WORKING PAPER 27

Market Prospects for Pulses in South Asia: International and Domestic Trade

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and
J.W.T. Bottema

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Supplementary Report of the Project:
Market Prospects for Upland Crops Products and Policy Analysis in Selected Asian Countries (MPUPA)

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Foreword

This working paper explores the international trade in pulses in South East Asia. Pulses are an important source of livelihood for farmers in South East Asia. They are also important in the daily diet throughout the region. This report is based on country reports produced by Mruthyunjaya, Naseer Alam Khan, L.P. Rupasena, and Hla Kyi, and a compilation by Dr. Nico L. Kana and Dr. J.W.T. Bottema.

The publishing of this report was made possible through the generous support of the Government of Japan, in the framework of the project “Market Prospects of Upland Crops in Asia (MPUPA)”.

The report underlines the dynamic nature of market development in pulses over the last ten years. It shows that international trade is becoming important in crops which are usually though of as marginal land crops, and that huge shifts are occurring in producer centres. This exploration may serve as the basis for follow-up on the topic of international trade in food grains in Asia.

Dr.

Haruo Inagaki

Director

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Hla Kyi
Taco Bottema

1. Introduction

This report contains the findings of country studies covering the structure of and the potential for trade in pulses in India, Pakistan, Sri Lanka and Myanmar. It explores and describes the current pattern of trade and suggests ways for follow-up and, eventually, improvement.

Trade issues on food crops seldom enter the arena of international trade negotiations. There are two reasons. Crops can be regarded as too important in national economic policy to be submitted to the negotiation table, or inversely, they are not sufficiently important to merit much attention at all. The fact that food crops are considered very important in national policy does not mean that food crops are not important in international trade relations; rice stocks are often used to swap for debts. This very fact confirms to some extent the degree of government control over domestic food grain markets; many countries in Asia use trade regimes to influence domestic prices. They have good reasons for doing so because of the substantial employment and income linkages of prices for agricultural goods.

Returning to the second reason for the absence of food crops in international trade discussions, the lack of importance, the above arguments are far less compelling in case of crops of lesser proportional national economic importance. Yet, the question arises - when a can crop be considered as having national importance. Pulses, for example, do not enjoy coverage in the trade discussions, nor in coverage of international commodity trade systems, but they are indubitably of national importance in most South Asian countries.

It is illuminating to review the actual coverage in international markets of agricultural commodities as compared to national importance of commodities including foodcrops. One is then struck by the fact that very important national production and processing markets do not have a place in the databases on international commodity trade. This absence does not mean that there is no international trade, but likely that trade is dispersed and intermittent at relatively low quