0	44.7
Turkey	13.4	37.3	29.6	4.9	20.2	17.5	10.3	29.6	24.2
United States of America	32.9	49.1	27.4	16.8	37.9	22.6	26.0	43.7	25.5
Nepal	11.4	15.1	9.0	2.5	7.1	5.9	8.2	11.7	7.6
Syrian Arab Republic	30.7	72.1	75.8	13.2	81.5	76.5	23.4	77.3	76.2
China	25.6	19.5	22.3	12.4	14.9	20.5	21.5	18.8	21.4
Australia	-	-	-	59.9	115.8	153.8	-	-	-
Bangladesh	2.1	4.1	2.9	7.7	7.3	5.2	5.9	6.2	4.2
Iran, Islamic Rep of	54.9	69.1	23.2	16.3	24.5	18.2	39.3	49.9	20.8
Ethiopia	-	-	-	35.8	36.9	28.3	-	-	-
W O R L D	5.3	14.0	10.8	5.1	9.4	6.1	5.2	11.9	8.8

Source: Ibid

Table-2.20

C O U N T R Y - W I S E I N S T A B I L I T Y I N D I C E S

CROP: TOTAL PULSES (%)

COUNTRY	1985-95			1995-05			1985-05		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
India	5.0	10.8	6.3	5.7	13.2	10.2	5.3	12.2	8.6
China	25.8	41.7	20.0	7.7	11.6	7.1	18.7	29.5	14.8
Canada	35.6	40.4	20.3	25.4	30.0	18.8	31.6	36.1	19.6
Brazil	17.9	20.6	12.3	17.0	19.2	5.6	17.5	19.9	9.5
Nigeria	11.0	10.4	15.9	14.6	2.2	13.5	13.5	7.9	14.8
Myanmar	16.7	23.1	9.3	9.3	7.5	7.9	13.5	16.9	9.0
Australia	16.1	35.7	38.1	7.6	40.8	46.4	13.8	39.2	42.4
France	16.7	21.3	12.2	9.8	14.5	12.1	15.1	19.7	12.2
Russian Federation	-	-	-	14.8	29.9	25.3	-	-	-
United States of America	14.7	20.7	9.0	18.0	22.2	6.5	16.4	21.5	7.9
Turkey	9.4	19.5	14.3	3.3	8.1	5.8	7.4	14.9	10.8
Mexico	27.8	40.4	15.3	17.5	18.2	12.1	23.3	30.7	13.9
Ethiopia	-	-	-	14.1	13.7	11.3	-	-	-
Pakistan	14.9	21.5	11.7	3.2	17.2	14.8	10.6	19.5	13.4
United Kingdom	17.3	29.6	19.4	12.0	12.6	10.3	14.9	22.4	15.4
Ukraine	-	-	-	17.4	26.0	34.6	-	-	-
Iran, Islamic Rep of	27.7	20.9	25.1	12.9	14.1	12.4	21.8	18.2	19.6
Uganda	6.0	6.4	8.0	0.8	19.6	19.6	4.4	14.4	14.8
W O R L D	1.7	4.6	4.7	2.7	3.0	2.6	2.3	3.9	3.8

Source: Ibid

Chapter-3

Growth and Instability in Pulse Trade

We have analysed production performance of pulses at the global and country level in Chapter-II. Findings suggest that global pulse production grew at a slow rate of 0.48% per annum between 1985 and 2005. It was found better during the second period spanning 1995-05 (0.90% per year) in comparison to first period covering 1985-95 (0.69% per year). A mixed performance has been observed across the developed, developing and emerging economies. Canada and Myanmar achieved a spectacular growth rate in pulse production (14.03 & 10.05% per annum) during this period. On the other hand, it has been negative in France, Ukraine, Russia and Turkey. Among the Asian countries, Myanmar has crossed 10% mark and performed well. But, India, the leading producer of pulses has exhibited a marginal growth in pulse production (0.34% per annum) during this period. Thus, a considerable diversity has been observed in the growth of pulse production in individual countries. The reasons for varied performance differ from country to country but in majority of the cases, poor yield growth has been responsible for slow growth in pulse production. In India, inadequate adoption of improved technology, low irrigation coverage and uncertainties related to pulse farming are responsible for slow growth in pulse production between 1985 and 2005.

After reviewing pulse production performance in detail in chapter-II, we would analyse growth of pulse trade during the reference period. In view of large inter country differences, trade in pulses is analysed at the global and country level. In addition, this chapter covers instability in pulse trade and its implications for India.

In order to put growth of pulse trade in proper perspective, it would be useful to give a brief idea about trade in pulses at the global level.

Table-3.1

Share of Pulse Production Traded at the Global Level

Year	Exports as % Production	Imports as % of Production
1985	6.16	5.94
1995	12.97	12.20
2005	14.07	14.26

Source: faostat.fao.org/

Clearly, share of pulse production traded at the global level has more than doubled between 1985-05. It is largely due to rising demand in countries like India at one hand and slow increase is supply owing to low growth in the domestic production. Moreover, pulse exports have experienced higher growth between 1985 and 2005 (Table 3.1).

It would be worthwhile to analyse the share of different pulse varieties in total pulse trade at the global level.

Table-3.2

Exports and Imports of Pulse Varieties at the Global Level

Crop	Exports			Imports		
	1985	1995	2005	1985	1995	2005
Beans Dry	41%	32%	29%	41%	32%	29%
Beans Green	3%	3%	4%	4%	3%	6%
Peas Dry	46%	53%	48%	43%	53%	47%
Peas Green	1%	2%	2%	1%	2%	2%
Lentil	9%	10%	17%	11%	10%	16%
Total	100	100	100	100	100	100

Source: Ibid

Figure-3.1

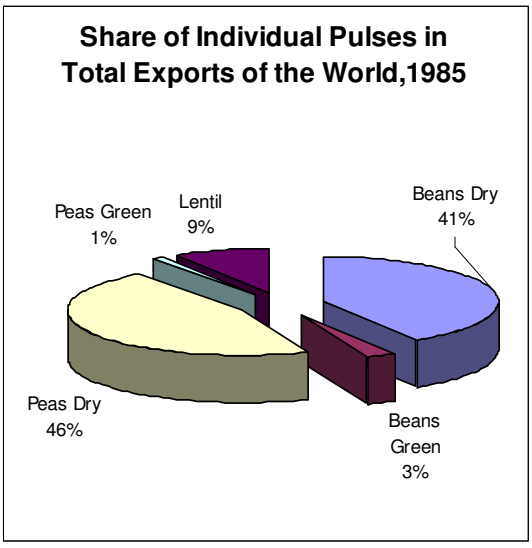


Figure-3.2

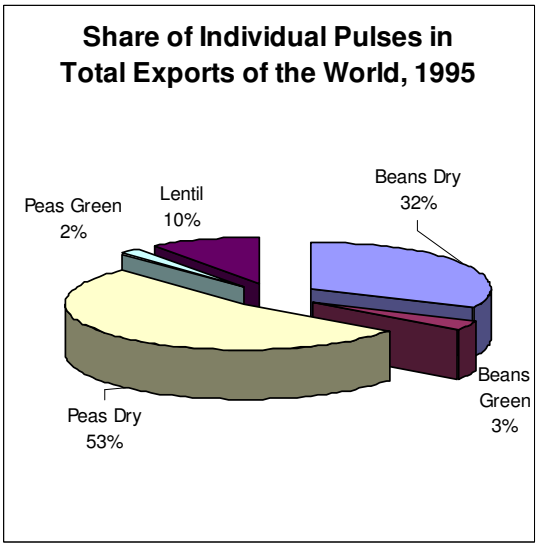
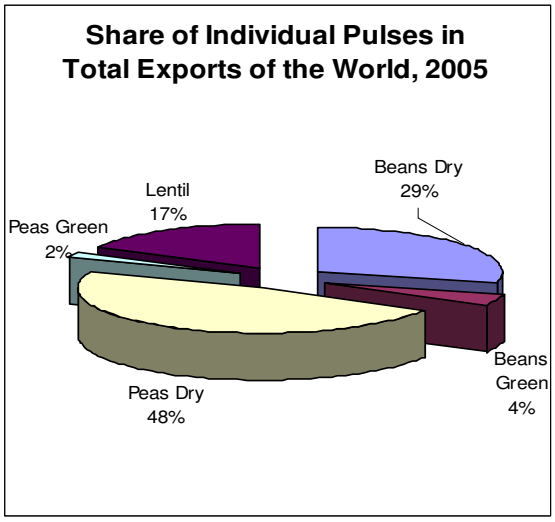


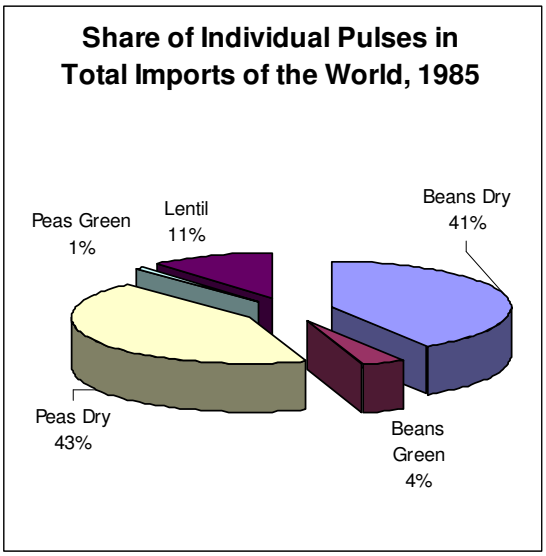
Figure-3.3



The most commonly traded pulse crops are beans, which formed 44% of total exports in 1985. Dry beans constituted the major share (41%) of total exports in 1985. But, their contribution in total volume declined over the period and constituted 29% in 2005. In the array, peas (green + dry) were next pulse variety. Dry peas formed 46% of total peas exports. Share of peas in global pulse exports increased by 3% during the study period. It appears that pattern of global pulse trade has shifted from dry beans to lentil and peas. It could be due to higher demand, which reflects preference of consumers. Lentil constituted 9% of total pulse exports in 1985 that increased to 17% in 2005. Thus, lentil emerged as the most important gainer in the global pulse exports overtime. One could notice variations in the figures of imports and exports of pulses. It could be attributed to reporting errors by the concerned countries (Table 3.2).

Figure-3.4

Figure-3.5



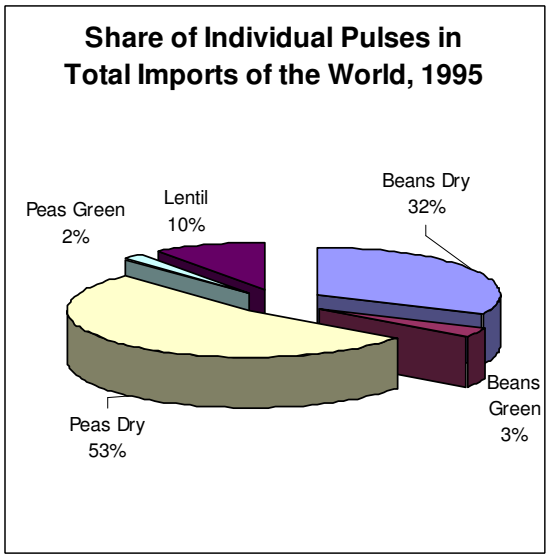
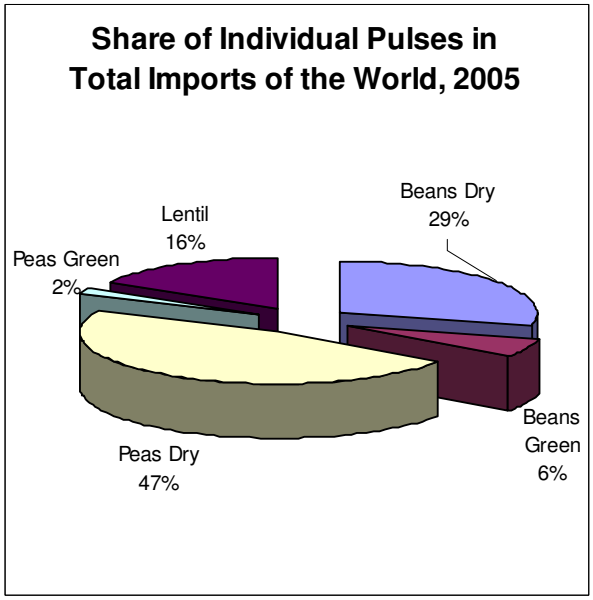


Figure-3.6



Now, we focus our attention on trade and its instability for the above mentioned pulse varieties.

I. Beans

We have earlier mentioned that beans form the largest share of pulse trade at the global level. The data are separately available for green and dry beans. We

would first take up green beans and then dry beans in the forth-coming analysis. Tables 3.3 & 3.4 present share of trading countries in the world green and dry beans exports in quantity and value terms in 1985, 1995 and 2005. These also provide information on per unit value.

Table-3.3

Share of Beans, Green Exporting Countries in the World (%)

Country	Quantity			Value			Per Unit Value Rs./Kg		
	1985	1995	2005	1985	1995	2005	1985	1995	2005
Belgium	0.0	0.0	3.7	4.3	1.2	4.4	-	-	65.9
Egypt	10.9	5.8	7.5	8.9	1.7	9.5	4.5	10.4	69.5
Ethiopia	0.0	0.0	1.3	0.0	0.0	0.0	-	-	0.0
France	6.4	10.9	19.5	7.6	4.9	13.8	6.6	16.5	38.6
Germany	5.2	0.3	1.6	2.5	0.4	1.1	2.7	57.3	38.3
Italy	3.3	2.8	1.3	5.1	3.5	1.2	8.6	45.5	51.5
Jordan	7.7	4.1	1.7	2.4	2.3	1.1	1.7	20.5	36.9
Kenya	0.0	7.8	8.3	0.0	17.7	20.6	-	82.8	135.5
Kyrgyzstan	0.0	0.0	1.9	0.0	0.0	0.0	-	-	0.0
Malaysia	0.0	5.7	4.1	0.0	0.8	1.1	-	5.3	14.5
Mexico	17.3	8.0	5.6	12.2	6.4	7.2	3.9	29.1	69.3
Netherlands	8.7	5.4	9.6	6.8	7.0	6.8	4.3	46.9	38.4
Oman	0.0	0.5	0.8	0.0	0.9	0.5	-	67.2	37.9
Senegal	0.0	0.1	1.8	0.0	0.1	1.0	-	21.0	31.3
Spain	25.5	13.2	6.3	37.0	23.4	10.9	8.0	64.1	94.7
United Kingdom	1.7	0.6	7.8	1.0	0.6	2.3	3.3	35.9	16.5
United States of America	5.2	11.1	10.1	7.7	10.6	8.7	8.2	34.7	47.1
Total of Above	**91.8**	**76.2**	**92.8**	**95.4**	**81.6**	**90.4**	**5.5**	**36.2**	**54.6**

Source: Ibid

Table-3.4

Share of Beans, Dry Exporting Countries in the World (%)

Country	Quantity			Value			Per Unit Value Rs./Kg		
	1985	1995	2005	1985	1995	2005	1985	1995	2005
Argentina	15.7	7.8	8.0	14.0	11.8	8.0	4.8	24.8	22.7
Australia	0.0	0.7	1.9	0.0	0.7	1.6	-	15.9	19.2
Canada	3.9	6.3	11.0	4.2	7.3	12.6	5.8	18.8	26.1
China	9.4	31.1	32.2	9.5	23.9	28.2	5.4	12.5	19.9
Ethiopia	0.0	0.0	2.2	0.0	0.0	0.0	-	0.0	0.0
Myanmar	7.0	8.3	12.3	5.3	6.7	9.2	4.0	13.2	17.0
Nicaragua	0.0	1.0	1.6	0.0	0.8	2.2	-	13.2	30.9
Pakistan	0.0	0.0	1.0	0.0	0.0	0.8	-	-	17.1
Thailand	20.6	2.0	1.2	16.8	2.4	1.3	4.4	19.4	25.1
United Kingdom	0.4	2.1	2.8	0.3	1.0	1.2	4.4	7.8	9.8
United States of America	22.1	19.2	11.8	25.3	18.9	14.3	6.2	16.0	27.6
Total of Above	**79.0**	**78.5**	**86.0**	**75.3**	**73.5**	**79.4**	**5.4**	**16.3**	**22.8**

Source: Ibid

Table-3.5

Share of Beans, Green Importing Countries in the World (%)

Country	Quantity			Value			Per Unit Value Rs./Kg		
	1985	1995	2005	1985	1995	2005	1985	1995	2005
Belgium	0.0	0.0	16.3	5.5	7.1	7.9	-	-	28.3
Canada	7.3	7.8	6.0	7.8	6.6	6.0	10.6	35.7	58.1
Egypt	0.0	0.0	5.2	0.0	0.0	1.4	-	-	15.4
France	27.3	13.6	11.2	32.6	23.1	19.2	11.8	71.7	99.8
Germany	13.5	7.6	4.4	12.8	10.0	5.5	9.4	55.5	72.9
Italy	0.1	1.1	3.3	0.1	2.1	4.1	15.4	83.2	72.3
Netherlands	16.1	11.1	8.2	13.3	13.3	9.0	8.2	50.9	64.0
Portugal	0.0	0.3	1.5	0.0	0.5	2.2	-	72.7	89.9
Singapore	0.0	9.7	2.2	0.0	2.6	0.9	-	11.3	25.4
Spain	0.0	3.9	19.7	0.0	1.2	11.4	-	13.5	33.6
United Kingdom	4.7	6.0	7.1	6.7	11.1	17.2	14.2	78.7	141.8
United States of America	9.6	8.9	6.4	10.3	8.9	7.8	10.5	41.9	71.4
Total of Above	**78.6**	**70.1**	**91.3**	**89.2**	**86.6**	**92.6**	**9.9**	**42.2**	**58.3**

Source: Ibid

Table-3.6

Share of Beans, Dry Importing Countries in the World (%)

	---------- Quantity ------			---------- Value ----------			---Per Unit Value Rs./Kg---		
Country	**1985**	**1995**	**2005**	**1985**	**1995**	**2005**	**1985**	**1995**	**2005**
Algeria	2.0	3.1	2.0	2.3	3.2	2.2	6.8	19.6	26.8
Angola	2.2	1.5	1.5	1.7	1.3	1.5	4.5	17.1	25.5
Brazil	1.3	7.8	4.1	1.5	6.7	3.2	6.9	16.1	19.0
Canada	0.8	0.7	1.3	1.2	0.9	1.9	8.3	23.9	36.1
China	9.4	2.6	2.2	7.0	1.9	1.8	4.3	13.8	19.8
Costa Rica	0.0	0.3	1.2	0.1	0.3	1.4	9.6	20.3	28.5
Cuba	0.0	3.3	5.4	0.0	2.3	3.7	-!	13.4	16.8
Dominican Republic	0.7	0.4	1.5	0.7	0.4	2.1	6.2	19.1	34.1
France	4.2	2.6	1.9	6.2	4.7	3.1	8.4	33.8	40.5
India	11.2	4.2	12.5	9.0	3.4	9.9	4.6	15.2	19.7
Indonesia	0.1	5.1	1.2	0.1	3.4	0.6	5.2	12.5	12.6
Iraq	0.0	0.0	0.0	0.0	0.0	0.0	-	22.5	27.4
Italy	5.3	3.9	3.8	7.4	6.1	4.8	8.0	28.8	31.5
Japan	9.4	7.0	4.8	8.7	8.7	6.8	5.3	23.2	34.8
Korea, Republic of	1.5	1.9	2.3	1.4	1.3	1.5	5.4	12.9	16.5
Malaysia	2.3	1.6	1.6	1.6	1.3	1.5	4.1	15.3	23.3
Mexico	14.6	1.2	3.2	12.1	1.3	4.1	4.8	19.8	31.5
Netherlands	6.1	2.7	1.5	4.3	2.9	2.1	4.1	20.2	34.7
Pakistan	0.1	3.0	3.1	0.1	1.7	2.1	5.1	10.7	16.5
Philippines	0.1	1.3	1.3	0.1	0.8	1.2	3.2	11.8	23.4
Portugal	0.1	1.2	1.4	0.1	1.8	1.7	8.0	28.5	29.3
South Africa	1.1	3.4	2.2	0.9	3.0	1.5	4.7	16.5	16.6
Spain	0.8	2.8	2.0	1.1	5.0	2.8	8.3	33.7	35.6
United Kingdom	9.7	5.4	4.7	12.6	7.2	5.4	7.5	25.3	28.7
United States of America	1.4	1.6	6.0	1.6	1.9	7.8	7.0	21.7	32.1
Venezuela, Bolivar Rep of	1.6	3.7	1.6	2.0	4.7	1.9	7.2	23.7	28.1
Viet Nam	0.0	0.1	1.3	0.0	0.0	0.9	-	13.1	16.8
Total of Above	**86.1**	**72.3**	**75.7**	**84.0**	**76.5**	**77.6**	**5.8**	**18.7**	**24.7**

Source: Ibid

A perusal of the tables indicates that Spain, Mexico and Egypt were the major exporters of green beans in 1985. After a decade, share of these countries in world green beans exports shrunk significantly. The highest contraction was observed in the share of Spain (12%). On the other hand, the US and France improved their contribution. In 2005, France became the leading exporter and the US maintained its position. Other countries such as the UK, Netherlands and Kenya were also observed as good performers. Per unit value of green beans exports at world level has risen from Rs.5.5 in 1985 to Rs. 54.6 in 2005. The escalation in per unit value of beans varied significantly across the countries. Per unit value of green beans in international market has far reaching consequences for the importing countries for the national security. Governments often feel that self-sufficiency is important and domestic producers should not be driven out of business by foreign competition. Therefore, most of the countries impose import barriers. The most important reason for these barriers is to protect business and farmers from import competition. In essence, the government gets more benefit from an additional unit of welfare to producers than to consumers. Dry beans were exported primarily by the US, Thailand and Argentina in 1985 but their shares in total world exports dropped overtime and China, Myanmar, the US and Canada together captured 67% share of world exports of dry beans.

Table-3.5 indicates share of green beans importing countries in quantity and value terms. France followed by Netherlands and Germany were the biggest importers in 1985. After a decade, share of these countries dropped but the first two maintained leading position in quantity terms. In 2005, Spain along with Belgium and France became the leading importers of green beans. The share of importing countries in value terms mostly coincided with quantity but Belgium was an exception by showing16.3% share in quantity against 7.9% in value terms. It could be due to low per unit value. In eighties, Mexico and India together imported around one fourth of total world imports of dry beans. India maintained its leading position in 2005 but share of Mexico shrunk by almost 10 percentage points (Table 3.6).

Prices as indicated by the per unit value show an increase of more than five fold during the reference period. Large variations were observed in the per unit value across the countries. The world is characterized by trade barriers that make prices in the importing countries higher than world prices. These trade barriers

increase the price of imported goods and therefore, change relative prices in the economy. As relative prices shift, production and consumption adjust and welfare of various groups changes. Some countries feel that certain products must be protected from international competition for national security reasons and food is one of these products.

Table-3.7

Growth Rate of Green Beans Exports in Important Countries of the World

(% per annum)

	EXPORTs (Quantity)			EXPORTs (VALUE)		
Country	**I G.Rate**	**II G.Rate**	**III G.Rate**	**I G.Rate**	**II G.Rate**	**III G.Rate**
Egypt	-6.36	3.20	-0.76	-6.90**	10.60	0.99
France	11.19*	12.94*	12.20*	8.61*	22.51*	12.97*
Germany	-22.35	13.69**	3.26	-8.00	13.77*	16.35
Italy	6.91*	-2.54	4.38**	12.03*	-4.23**	4.22*
Jordan	-4.16	28.89	-2.72	15.99*	9.04	13.03*
Kenya	-7.73	6.66*	3.65*	8.81	13.13*	10.04*
Malaysia	-1.73	2.52	2.32	1.39	11.19*	8.55*
Mexico	-2.11	1.32	3.22*	14.58**	5.40*	11.25*
Netherlands	2.93**	8.84*	6.38*	15.92*	6.47	7.90*
Oman	25.03**	14.08*	17.87*			
Spain	0.19*	-2.01*	0.15	9.57*	-0.03	3.61*
United Kingdom	10.05*	29.50*	15.10*	11.12*	13.07**	17.55*
United States of America	19.76**	3.60**	10.74*	26.96*	4.53*	12.45*
WORLD	7.55*	4.77**	6.09*	15.81*	6.87*	9.10*

Significant at below 5% (*) and below 10% (**) level of probability
Growth rate could not be calculated for Belgium, Ethiopia, Kygyzstan and Senegal due to data gaps.
Source: Ibid

Table-3.8

Growth Rate of Dry Beans Exports in Important Countries of the World

(% per annum)

Country	EXPORTs (Quantity)			EXPORTs (VALUE)		
	I G.Rate	II G.Rate	III G.Rate	I G.Rate	II G.Rate	III G.Rate
Argentina	0.47	-0.54	2.05*	5.88**	-5.71*	2.23**
Australia	12.08*	7.71	10.81*	13.86**	4.88	11.06*
Canada	10.72*	9.53*	10.30*	10.09*	9.15*	10.27*
China	10.44*	5.49*	4.16*	12.89*	4.61*	5.55*
Myanmar	13.09**	5.51*	9.84*	12.95*	3.76*	9.68*
Nicaragua	170.23*	18.09**	50.41*	259.72**	18.75*	67.94*
Thailand	-14.35*	-2.82	-11.25*	-10.10*	-4.92*	-9.46*
United Kingdom	13.27*	16.78*	10.15*	10.13**	10.87*	6.80*
United States of America	2.00*	-4.77*	-0.10*	1.65	-3.15*	-0.04
WORLD	4.16*	2.74*	2.89**	5.00*	1.33	3.12*

Significant at below 5% (*) and below 10% (**) level of probability
Growth rate could not be calculated for Pakistan and Ethiopia due to data gaps.
Source: Ibid

Table-3.9

Growth Rate of Green Beans Imports in Important Countries of the World

(% per annum)

Country	EXPORTs (Quantity)			EXPORTs (VALUE)		
	I G.Rate	II G.Rate	III G.Rate	I G.Rate	II G.Rate	III G.Rate
Belgium				9.30*	9.76*	8.90*
Canada	6.19*	6.72*	5.51*	9.03*	6.87*	6.04*
France	-1.32**	7.76*	3.26*	5.21*	7.19*	4.64*
Germany	0.92	1.77*	9.52*	7.27	1.38	16.55
Italy	29.40*	20.80*	22.10*	36.44**	16.59*	19.90
Netherlands	1.97	4.62*	0.86	10.23*	4.26	4.39
Spain	71.04*	29.57*	29.34*	73.06*	40.44*	34.73*
United Kingdom	7.77*	9.13*	10.70*	14.77*	11.09*	13.748
United States of America	3.02**	4.25*	5.24*	5.76*	6.02*	7.68*
WORLD	**5.00***	**7.48***	**6.92***	**8.62***	**8.228**	**7.50***

Significant at below 5% (*) and below 10% (**) level of probability
Growth rate could not be calculated for Egypt due to data gaps.
Source: Ibid

Table-3.10
Growth Rate of Dry Beans Imports in Important Countries of the World

(% per annum)

	IMPORTs (Quantity)			**IMPORTs (VALUE)**		
Country	**I G.Rate**	**II G.Rate**	**III G.Rate**	**I G.Rate**	**II G.Rate**	**III G.Rate**
Algeria	1.52	-3.40*	3.52*	0.65	-1.22	3.77**
Angola	8.51**	4.60	2.50**	10.17	5.72	4.04**
Brazil	21.04*	-5.01	5.68	18.29*	-11.49*	3.55
Canada	2.99*	5.97*	7.44**	3.53*	6.66*	7.45*
China	-9.48*	-1.69**	-6.88*	-6.71*	-2.31	-5.71*
Costa Rica	30.42**	21.20	29.06	27.59**	20.69*	27.71*
Cuba	7.59	9.53**	4.53**	6.86**	6.25	3.29**
Dominican Republic	0.48	18.71	4.79	-0.73	19.74*	4.96*
France	1.01	-1.47*	-0.03*	3.73*	-3.39*	-0.24
India	-12.81**	19.02	2.08	-12.17**	17.46*	2.17
Indonesia	34.44*	-8.73	3.27	35.07*	-10.91*	2.36
Iraq	-60.71*	20.11	11.73	-49.83*	16.79	1.08
Italy	4.26*	2.78*	3.99*	5.97*	0.06	2.89*
Japan	3.35*	-1.10*	-0.49*	9.73*	-2.10**	1.37
Korea, Republic of	15.83	5.43	9.80	19.64	70.87	3.51
Malaysia	1.33*	2.86*	1.64*	3.97*	3.57	4.28*
Mexico	-20.76**	1.27*	1.72*	-16.76	1.35	2.50
Netherlands	-5.72*	-4.50*	-5.17*	1.94	-2.22**	-1.23**
Pakistan	31.03	0.90*	11.52*	30.64*	0.04	11.19*
Philippines	17.29	3.66*	11.44*	23.84*	-0.22	12.89*
Portugal	27.74*	3.69*	10.30*	29.93*	0.70	9.63*
South Africa	22.04	0.09*	10.83*	-27.33	-1.98	27.39
Spain	17.60	-0.84*	5.85**	20.35*	-3.74*	5.24*
United Kingdom	-0.49*	-1.21*	-0.46*	-0.89	-3.51*	-1.50*
United States of America	9.82*	17.38	14.31	10.17*	15.97*	13.60*
Venezuela,Bolivar Rep of	13.38	-2.45*	5.78*	17.08*	-5.21*	5.87*
WORLD	**4.71***	**2.39***	**3.14***	**5.56***	**0.67***	**2.92***

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid

The annual growth rates of green beans exports in Table 3.7 indicate that exports of green beans in quantity and value terms grew at the rate of 6.09 and 9.10% per annum during the study period. These values were found significant at below 5% level of probability. First period was observed far superior in comparison to second period. In most of the exporting countries, growth was positive and the front-runners were Oman, UK, France and the US. On the other hand, exports in Jordan and Egypt shrunk in this period. The growth rate of exports of dry beans in comparison to green beans was less than half in quantity as well as in value terms between 1985-05. Nonetheless, Nicargua exhibited around 50% per annum growth during the same period. Canada, Australia and UK also experienced more than 10% per annum growth during the reference period (Table 3.8).

Growth of imports of green beans was observed marginally higher in quantity and lower in value in comparison to exports of green beans at the world level. Spain and Italy indicated highest growth during the first, second and entire study period. These countries also maintained their position in value terms and coefficients were found significant at below 5% level of probability.

Table 3.10 indicates that imports of dry beans grew at the rate of 3.14% per annum in quantity and 2.92% per year in value terms between 1985-05. Costa Rica followed by the US were the leading countries (Table 3.10).

Now, we present results of instability Indices of beans trade based on log variance method. Tables 3.11 and 3.12 show that instability index (II) of green beans exports in quantity terms at the global level was 10.5% for the period 1985-2005. The level of uncertainty in the first period was found slightly higher in comparison to the second period. It could be due to WTO effect after 1995. Large variations were observed across countries. The degree of instability in green beans exports was observed comparatively higher in Jordan and Germany. Between remaining exporters, the UK showed extremely high instability index i.e. (223%) between 1985-2005. These indices of beans exports at the global level in value terms were found above quantity indices. At the country level, Germany and Egypt indicated higher instability index of beans exports in value terms.

Instability index of dry beans exports in quantity terms at the global level was found higher than green beans. UK followed by China and Myanmar revealed higher II indices in comparison to other exporting countries. It is interesting that degree of instability in quantity and value of exports of dry beans was around the same during entire study period.

Findings related to instability in imports of green beans indicated that level of uncertainty in green beans imports was below 10% in terms of quantity and 11.8% in value at the global level. It may be pointed out that II index was found extremely high for Germany. Italy also indicated higher instability in comparison to other countries. The instability index of dry beans imports at the global level was observed higher than green beans in quantity as well as in value terms. Out of two periods, period-I revealed higher uncertainty. Among the importers, Costa Rica showed extraordinarily high II index and instability was found higher in the first period.

Table-3.11

Instability in Trade of Beans, Green

(%)

	Exports (Quantity)			*Exports (Value)*		
Country	**1985-95**	**1995-05**	**1985-05**	**1985-95**	**1995-05**	**1985-05**
Belgium	-	-	-	26.2	17.8	24.2
Egypt	56.7	75.5	66.5	73.3	234.1	157.4
Ethiopia	-	-	-			
France	46.9	23.6	36.4	40.1	23.8	32.8
Germany	16766.5	155.8	3916.6	181005.7	34.1	20119.3
Italy	32.0	38.1	35.5	30.2	38.8	36.1
Jordan	57.9	18181.7	3933.3	42.6	167.0	110.2
Kenya	-	24.9	-	-	30.9	-
Kyrgyzstan	-	-	-			
Malaysia	-	23.4	-	-	17.4	-
Mexico	18.8	34.8	27.7	174.8	32.3	109.9
Netherlands	59.6	70.4	65.4	30.8	45.1	38.9
Oman	-	77.8	-	-	-	-
Senegal	-	-	-	-	4352.9	-
Spain	14.1	7.8	11.4	22.7	16.9	21.2
United Kingdom	313.8	127.8	223.0	80.7	109.1	95.4
United States of America	50.2	21.5	38.1	51.9	9.1	36.4
WORLD	11.0	9.9	10.5	15.6	12.1	14.9
	Imports			***Imports***		
Belgium	-	-	-	18.7	22.8	20.9
Canada	15.8	15.8	15.8	7.5	7.5	7.6
Egypt	-	-	-	-	-	-
France	8.9	8.4	9.3	15.7	11.0	13.5
Germany	20740.8	7.1	4263.8	532731.0	11.7	43086.5
Italy	140.1	45.4	96.7	111.0	21.9	75.1
Netherlands	17.6	13.6	15.8	14.4	17.4	16.4
Portugal	-	29.8	-	-	27.5	-
Singapore	-	26.2	-	-	35.0	-
Spain	-	52.1	-	-	44.0	-
United Kingdom	12.4	12.5	12.5	19.3	16.2	17.9
United States of America	18.3	5.8	13.4	48.7	11.1	33.7
WORLD	8.7	7.3	8.1	12.9	10.4	11.8

Source: Ibid

Table-3.12

Instability in Trade of Beans, Dry

(%)

	Exports (Quantity)			*Exports (Value)*		
Country	**1985-95**	**1995-05**	**1985-05**	**1985-95**	**1995-05**	**1985-05**
Argentina	33.1	27.9	30.6	41.5	34.2	38.3
Australia	-	123.3	-	-	92.0	-
Canada	39.4	13.8	28.8	29.3	13.5	22.7
China	84.5	33.6	62.7	54.2	17.8	39.7
Ethiopia	-	278.2	-			
Myanmar	90.1	21.4	60.8	64.8	22.3	46.5
Nicaragua	-	176.7	-	-	179.8	-
Pakistan	-	-	-	-	-	-
Thailand	33.6	25.9	30.9	23.7	18.5	21.7
United Kingdom	106.0	88.4	98.8	83.4	45.3	66.5
United States of America	24.2	10.8	19.1	25.2	15.4	21.0
WORLD	22.3	12.1	18.0	21.2	11.3	17.2
	Imports			*Imports*		
Algeria	190.1	71.4	133.2	188.9	37.3	119.4
Angola	89.4	43.1	67.9	123.7	56.2	91.7
Brazil	107.6	62.4	89.1	130.2	94.7	115.7
Canada	11.1	45.6	31.9	15.9	35.9	27.3
China	47.0	13.8	33.5	41.6	12.6	29.8
Costa Rica	407.1	159.0	279.0	396.2	184.7	287.2
Cuba	-	145.6	-	-	98.8	-
Dominican Republic	55.8	54.6	56.3	66.3	51.0	60.3
France	8.4	8.1	8.4	16.9	7.7	13.7
India	145.4	84.2	116.4	133.2	75.1	105.7
Indonesia	153.1	74.4	125.6	142.6	77.7	122.4
Iraq	-	721.2	-	-	669.4	-
Italy	18.9	8.3	14.5	18.2	8.9	14.7
Japan	18.3	8.7	14.5	29.5	12.3	22.9
Korea, Republic of	330.9	32.4	186.4	261.6	459701.0	41562.9
Malaysia	8.2	76.9	50.3	12.6	44.0	31.2
Mexico	323.6	82.7	205.4	350.2	98.6	224.6
Netherlands	34.6	27.9	31.4	19.9	20.8	20.7
Pakistan	169.9	42.7	116.6	165.9	49.0	115.7
Philippines	109.8	26.7	76.1	87.9	47.0	71.3
Portugal	128.6	12.1	83.8	116.6	12.6	78.5
South Africa	372.0	62.6	217.3	-	80.0	370322.7
Spain	31.6	9.0	25.8	34.4	13.2	30.3
United Kingdom	6.0	5.7	5.8	25.9	9.1	19.1
United States of America	29.8	22.5	26.6	26.7	24.3	25.8
Venezuela,Bolivar Rep of	54.0	29.0	44.9	45.5	33.3	42.7
Viet Nam	-	128.6	-	-	144.8	-
WORLD	28.4	11.6	21.5	23.0	12.1	18.6

Source: Ibid

II. Peas

Peas are second important crop in world trade of pulses. The data on trade related parameters of peas are separately available for green and dry peas. Tables 3.13 and 3.14 show share of important countries in global exports of green and dry peas.

A scrutiny of these tables indicates that Netherlands, France and Mexico were the three largest exporters of green peas in 1985. In value terms, all the three maintained their position. France was also the leading exporter of dry peas. Denmark attained second rank among exporters of dry peas in 1985. In value terms, Mexico maintained its share in exports of green peas. However, share of France and Netherlands were lower due to low per unit value. After two decades, Guatemala, France, Russia and China together captured almost 40% share in global exports of green peas. In case of dry peas, both first and second ranking countries were also ahead of other countries in their share in global value of dry peas in 1985. After two decades in 2005, scenario changed for dry peas and Canada with 58.7% share in world exports became the leading exporter. However, share of Canada in value terms was lower than its share in quantity. It could be attributed to low per unit value.

Per unit value of exports of green peas at the global level was Rs.4.6 in 1985, which became Rs.44.6 in 2005. It amounts to almost 10 times increase in value. The situation was entirely different for dry peas. Per unit value of dry peas exports at the global level was Rs.3.4 in 1985 and more than doubled during the study period.

A perusal of data on imports of green peas indicates (Table 3.15) that the US followed by Canada and France were the three largest importers in 1985 but the share of these countries in value was higher than quantity due to differentials in per unit value. The largest gap was observed in the case of the US and it registered almost 36% share in value terms against 20% in quantity terms. In dry peas imports, Netherlands and Germany covered around 59% of the world share in quantity and it was found lower for value. After two decades in 2005, Spain, India and Belgium became the leading importers of dry peas. China and Netherlands were the next ranking countries. Surprisingly, share of Belgium in value terms was only around 10% in green peas imports in 2005 against 33% in quantity terms. It could be attributed to low value of imports. Also, situation changed drastically for imports of dry peas. Spain and India together imported almost 45% of global imports. These were also leading countries in value terms (Table 3.16).

Table-3.13

Share of Peas, Green Exporting Countries in the World (%)

Country	Quantity			Value			Per Unit Value Rs./Kg		
	1985	1995	2005	1985	1995	2005	1985	1995	2005
Austria	0.0	0.1	1.3	0.0	0.1	0.3	-	16.1	8.8
Belgium	0.0	0.0	4.6	0.0	0.0	0.0	-	-	0.0
China	0.0	8.6	8.1	0.0	10.7	6.5	-	26.3	35.6
Czech Republic	0.0	2.4	0.9	0.0	0.7	0.1	-	6.1	6.8
France	24.9	43.2	11.7	18.3	17.1	4.0	3.3	8.3	15.2
Germany	2.9	0.9	5.0	2.2	0.8	2.9	3.4	18.9	26.0
Guatemala	0.0	0.7	13.4	0.0	0.6	13.7	-	17.6	45.7
India	0.0	0.4	0.6	0.0	0.5	0.3	-	22.9	25.5
Italy	5.5	3.5	0.9	12.4	6.9	1.5	10.3	41.0	73.2
Kenya	0.0	2.1	6.0	0.0	0.0	24.1	-	0.0	178.4
Mexico	15.3	3.6	2.8	15.7	3.8	2.5	4.7	22.0	39.9
Netherlands	28.1	3.3	5.3	21.4	4.8	11.6	3.5	30.8	98.2
Peru	0.0	0.2	3.4	0.0	0.4	6.0	-	40.3	77.9
Russian Federation	0.0	0.3	9.4	0.0	0.0	1.2	-	3.5	5.8
Spain	8.3	1.9	1.3	15.1	6.0	2.3	8.3	66.4	81.3
Syrian Arab Republic	0.0	0.7	0.1	0.0	0.0	0.1	-	0.0	26.8
Tanzania, United Rep of	0.0	0.0	0.5	0.0	0.0	1.2	-	-	112.5
Ukraine	0.0	0.1	7.1	0.0	0.0	0.9	-	6.5	5.4
United Kingdom	3.1	4.7	4.9	2.6	2.9	2.3	3.8	13.1	21.0
United States of America	0.0	4.8	2.6	0.0	10.4	6.4	-	45.5	107.5
Zimbabwe	0.0	3.0	1.0	0.0	22.7	2.9	-	159.0	132.5
Total of Above	**88.1**	**84.8**	**90.9**	**87.7**	**88.5**	**90.7**	**4.6**	**21.1**	**44.6**

Source: Ibid

Table-3.14

Share of Peas, Dry Exporting Countries in the World (%)

Country	Quantity 1985	Quantity 1995	Quantity 2005	Value 1985	Value 1995	Value 2005	Per Unit Value Rs./Kg 1985	Per Unit Value Rs./Kg 1995	Per Unit Value Rs./Kg 2005
Australia	2.5	3.5	3.0	2.3	4.0	3.7	3.2	8.1	10.6
Canada	7.5	27.4	58.7	7.5	24.7	51.4	3.4	6.4	7.6
Denmark	17.8	1.7	0.9	15.7	2.3	0.9	3.0	9.5	8.9
France	39.5	27.4	12.1	35.5	26.4	11.5	3.1	6.8	8.2
Germany	0.5	0.9	1.9	1.0	1.5	2.0	7.0	12.0	9.1
Myanmar	0.0	0.2	0.1	0.0	0.5	0.2	-	14.5	14.8
Russian Federation	0.0	4.2	2.2	0.0	3.1	1.4	-	5.2	5.6
Ukraine	0.0	13.4	4.3	0.0	10.0	3.1	-	5.3	6.2
United Kingdom	4.4	1.2	0.8	5.1	1.5	1.5	3.9	8.7	16.4
United States of America	7.7	3.2	9.4	10.5	6.1	11.2	4.6	13.6	10.3
Total of Above	**80.0**	**83.2**	**93.4**	**77.6**	**80.1**	**87.1**	**3.4**	**7.1**	**8.6**

Source: Ibid

Next, we would analyse growth performance of exports and imports of green and dry peas. An analysis of Tables 3.17 and 3.18 points out that exports of green peas grew at the rate of 7.34% per annum between 1985-2005 and coefficient was found significant at zero level of probability. The growth rate of its value was almost higher by 2% at the global level. Out of the two selected periods, performance in period-I was commendable in quantity as well as in value terms. The highest growth of green peas exports was observed in Guatemala and coefficient was significant. However, growth rate in terms of value here was much lower and found less than half and insignificant. It could be attributed to the price differentials. China and Germany also indicated higher growth rates in the exports of green peas during the study period but this growth was impressive for Tanzania in value terms.

In case of dry peas exports, growth performance was impressive for Myanmar, Canada and Germany. In particular, differential in growth rate of quantity and value was significant for Myanmar during the study period. At the global level, annual growth rate of dry peas exports was 3.42% per annum between 1985-2005. But, it was dismal in value by indicating a growth rate of merely 0.38% per year. Out of the two selected periods, period-I was impressive but negative growth during the II period-depressed growth for the entire study period (Table-3.18).

Growth of green peas imports at the global level was commendable by indicating an annual increase of 9.51% per year and its coefficient was found significant at below 5% level of probability. Spain, Malaysia, Italy and Germany registered an impressive growth rate of more than 10% per year. In value terms, Germany was the leading countrie. Period-I was observed far superior than second period in terms of growth in quantity as well as in the value of green peas imports (Table3.19).

The imports of dry peas registered 3.43% annual growth at the world level. It was however merely 0.60% per year for the value. Spain and China indicated higher growth in comparison to other trading countries. It was as high as 28.17% per year in case of Spain (Table 3.20).

Instability index of green peas exports exceeded green as well as dry beans at the global level. It was 22.4% for quantity and 26.2% for value of exports. A comparison of uncertainty in exports of green peas in the first and second period in different countries revealed mixed results. It was extremely high for Germany.

Especially, instability index during the first period was as high as 11737.9. Other countries except Mexico also showed more than 25% instability index (Table 3.20).

Instability index of green peas imports was around 20% for the quantity and 13.7% for the value at the world level. The most notable feature in this case was below 9% II index of import value in the second period at the global level. Again, Germany indicated very high instability in imports of green peas. Other countries except Italy indicated II index less than 35% that is also quite high (Table 3.21).

Instability index of dry peas exports at the global level was estimated lower than green peas. In fact, II index has showed reverse direction. It was higher in the second period for quantity, while opposite was observed in the case of value. Among the exporting countries, Germany followed by Australia indicated higher instability in comparison to other countries. Instability index of dry peas imports was slightly lower than green peas imports at the global level. Between selected two periods, instability was lower in the second period and the same was true for value. Among the Importing countries, highest uncertainty was estimated for Pakistan. It could be due to fluctuations in domestic demand, which determined quantity of imports (Table 3.22)

III. Lentil

Lentil is the third ranking crop in world trade of pulses. Tables 3.23 and 3.24 present share of important countries in the world exports and imports of lentil. A perusal of tables indicates that Turkey with 44.3% and 43.6% share in quantity and value in the world exports was leading country in 1985. After two decades in 2005, Canada overtook Turkey and acquired around 41% share in world exports. India became second ranking country with 20% share in quantity and 23.6% share in value. Per unit value of lentil at the global level was Rs.6.8 in 1985 and more than doubled during the study period.

A large number of countries import lentil. It could be due to preference of consumers and demand for this highly nutritive pulse and short domestic supply in these countries. It may be mentioned that India was the largest importer and constituted 21.6% and 17.6% share of the world imports in quantity and value terms in 1985. Other importing countries indicated less than 10% share in quantity as well as in value terms. After two decades, Bangladesh became the leading importer with 10.5% and 12.1 per cent global share in quantity and value terms. Per unit value of lentil was Rs. 6.8 in 1985 and reached to Rs.21.9 in 2005. It indicated almost triple increase at the global level.

Table-3.15

Share of Peas, Green Importing Countries in the World (%)

Country	Quantity 1985	Quantity 1995	Quantity 2005	Value 1985	Value 1995	Value 2005	Per Unit Value Rs./Kg 1985	Per Unit Value Rs./Kg 1995	Per Unit Value Rs./Kg 2005
Belgium	0.0	0.0	32.9	18.0	7.9	10.0	-	-	15.9
Canada	11.5	3.3	3.9	11.4	5.2	7.3	8.2	54.2	98.6
China	0.0	4.0	1.7	0.0	2.9	1.0	-	25.1	30.7
Cuba	0.0	0.0	0.0	0.0	0.0	0.0	-	15.0	-
France	11.0	5.5	2.6	17.2	8.5	5.0	12.9	53.3	99.9
Germany	3.0	2.2	1.9	2.7	3.9	4.9	7.3	60.2	136.6
Indonesia	0.0	0.0	2.9	0.0	0.0	0.5	-	40.1	9.6
Italy	0.1	0.7	1.4	0.3	0.4	0.5	16.1	22.3	18.1
Malaysia	0.0	9.2	2.5	0.0	2.5	2.3	-	9.3	47.2
Netherlands	5.0	9.9	11.5	2.5	8.6	14.7	4.2	30.0	66.6
Poland	0.0	0.9	1.2	0.0	0.2	0.2	-	8.7	7.2
Spain	0.0	1.5	1.3	0.0	0.5	0.5	-	10.2	19.8
United Kingdom	2.4	6.4	6.4	5.3	15.5	22.3	18.0	83.4	183.5
United States of America	20.2	9.8	14.1	36.1	11.6	13.7	14.8	41.1	50.7
Total of Above	**53.2**	**53.5**	**84.4**	**93.4**	**67.6**	**82.9**	**8.3**	**34.6**	**52.4**

Source: Ibid

Table-3.16

Share of Peas, Dry Importing Countries in the World (%)

Country	Quantity			Value			Per Unit Value Rs./Kg		
	1985	1995	2005	1985	1995	2005	1985	1995	2005
Bangladesh	0.0	0.7	2.4	0.0	0.7	2.1	-	7.4	8.9
Belgium	0.0	0.0	9.6	12.2	15.7	7.5	-	-	7.8
Canada	0.5	0.2	2.1	1.0	0.6	1.6	7.3	20.2	7.7
China	0.9	0.7	6.4	0.5	0.8	6.0	2.1	9.1	9.3
Colombia	1.3	1.1	1.0	1.7	1.1	1.0	5.0	7.8	9.8
Cuba	0.0	0.8	1.6	0.0	1.0	2.0	-	10.5	11.8
Germany	23.4	11.9	0.6	19.4	9.8	1.2	3.1	6.4	17.8
India	0.0	5.0	19.9	0.0	6.9	20.2	-	10.8	10.0
Italy	2.5	5.4	4.3	3.7	4.6	3.7	5.7	6.6	8.6
Netherlands	35.7	19.7	5.0	28.7	17.1	4.3	3.0	6.7	8.4
Pakistan	0.5	3.1	2.4	0.7	3.8	2.5	5.2	9.6	10.2
Spain	0.3	15.5	25.4	0.7	12.5	18.9	9.8	6.2	7.4
United States of America	0.6	1.0	1.3	0.9	1.7	2.5	5.8	13.0	18.4
Total of Above	**65.7**	**65.0**	**82.2**	**69.4**	**76.4**	**73.5**	**3.8**	**7.7**	**9.9**

Source: Ibid

Table-3.17

Country wise Growth of Peas Green Exports (1985-2005)

(% per annum)

	EXPORTs (QUANTITY)			EXPORTs (VALUE)		
Country	**I G.Rate**	**II G.Rate**	**III G.Rate**	**I G.Rate**	**II G.Rate**	**III G.Rate**
China	20.59*	5.12*	9.29*	0.48	4.59*	2.68*
France	13.53*	-6.42	5.78*	11.29*	-3.21	4.93*
Germany	-8.37*	5.47	8.91	0.08	18.76*	18.52
Guatemala	-55.32*	31.23*	16.50*	-47.81*	39.40*	7.33
Italy	7.47*	-7.10*	-0.35	10.72*	-6.96*	0.35
Kenya	-8.41	2.72	5.03	-73.82	165.18**	37.95
Mexico	-5.38*	0.37	0.29	-1.30	95.77	2.70
Netherlands	-6.80	12.54**	-1.92	4.26	19.39*	7.11*
Spain	-2.86	-2.01	-0.24	11.15*	-2.89*	5.31*
Tanzania, United Rep of	Data not available			-4.30	87.94*	57.51*
United Kingdom	10.48**	13.15*	5.80*	13.33	6.12	4.71*
United States of America	18.85**	-5.84*	3.47	24.37	0.26	6.04*
Zimbabwe	23.03	-15.43	-4.83	59.99*	-20.65	-1.88
WORLD	11.04*	4.85*	7.34*	16.81*	6.43*	9.16*

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid

Table-3.18

Country wise Growth of Peas Dry Exports (1985-2005)

(% per annum)

	EXPORTs (QUANTITY)			EXPORTs (VALUE)		
Country	**I G.Rate**	**II G.Rate**	**III G.Rate**	**I G.Rate**	**II G.Rate**	**III G.Rate**
Australia	9.42	-3.56	1.55	8.58	-4.20	1.15
Canada	20.93*	6.06*	15.58*	17.91*	4.68**	13.69*
Denmark	-4.79	-5.88*	-8.50*	-6.87**	-7.95*	-10.55*
France	8.28*	-7.21	-0.79	4.12	-7.77*	-4.87*
Germany	4.48	6.26*	13.58*	3.11	1.84	5.51*
Myanmar	206.39**	-0.17*	27.59*	178.15**	-3.65	56.72*
United Kingdom	-8.39**	-0.74	-5.91*	-10.49**	0.44	-6.61**
United States of America	0.16	7.80*	2.13*	0.49	2.78	0.54
WORLD	8.91*	-0.13	3.42*	5.02*	-1.20	0.38

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid

Table-3.19

Country wise Growth of Peas Green Imports (1985-2005)

(% per annum)

	IMPORTs (QUANTITY)			IMPORTs (VALUE)		
Country	I G.Rate	II G.Rate	III G.Rate	I G.Rate	II G.Rate	III G.Rate
Belgium	NA	NA	NA	4.69**	10.38*	8.24*
Canada	2.62*	6.85*	5.05*	8.84*	9.09*	7.58*
China				144.52*	-7.08*	18.64*
France	2.66	0.65	0.99	7.11*	2.09	2.49*
Germany	7.40	4.19	11.58	16.45	7.57*	22.71
Italy	23.47*	31.07*	13.85*	16.99*	19.89*	9.31*
Malaysia	76.97	4.34	19.69*	59.64*	8.08**	20.87*
Netherlands	18.56*	9.16*	9.11*	30.30*	15.21*	16.19*
Spain	81.87	3.49	23.28*	61.18*	5.40	18.23*
United Kingdom	18.74	3.22	10.59*	24.76*	5.73	14.12*
United States of America	2.68*	10.54*	4.60*	1.97	8.27*	3.48*
WORLD	**10.50***	**7.56***	**9.51***	**14.57***	**6.09***	**9.26***

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid

Table-3.20

Country wise Growth of Peas Dry Imports (1985-2005)

(% per annum)

	IMPORTs (QUANTITY)			IMPORTs (VALUE)		
Country	I G.Rate	II G.Rate	III G.Rate	I G.Rate	II G.Rate	III G.Rate
Bangladesh	NA	NA	NA	-13.48	8.48	14.28*
Belgium	NA	NA	NA	7.11*	-8.62*	-2.34
Canada	1.73	23.13*	9.68*	3.44**	10.55*	5.50*
China	4.43	8.78	12.23*	10.22*	6.31	13.07*
Colombia	8.21*	1.05	3.738	0.93	0.50	1.68*
Cuba	NA	NA	NA	-5.78	-1.49	11.84
Germany	3.38	-20.34*	-13.29*	-1.57	-15.23*	-13.63*
India	-9.12	20.09*	6.58*	-6.33	15.83*	5.97*
Italy	6.14	1.23	9.078	0.02	0.54	4.59*
Netherlands	4.09*	-12.92*	-6.308	0.84	-14.61*	-10.22*
Pakistan	6.95	7.94	9.90*	2.97	2.46	6.05
Spain	84.53*	1.71	28.17*	58.29*	0.50	19.70*
United States of America	12.83*	2.96	7.72*	13.15*	4.75*	8.08*
WORLD	**8.70***	**0.72**	**3.43***	**4.06***	**0.13**	**0.60**

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid
For Bangladesh and Belgium quantity data are not available.

Table-3.21

Instability in Trade of Peas, Green

(%)

	Exports (Quantity)			*Exports (Value)*		
Country	**1985-95**	**1995-05**	**1985-05**	**1985-95**	**1995-05**	**1985-05**
Austria	-	391.6	-	-	246.7	-
Belgium	-	-	-			
China	-	24.9	-	-	18.0	-
Czech Republic	-	225.4	-	-	191.5	-
France	46.5	88.5	71.7	41.4	56.1	51.5
Germany	11737.9	89.0	2917.8	140475.4	40.2	16825.2
Guatemala	-	166.7	-	-	145.0	-
India	-	217.3	-	-	193.5	-
Italy	36.6	31.9	36.0	23.3	19.4	24.0
Kenya	-	282.8	-	-	20262.0	-
Mexico	19.8	29.9	25.3	107.8	245947.4	25503.9
Netherlands	91.1	125.2	109.5	64.9	35.0	52.1
Peru	-	105.9	-	-	89.2	-
Russian Federation	-	-	-	-	-	-
Spain	72.0	19.4	49.7	51.6	18.0	37.8
Syrian Arab Republic	-	252.0	-	-	-	-
Tanzania, United Rep of	-	-	-	-	2641.3	-
Ukraine	-	1091.5	-	-	844.7	-
United Kingdom	86.9	77.3	82.7	86.2	57.1	72.8
United States of America	-	30.2	-	-	19.7	-
Zimbabwe	-!	336.8	-	-	519.7	-
WORLD	22.4	21.3	22.4	27.8	23.3	26.2
	Imports			***Imports***		
Belgium	-	-	-	29.1	39.7	34.7
Canada	29.2	10.7	22.1	9.4	10.2	9.9
China	-	35.3	-	-	29.4	-
Cuba	-	-	-	-	-	-
France	31.6	22.3	27.4	28.0	17.2	23.4
Germany	7476.7	68.5	2080.9	188692.8	22.9	20669.7
Indonesia	-	297.7	-	-	150.7	-
Italy	191.6	138.9	165.8	109.6	82.7	96.8
Malaysia	-	303.3	-	-	77.2	-
Netherlands	71.4	26.0	51.9	34.4	20.7	29.6
Poland	-	462.8	-	-	430.4	-
Spain	-	144.8	-	-	103.6	-
United Kingdom	20.6	23.1	23.6	21.4	31.3	28.2
United States of America	10.6	9.7	10.6	26.6	17.1	22.4
WORLD	20.2	20.1	20.4	16.1	9.0	13.7

Source: Ibid

Table-3.22

Instability in Trade of Peas, Dry

(%)

	Exports (Quantity)			*Exports (Value)*		
Country	**1985-95**	**1995-05**	**1985-05**	**1985-95**	**1995-05**	**1985-05**
Australia	83.3	83.2	84.0	59.7	65.3	63.3
Canada	31.4	52.7	43.8	23.5	36.6	31.4
Denmark	64.7	70.6	67.9	46.7	57.6	52.3
France	30.6	31.0	32.0	36.7	29.5	34.2
Germany	251.7	71.6	163.4	320.4	46.4	186.2
Myanmar	-	199.0	-	-	154.4	-
Russian Federation	-	310.7	-	-	244.3	-
Ukraine	-	167.2	-	-	137.0	-
United Arab Emirates				-	207.0	-
United Kingdom	89.6	39.4	66.5	96.7	36.9	69.6
United States of America	19.7	30.1	26.0	16.4	22.0	19.5
WORLD	12.8	20.6	17.9	14.9	13.8	14.9
	Imports			***Imports***		
Bangladesh	-	106.9	-	-	64.3	-
Belgium	-	-	-	27.9	29.6	30.4
Canada	17.1	45.7	35.9	16.9	21.0	19.6
China	46.3	98.3	75.0	43.7	89.6	68.5
Colombia	32.9	34.4	34.0	26.7	29.4	28.1
Cuba	-	86.5	-	-	69.7	-
Germany	21.9	74.1	56.0	30.7	47.2	41.7
India	-	84.1	-	-	93.7	-
Italy	88.3	38.8	67.0	69.0	26.1	50.6
Netherlands	14.5	52.7	38.4	27.1	39.6	35.0
Pakistan	252.5	302.9	280.6	280.2	207.9	246.4
Spain	84.2	75.3	87.3	69.5	73.1	75.1
United States of America	18.3	12.5	17.1	18.8	14.4	17.6
WORLD	20.4	16.6	19.3	18.2	15.1	17.1

Source: Ibid

Tables 3.25 and 3.26 present growth performance of lentil exports and imports at the global level. The global exports of lentil grew at the rate of 5.97% per annum during the study period and coefficient was significant. The results were almost similar for value of global exports of lentil. Among the important exporting countries, Australia indicated an amazing growth rate of 59.27% per annum in quantity and 30.55% per year in value terms and coefficients were found significant at below 5% level of probability. China and India also indicated impressive growth of more than 30% per annum during the study period. In all these cases, period-I was observed far superior than period-II. It implies that post WTO period was not very impressive for the world exports of lentil.

Having analysed export performance of lentil, we would also examine growth of imports. The world lentil imports in quantity and value terms grew at the rate of 7.07 and 6.05% per year with a significant coefficient. Bangladesh registered the highest growth rate i.e. 53.63% per annum during the study period. Other countries with more than 10% per year growth were Chile, Germany, Mexico, Pakistan, Peru, Sri Lanka, Sudan and the US. A larger number of importing countries imply high demand for lentil and short supply in these countries.

Instability index of lentil was observed higher than beans and peas. It was 25.6% during the reference period at the global level. Syria, Arab Republic and Nepal indicated extremely high uncertainty in lentil exports. India and Turkey also showed instability index above 60%. The uncertainty in lentil imports was lower than exports in quantity terms at the global level. It is interesting to note that II index for value was almost the same at the global level. Out of the two selected periods, period I showed higher instability index. The countries with very high instability in lentil imports were Bangladesh, Egypt, Germany, India, Iraq, Mexico and Pakistan. It is essential to point out that degree of uncertainty was extremely high in Germany.

Table-3.23

Share of Lentil Exporting Countries in the World (%)

Country	Quantity			Value			Per Unit Value Rs./Kg		
	1985	1995	2005	1985	1995	2005	1985	1995	2005
Australia	0.0	0.1	7.7	0.0	0.1	7.6	-	16.4	19.4
Canada	12.5	38.3	41.2	11.0	35.5	36.2	6.0	12.8	17.3
China	0.0	6.7	2.7	0.0	3.7	1.8	-	7.7	12.8
India	0.1	3.0	20.0	0.1	4.6	23.6	7.0	21.6	23.2
Nepal	7.9	1.3	1.0	5.2	1.6	1.2	4.5	17.4	22.1
Syrian Arab Republic	1.4	8.0	3.0	1.8	7.3	2.0	8.5	12.7	13.3
Turkey	44.3	18.6	8.4	43.6	22.6	11.3	6.7	16.8	26.5
United Arab Emirates	0.0	0.5	0.4	0.0	0.5	0.4	-	14.3	21.9
United States of America	13.7	13.7	11.8	15.8	12.3	10.8	7.9	12.4	18.0
Total of Above	**79.9**	**90.1**	**96.1**	**77.5**	**88.1**	**94.8**	**6.8**	**13.8**	**19.7**

Source: Ibid

Table-3.24

Share of Lentil Importing Countries in the World (%)

	---------- Quantity ----------			---------- Value ----------			---Per Unit Value Rs./Kg---		
Country	**1985**	**1995**	**2005**	**1985**	**1995**	**2005**	**1985**	**1995**	**2005**
Algeria	4.9	4.6	6.3	5.0	5.4	6.1	7.0	17.8	21.1
Bangladesh	0.3	0.0	10.5	0.3	0.0	12.1	6.1	12.2	25.3
Chile	0.0	1.3	1.1	0.0	1.4	0.9	-	16.1	19.0
Colombia	2.8	5.0	4.7	3.0	3.2	3.1	7.3	9.7	14.3
Ecuador	0.3	1.2	1.4	0.3	1.1	1.2	7.4	13.5	18.9
Egypt	1.0	4.6	5.7	1.3	5.6	5.8	9.3	18.6	22.3
Ethiopia	0.0	0.6	3.5	0.0	0.4	3.3	-	10.0	20.4
France	6.3	6.2	2.3	6.0	5.2	2.2	6.5	12.8	20.4
Germany	4.2	2.8	1.5	4.9	3.4	1.9	7.9	18.7	28.0
India	21.6	3.8	2.6	17.6	4.3	2.2	5.5	17.0	19.0
Iraq	5.3	1.3	3.8	3.6	0.8	5.1	4.6	9.3	29.6
Italy	7.6	3.4	2.0	8.6	4.0	2.2	7.6	17.7	24.2
Mexico	0.1	1.6	2.2	0.3	1.5	1.8	13.6	14.7	18.6
Morocco	0.0	3.2	2.5	0.0	3.8	2.3	-	18.0	19.7
Pakistan	1.8	3.6	3.6	2.2	2.0	3.4	8.4	8.4	20.5
Peru	0.5	2.2	1.9	0.9	1.7	1.9	11.3	11.3	22.9
Saudi Arabia	4.1	1.8	2.3	4.5	0.0	1.1	7.6	0.0	10.2
Spain	7.4	9.5	3.9	9.4	10.6	3.4	8.6	16.9	19.4
Sri Lanka	0.0	9.0	5.8	0.0	11.5	6.2	-	19.4	23.5
Sudan	0.5	3.1	4.1	0.8	1.8	4.2	9.9	9.0	22.6
Turkey	0.0	1.9	4.6	0.0	2.1	4.2	-	16.0	20.1
United Arab Emirates	0.0	1.3	2.2	0.0	1.9	2.1	-	22.7	20.8
United Kingdom	3.8	1.2	1.4	4.1	1.4	2.1	7.3	18.0	33.0
United States of America	0.3	0.7	1.0	0.4	1.0	1.3	9.3	21.8	28.8
Total of Above	**72.7**	**74.2**	**80.7**	**73.3**	**74.1**	**80.1**	**6.8**	**15.2**	**21.9**

Source: Ibid

Table-3.25
Country wise Growth of Lentil Exports (1985-2005)

(% per annum)

	EXPORTs (QUANTITY)			EXPORTs (VALUE)		
Country	**I G.Rate**	**II G.Rate**	**III G.Rate**	**I G.Rate**	**II G.Rate**	**III G.Rate**
Australia	19.43	184.76*	59.27*	30.55	227.09*	57.94*
Canada	19.74*	4.75*	11.40*	16.97*	4.47*	10.60*
China	277.97**	4.30	40.81*	176.98*	3.75	30.13*
India	48.44*	18.26*	35.82*	44.87*	14.75*	31.79*
Nepal	-0.10	3.89	0.50	-39.79	-26.85	0.65
Syrian Arab Republic	24.04	-9.59	7.93**	-63.21	85.69	10.82
Turkey	-3.11	-0.87	-3.44*	-3.13	-1.52	-2.57*
United Arab Emirates	-4.65	16.88*	9.35*	-9.80*	14.44*	6.10**
United States of America	11.55*	7.29*	6.49*	6.10**	7.59*	4.45*
WORLD	7.47*	5.68*	5.97*	4.19*	5.52*	5.26*

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid

Table-3.26

Country wise Growth of Lentil Imports (1985-2005)

(% per annum)

	IMPORTs (QUANTITY)			IMPORTs (VALUE)		
Country	**I G.Rate**	**II G.Rate**	**III G.Rate**	**I G.Rate**	**II G.Rate**	**III G.Rate**
Algeria	4.91	5.23*	6.05*	3.35	0.40	6.09*
Bangladesh	10.35	54.82*	53.63*			
Chile	44.55*	4.31*	17.95*	39.16*	4.03*	15.88*
Colombia	11.42*	6.47*	6.95*	3.18	7.28*	5.72*
Ecuador				104.18	8.18*	48.44*
Egypt	12.41	4.65***	6.84***	7.50	3.00	5.61*
Ethiopia				54.34**	-29.50	-1.96
France	7.14*	-1.55**	1.27**	4.63*	-0.79	0.60
Germany	2.13	0.14	10.06	2.30	0.71	14.80
India	-12.32	6.70	2.78	-10.21	5.14	3.26
Iraq	-16.06	22.00	-5.71	-17.88	28.55	-6.81
Italy	0.96	2.13*	1.50*	0.24	1.86	0.70
Mexico	37.35*	7.04*	18.96*	27.15*	108.54	12.91
Pakistan	12.79	10.38*	12.43***	6.10	11.14*	11.08*
Peru	24.02*	3.37**	12.05*	12.25	6.04*	9.65*
Saudi Arabia	1.09	8.65*	3.60*			
Spain	11.57*	-2.38*	2.62*	8.40*	-3.51**	1.14
Sri Lanka	85.20	4.04*	17.24*	82.60	-0.34	14.91*
Sudan	32.38*	9.13*	10.44*	16.99*	14.40*	8.23*
United Arab Emirates	9.22**	8.54	7.41*	2.39	2.74	2.56
United Kingdom	0.10	5.40*	1.68*	-0.99	6.35*	2.15*
United States of America	16.75*	6.68**	12.14*	14.11*	7.81*	10.94*
WORLD	**7.29***	**6.84***	**7.07***	**4.42***	**6.11***	**6.05***

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid

For Ecuador, Ethiopia, Morocco and Turkey, quantity data are not available.

Table-3.27

Instability in Trade of Lentil

(%)

Country	Exports (Quantity)			Exports (Value)		
	1985-95	1995-05	1985-05	1985-95	1995-05	1985-05
Australia	-	3781.1	-	-	49660.7	-
Canada	35.7	21.2	30.4	27.1	22.0	25.6
China	-	73.5	-	-	56.3	-
India	35.2	96.9	70.4	59.8	97.4	81.2
Nepal	96.9	71.6	85.1	-	384633.6	2316303.7
Syrian Arab Republic	419.6	103.4	259.0	502144.6	634472.6	565497.5
Turkey	80.1	51.2	66.3	53.1	48.0	50.6
United Arab Emirates	-	169.6	-	-	127.9	-
United States of America	22.9	35.4	29.8	41.5	23.9	33.5
WORLD	35.7	10.5	25.6	26.8	12.7	20.7
	Imports			**Imports**		
Algeria	112.6	48.3	82.6	128.0	84.9	106.9
Bangladesh	28429.8	245.6	5987.4	-	-	-
Chile	-	25.8	-	-	28.8	-
Colombia	68.9	31.6	52.2	69.9	36.4	54.4
Ecuador	-	17.4	-	31411.3	13.8	5751.1
Egypt	194.5	43.0	124.2	243.1	44.4	148.8
Ethiopia	-	281.3	-	-	501760.6	-
France	12.6	16.9	16.0	18.6	19.0	19.0
Germany	23026.6	22.1	4607.8	384213.8	25.6	34233.9
India	429.3	206.1	313.9	396.7	233.2	313.0
Iraq	383.2	2229.7	1109.0	382.2	3423.2	1479.0
Italy	12.5	8.9	10.8	19.0	13.1	16.4
Mexico	104.5	22.5	71.2	64.1	308623.2	29572.2
Morocco	-	126.5	-	-	137.1	-
Pakistan	210.0	69.6	142.0	233.4	70.3	154.0
Peru	57.7	28.8	45.9	54.5	28.0	42.5
Saudi Arabia	22.3	25.3	24.6	-	-	-
Spain	23.8	13.9	20.6	32.5	13.1	25.0
Sri Lanka	-	17.4	-	-	27.1	-
Sudan	138.2	38.2	93.4	118.3	51.9	87.1
Turkey	-	262.0	-	-	225.9	-
United Arab Emirates	-	110.0	-	-	99.2	-
United Kingdom	28.9	20.8	26.1	21.5	22.1	23.9
United States of America	23.4	35.6	30.2	29.1	26.9	28.2
Unspecified	-	359.3	-	-	318.9	-
WORLD	27.7	12.0	21.0	27.6	10.9	20.6

Source: Ibid

IV. Total Pulses

After analyzing world trade at the individual pulse level, we would examine trade scenario for total pulses Tables 3.28 and 3.29 present the country wise exports and imports of pulses. It may be noted that exporting countries of pulses were only few. In 1985, the UK was the leading exporter of pulses. After a decade in 1995, Myanmar, China and the UK acquired around 77% of the world market. In 2005, share of Myanmar was found more than 50% in world exports of pulses. India also captured 13.2% share of world pulse exports. The per unit value of pulses rose from Rs. 3.4 in 1985 to Rs. 7.9 in 2005.

The number of importing countries of pulses is relatively large. In 1985, India with 11.4% share in world pulse imports was the main importer. After a decade, India's share in world imports of pulses reached to 51.7%. The United Arab Emirates and Pakistan were the other two important importers. In 2005, India's share rose further and became almost 62% of world imports. The share of other countries, however declined and none of the importing countries crossed even 5% mark except Pakistan. The per unit value of world pulse imports was Rs. 5.3 in 1985 and almost trebled in 2005.

A perusal of the growth performance of world pulse exports in Table 3.30 indicates a growth rate of 7.22% per annum for quantity between 1985-2005. However, it was less than half in value terms. The coefficient for the quantity as well as value was significant. Out of the two periods, growth rate in the second period was observed more than 10% per annum and the coefficient was significant. The growth performance of India in pulse exports with 28.67% per annum increase was found impressive. China and Mynamar were other two important countries indicating more than 20% per year growth in pulse exports.

Growth rate of pulse imports at the global level was 22.67% per year in quantity terms between 1985 and 2005. A contrast was observed between the selected two periods. The growth rate was observed as high as 21.64% per year in the second period while it was negative in the first period. India followed by Spain indicated a growth rate of around 20% per annum during the reference period. The growth rate of pulse imports in India was higher in first period in comparison to the second period. Spain showed almost similar growth for both the periods.

Exports instability behaviour of total pulses diverged from individual pulse varieties at the global level. The instability index was 48.5% for the quantity and 30.8% for the value during the study period. The level of uncertainty was equally higher in quantity as well as in value terms during II period and I period. Among the important countries, estimated instability index was higher for Pakistan, India, China and the UK. The uncertainty level of imports of total pulses was estimated lower than that of exports at the world level during the study period. It was lower for the quantity in both the selected periods but in value terms, divergence was noticed across the selected two periods. It is surprising that Germany indicated exceptionally high instability index.

Section-2

Implications of World Pulse Production and Trade Levels for India

Any discussion of the possible implications of changes in world pulse production and trade for India must begin by noting two important facts. The first which is mentioned earlier that global pulse production has risen at a very slow pace of 0.48% per annum between 1985-2005. Second, world pulse trade like other agricultural commodities occurs in a highly imperfect setting, where, as a result of tariff and non-tariff barriers imposed by the developed and developing countries alike, world trade is determined by the surpluses and deficits in the countries which indulge in world trade. Often these factors do not influence world consumption and production. Moreover, consumption is driven by individual preferences; price level of own good and its substitutes while production is determined by profitability agro-climatic conditions and level of technological adoption by the farmers.

We have earlier mentioned that India is the largest producer and consumer of pulses in the world. Owing to inadequate domestic production, share of India has risen enormously in the global imports of pulses. It was as high as 61.7% in quantity and 63.9% in value terms during 2005. Some improvement has also been noticed in share of India in world pulse exports and its share has reached to 13.2% in terms quantity in 2005. Table 3.27 and 3.28 show that India's involvement in

world pulse trade has been rising but high imbalance has been observed between India's share in world exports and imports.

It is evident from above Tables that both Indian imports and exports of pulses have increased significantly between 1985 and 2005 as a share of world trade. This trend has been much more marked for imports than for exports. The reason for this is that the pattern of Indian agricultural growth since the onset of the green revolution in the mid sixties has been dominated by rice and wheat due to food security and self-sufficiency reasons. As a result, priority was given to reduction in imports through increased domestic production of major cereals. Success in this import substitution endeavour has been the main reason for the decline in India's imports of agricultural commodities such as wheat but imports of edible oils and pulses have risen many folds due to slow growth of domestic production over the past few decades. Also, exports of pulses have risen but at a slow rate. The reason being that the Green revolution while reducing the supply deficit of foodgrains, did not lead to generation of technology for these crops. Since, the emphasis on cereals in national agricultural policy distracted policy makers from paying greater attention to pulses and edible oils, the long-term problems occurred and India is presently dependent on imports for both these essential food commodities to cover up rising growth of domestic demand.

Thus, dwindling share of India in world pulse trade reflects a failure of domestic production as a result of a deliberate pursuit of import substitution in order to achieve a perceived need to attain the goals of domestic food security. India's share in world pulse output has on the whole declined during the period when growth performance of wheat and rice has been commendable.

We have noticed that share of India in world pulse imports of different pulses varied. It has been small particularly in case of lentil imports and high in cases of dry peas and dry beans imports. Consequently, growth of Indian pulse imports is higher than world pulse imports.

The implications of low growth in domestic pulse production and world pulse trade are obvious. Although, India's share in world pulse imports at present is extremely high, an opening up of India's large agricultural sector to world trade may have large effect in the nature of the world equilibrium in areas of prices and subsequently output.

In a nutshell, a high share of India in world pulse imports means that trade liberalization by India would lead to big changes in world relative prices of pulses.

It is extremely difficult to analyse the implications and consequences of changes in world pulse production and trade for India because production of pulses is concentrated in a few countries and hence availability is extremely limited while imports are essential due to buoyant domestic demand. The longer run impact of changes in world pulse production and trade would be determined by an interaction of the changes in national and international trade policy, growth of domestic output, consumer preference and availability of alternative sources of protein to the Indian masses at the affordable prices.

We had proposed a hypothesis that world trade in pulses is low and instable. Pulse trade at global level was found more than 10% of total production and that is not very low. Therefore, first part of our hypothesis is rejected at the global level. As far as, instability in global pulse trade is concerned, it was found high and therefore, second part of our hypothesis is accepted. For individual countries, results varied and therefore, it was accepted in some cases while for others, it was rejected.

Table-3.28

Share of Total Pulses Exporting Countries in the World (%)

Country	Quantity 1985	Quantity 1995	Quantity 2005	Value 1985	Value 1995	Value 2005	Per Unit Value Rs./Kg 1985	Per Unit Value Rs./Kg 1995	Per Unit Value Rs./Kg 2005
Afghanistan	7.2	0.0	0.6	9.1	0.0	0.0	4.3	-	0.0
China	0.5	18.2	1.3	1.1	30.3	5.3	7.8	11.0	32.4
India	0.3	9.6	13.2	0.4	33.5	44.8	3.5	23.0	26.9
Kyrgyzstan	0.0	0.0	2.5	0.0	0.0	0.0	-	-	0.0
Myanmar	0.0	48.3	51.6	0.0	0.0	0.0	-	0.0	0.0
Pakistan	0.4	0.1	4.0	0.7	0.3	7.8	6.0	22.0	15.4
United Kingdom	10.2	10.8	21.3	10.2	12.1	24.6	3.4	7.4	9.1
Total of Above	**18.6**	**87.1**	**94.6**	**21.6**	**76.3**	**82.5**	**3.4**	**6.6**	**7.9**

Source: Ibid

Table-3.29

Share of Total Pulses Importing Countries in the World (%)

Country	Quantity 1985	Quantity 1995	Quantity 2005	Value 1985	Value 1995	Value 2005	Per Unit Value Rs./Kg 1985	Per Unit Value Rs./Kg 1995	Per Unit Value Rs./Kg 2005
China	4.3	2.4	4.3	2.6	1.9	8.3	3.3	9.8	33.4
Egypt	0.0	0.1	3.7	0.0	0.1	0.0	9.8	10.2	0.0
India	11.6	51.7	61.7	8.2	64.7	63.9	3.7	16.0	17.9
Nepal	0.1	0.0	2.2	0.1	0.0	0.0	2.5	-	0.0
Pakistan	0.4	11.4	6.7	0.3	12.2	5.1	4.0	13.7	13.2
Spain	0.1	0.4	2.4	0.2	0.3	1.3	7.3	10.6	9.2
Turkey	0.0	0.0	1.3	0.0	0.0	1.9	-	16.7	25.4
United Arab Emirates	3.4	13.6	2.3	4.0	0.0	0.0	6.3	0.0	0.0
United States of America	0.0	5.7	3.4	0.0	6.4	7.9	-	14.3	40.7
Yemen	1.0	0.0	0.2	1.1	0.0	0.1	6.2	-	11.7
Total of Above	**20.8**	**85.4**	**88.1**	**16.5**	**85.5**	**88.5**	**5.3**	**12.8**	**17.3**

Source: Ibid

Table-3.30

Country wise Growth of Total Pulses Exports (1985-2005)

(% per annum)

	EXPORTs (QUANTITY)			EXPORTs (VALUE)		
Country	**I G.Rate**	**II G.Rate**	**III G.Rate**	**I G.Rate**	**II G.Rate**	**III G.Rate**
China	77.50*	-4.69	24.67*	59.78*	-4.86	14.41*
India	67.40*	12.40*	28.67*	76.43*	10.00*	29.66*
Myanmar	149.24*	11.11	23.74*	NA	NA	NA
Pakistan	-17.99**	118.66*	5.19	-19.10*	51.45*	1.91
United Kingdom	-4.07	25.50*	8.35*	-7.61	23.46*	4.25
WORLD	7.73*	11.06*	7.22*	0.75	8.82*	3.06*

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid

For Myanmar, value figures are not available

Table-3.31

Country wise Growth of Total Pulses Imports (1985-2005)

(% per annum)

	IMPORTs (Quantity)			IMPORTs (VALUE)		
Country	**I G.Rate**	**II G.Rate**	**III G.Rate**	**I G.Rate**	**II G.Rate**	**III G.Rate**
China	-11.33	8.18*	12.38	-10.29	15.07*	5.58**
Egypt	41.33*	31.10*	6.22	28.85**	94.03	12.54
India	22.30*	-4.14	21.64	24.74*	10.13	13.53*
Pakistan	23.01*	5.40	-3.56	23.04*	0.38	10.39*
Spain	19.04	21.64**	19.57	8.96	17.01	15.71*
Turkey				-34.06	47.56*	43.88*
United Arab Emirates	8.18*	12.38	8.57*			
United States of America	31.10*	6.22	0.93	18.61*	26.85*	14.12*
WORLD	**-4.14**	**21.64**	**22.67***	**-9.22***	**8.58***	**1.00**

Significant at below 5% (*) and below 10% (**) level of probability
Source: Ibid

Table-3.32

Instability in Trade of Total Pulses

(%)

	Exports (Quantity)			*Exports (Value)*		
Country	**1985-95**	**1995-05**	**1985-05**	**1985-95**	**1995-05**	**1985-05**
Afghanistan	-	-	-!	-	-	-
China	260.8	103.0	194.9	88.2	49.7	78.7
India	218.2	18.3	131.6	72.9	21.7	57.7
Kyrgyzstan	-	-	-			
Myanmar	-	123.9	-	-	-	-
Pakistan	158.2	4509.0	1551.7	183.3	304.2	250.3
United Kingdom	224.7	67.3	148.3	221.6	59.7	143.7
WORLD	52.5	44.3	48.5	42.6	14.4	30.8
	Imports			*Imports*		
China	155.4	174.5	166.6	147.5	152.3	153.2
Egypt	258.0	226.0	242.7	201.7	-	-
India	143.8	135.1	139.5	135.3	124.5	130.1
Nepal	-	-	-	-	-!	-
Pakistan	154.0	90.5	125.3	140.0	61.8	106.4
Spain	210.2	292.9	252.0	96.5	238.0	168.9
Turkey	-	262.1	-	-	240.8	-
United Arab Emirates	61.7	61.2	63.1	-	-	-
United States of America	-	296.6	-	-	181.3	-
Yemen	-	-	-	-	-	-
WORLD	40.3	40.8	41.2	32.7	43.9	39.4

Source: Ibid

Chapter-4

Summary and Conclusions

This chapter presents summary of findings and policy implications. The main focus of this research has been to analyse the growth performance including instability of global pulse production, trade and its implications for India. In view of large inter country differences; these issues have been also taken up at the global and country levels.

The specific objectives of the study are following:

(iv) to measure growth and instability in global pulse production.

(v) to analyse growth and instability in global pulse trade.

(vi) to suggest policy initiatives.

This study is based on secondary data obtained from the FAO web site. All the major pulse varieties, for which data are available, were covered in the study. The analysis covers a period from 1985-2005.

Main Findings:

I. Global Pulse Production:

Geographical Spread:

The most important pulse crops at the global level are beans, which include green gram, black gram and pigeon pea. India, Brazil, Myanmar, Mexico and China cover more than 60% of global acreage. These are also leading countries in production. Disparities in yield rates were found significant. The yield gap across the countries was as high as 15 qtl/ha.

Peas are the second important pulse crop grown at the world level. Canada, France, China, Russia and India are the leading producers. Like beans, yield rates of peas vary significantly and range between a high levels of 4452 kg/ha. in France and a low level of 757 kg/ha. in Ethiopia.

Chickpeas are fairly important as a pulse crop and widely grown in India Pakistan, Iran and Turkey. These countries together cover more than 80% of the global acreage and around 85% of production. The average yield at the world level was 770 kg/ha. which is much below the potential yield of 15-20 qtl/ha. None of the producing country achieved this yield rate.

Broad beans (kidney beans and cowpea) are the fourth ranking pulse crops in terms of production at the world level. China and Ethiopia are the leading producers. Coincidently, yield level of broad beans is second highest among pulses i.e. 1628 kg/ha.

Lentil is another pulse crop known for its high nutritive value. India, Canada and Turkey are the main producers. The yield levels vary significantly across the main producing countries. China with 1799 kg/ha. was the best performer.

After analyzing above mentioned pulse varieties, we had looked into area, production and yield of total pulses. Pulses are grown on around 69 million hectares of area and production was nearly 60 million tonnes of grain during 2005. India, China, Canada, Brazil and Nigeria are the important producers. Myanmar and Australia come next. The average yield of pulses at the world level was 862 kg/ha., which is much below the potential yield. In terms of yield, France, UK, US and Canada were the best performers. In France and Canada, this could be attributed to large share of peas which eventually show high yield rates in comparison to other pulses due to large availability of improved varieties and their higher adoption by the growers.

Growth Performance:

Growth performance in terms of area, production and yield of included pulse varieties at the global and individual country level varied significantly.

Growth rate of acreage of beans at the world level was found negative (0.49% per annum) between 1985-2005. It was poor in Thailand, India, Brazil, Indonesia and Burundi. On the other hand, Myanmar, Canada, Uganda, Nicaragua and Cameroon exhibited significant expansion in area. Production of

beans grew at more than 5% per annum in these countries. The main source of production growth was area expansion. Productivity growth was good in Iran and Brazil where it rose at more than 3% per annum during the study period.

It is surprising to observe that acreage of peas declined at 2.73% per annum at the global level despite higher level of yield. Some important countries such as Spain and Canada indicated more than 10% per year growth in area under peas. These countries also exhibited positive growth rate in production. Spain and Germany gained in production due to area expansion. India also achieved impressive growth in peas production due to yield improvement.

Area under chickpeas at the global level grew at the marginal rate of 0.35% per annum between 1985-2005; Iraq, Iran and Australia were the major gainers, while India and Mexico were the loosers. The production performance of Iraq, Ethiopia and Australia was commendable. Nevertheless, these gains partially compensated for the losses in some other countries and world production grew at around 1% per year during the study period.

The estimates of growth rates of area, production and yield of broad beans indicated that global area under broad beans declined at the rate of 0.83% per year during the study period. The second period was favourable while the first period indicated a negative growth. Australia, Peru and Sudan exhibited positive growth in area while Italy, Germany and Spain showed negative growth. Global production of broad beans increased at the marginal rate of 0.16% per year due to yield growth of 1% per annum during the reference period. The major contributors were Australia, Peru, Sudan, Ethiopia and France.

Lentil exhibited best growth performance among the included pulse crops. The area, production and yield grew at 1.69%, 2.31% and 0.88% per annum during the study period. Australia, Canada, China, US, Ethiopia and Iran exhibited exceptional growth in lentil production primarily due to area expansion.

Global production of total pulses registered a slow growth of 0.48% per annum between 1985 and 2005. Myanmar and Canada have exhibited more than 10% per annum growth. Nigeria, Ethiopia and Iran recorded between 3-7% growth in the same period. The leading producers such as India, China, the US

and Mexico indicated poor production growth. At global level, the second period with 0.90% per year growth was better than the first period with 0.48% per annum growth. Yield growth was primarily responsible for this marginal growth in pulse production. However, growth performance of yield was poor as it grew at the slow rate of 0.50% per year between 1985-2005. The poor production performance of pulses at the global level could be attributed to inadequate levels of research and development at the one hand and slow adoption of available improved varieties by the farmers on the other hand. In brief, neither area nor yield favoured pulses at the global level. As a result, production performance was found poor.

Instability in Global Pulse Production:

The following important points emerged from the analysis of instability in the production of pulses at the global level:

- Instability index of pulse production displayed high uncertainty at individual country level barring a few exceptions when I-I index was below 10%. It was however, low at the aggregate level.
- Instability behaviour of individual pulses is diverse. The crop of beans indicated lower production instability in comparison to other crops like broad beans and peas.
- Evidences of higher instability in yield at the crop level are much more than area except chickpeas, which has exhibited lower figure for yield. In five out of total six cases, yield variability is responsible for uncertain production at the global level.
- Range of instability in production of total pulses is quite wide at the country level. It was estimated to be as high as 39% in Australia. In contrast, it was found to be around 7.9% in Nigeria.
- Majority of analysed countries have indicated pulse production instability above the world level.

II. Global Pulse Trade:

Scenario:

The data on trade of different pulse varieties at the global and individual country level are available for green and dry beans, green and dry peas, lentil and total pulses. Around 6% of global pulse production was traded in 1985. Its share grew significantly and became 14% in 2005.

The leading exporters of green beans in 1985 were Spain, Mexico and Egypt but their shares shrunk over time and France attained leading position in 2005. Other major exporters are UK, Netherlands and Kenya. Per unit value of green beans exports has increased almost 10 times between 1985-2005. Spain, Belgium and France are the major importers of green beans. Price of green beans imports increased five folds during this period.

Dry beans were exported primarily by the US, Thailand and Argentina in 1985 but their shares in total world exports dropped overtime and China, Myanmar, the US and Canada together captured 67% share of world exports of dry beans. In eighties, Mexico and India were the major importers. India maintained its position of leading importer in 2005 but share of Mexico shrunk by almost 10% during this period. Netherlands followed by France & Mexico were the three largest exporters of green peas. After two decades, the highest share of green peas exports was acquired by Guatemala. Per unit value of exports increased ten folds during the study period. The US, Turkey and Canada were the three largest exporters of lentil in 1985. In 2005, Canada became the leading exporter. Turkey largely exported lentil in eighties but Canada overtook during the course of time and acquired 41% share of the world market. Bangladesh was the major importer of lentil in 2005.

Findings suggest that major exporters of pulses at the world level were few in 1985 and US was the leading exporter. Among the major exporters, share of Myanmar grew at the phenomenal rate and constituted more than 50% of

world pulse exports in 2005. India is the major importer of pulses and its share in world imports of pulses is around 60%.

Growth and Instability of Pulse Trade:

Growth rate of green beans exports in quantity and value terms was 6.09% and 9.10% per annum during the reference period. The first period was observed to be superior in comparison to the second period. In most of the exporting countries, growth was positive. Oman, UK, France and US were front-runners. On the other hand, growth of green beans imports was observed to be higher in comparison to exports. Spain and Italy imported at the highest rate.

Growth of dry beans exports and imports was much lower than green beans exports. It was around 3% per year in quantity and value terms. The exports of Nicaragua, Australia and Canada increased at the growth rate of more than 10% per year during the reference period. The imports of dry beans also grew at around 3% per annum at the global level. Among the major importers, Costa Rica, the US, Pakistan and Philippines etc. have exhibited expansion at more than 10% per year during the study period. The period beginning from 1985 to 1995 was observed to be far better than the second period from 1995-2005.

Green peas exports at the global level grew at the rate of 7.34 per year during the study period. The growth of value was even higher than this rate. Guatemala, China and Germany indicated higher growth in comparison to other exporting countries. The imports of green peas at the global level out performed exports and growth was around 10% per annum with a significant coefficient. Spain, Malaysia, Italy and Germany registered more than 10% growth during this period.

Lentil, another traded pulse crop showed 5.97% per year export growth at the global level between 1985-2005 Australia with 59.27% per annum growth was the leading country. China and India also indicated more than 30% per year growth in this period. The imports of lentil expanded at a lower rate in comparison to exports. Bangladesh registered an exceptional growth of 53.63% per year in the reference period.

Export growth of pulses at the global level was 7.22% per annum during the reference period. Growth rate in the second period was more than 10% per annum India, China and Myanmar indicated impressive growth of pulse exports during this period.

Results show that growth of pulse imports at the global level was as high as 22.67% per year between 1985-2005. The second period revealed a higher growth rate than the first period. India and Spain registered around 20% per year growth in pulse imports in this period.

The uncertainty level in world pulse trade calculated by log variance method suggests that it was 10.5% for green beans, 18 % for dry beans, 22.4..% for green peas,17.9% for dry peas,25.6.% for lentil' and 41.2% for exports of total pulses in quantity terms. The country level indices vary significantly. Pakistan, UK, China and India indicated relatively higher instability in pulse exports.

Policy Implications:

Findings of this study suggest that major proportion of pulse crops is grown and traded by a limited number of countries at the global level. Moreover, growth of global pulse production has been extremely slow between 1985-2005 and production grew at a minimal rate of less than 0.48% per year. Whatever, little growth was achieved; it was primarily due to yield enhancement. At the country level, results were mixed and both area expansion and yield were responsible for growth in pulse production. Furthermore, beans followed by chickpeas occupied the largest share of cultivated area and yielded around 58% of world pulse production. Peas with a share of 13% in global pulse area contributed almost double in production. Significant share of area under pulses was occupied by broad beans and lentil, which contributed almost 13% to global pulse production. The degree of instability in world production was found low but some of major producers revealed higher instability in pulse production.

World pulse trade has increased significantly between 1985 and 2005. Peas are the largest traded pulse variety and constituted around 50% of world pulse trade in 2005. In most of the cases, value has experienced faster growth in

comparison to quantity. The overall growth in pulse exports between 1985 and 2005 has been 7.22% per year in quantity and 8.82% per year in value terms, where as imports had registered 22.67% increase. In fact, decline in international prices of food commodities after 1995 has not made any impact on the exports and imports growth of pulses. The export instability indices of quantity and value were estimated at 41.2% and 39.4% for this period. The international trade through an analysis of exports and imports was also found quite uncertain.

Global pulse production and trade suggests a fairly complex scenario. The buoyant demand in India and almost constant supply is the main factor in continuous upward pressure in trade and prices of different varieties of pulses in the world. These developments were the result of imbalance in domestic supply and demand in countries with higher consumption. India's share in global Imports was around 62% in 2005. On an average, India imported 2-3 million tonnes per year of pulses in the recent past.

Given the uncertainty of global supply of pulses and rising domestic demand in India, it would be prudent to plan future domestic pulse production in such a way that major share of demand is fulfilled by domestic production. Reducing over dependence on global pulse supply would increase overall welfare of the farmers in rainfed areas and will improve access for consumers. So far, the country has not been able to achieve the target of 16 million tonnes. For achieving this target, following areas need special attention.

a) Technology Transfer: the effective transfer of available technology is the key to narrowing down the gap between potential and actual yield. It has been extremely slow in case of pulses due to non-availability of improved seeds and adequate extension services. Therefore, adequate supply of certified seeds of various pulses should be ensured before the sowing reason.
b) Area expansion in irrigated farming in non-traditional regions.
c) Integrated management of key pests and diseases limiting productivity of these crops in different agro climatic conditions.

d) Proper Implementation of minimum support price (MSP). Pulses should be procured at MSP in major growing states where large transactions take place with spot payment to farmers.

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Action taken on Comments by Prof. (Dr. Prof. P.N. Mehrotra, Hony. Director, AER, Centre Allahabad

- Comment on table 3.2 is incorporated in the text.
- Information on the use of technology promoting inputs is added.
- Information on relative profitability of pulse crops vis-à-vis competing crops is incorporated.

Some useful pie diagrams and graphs have been incorporated.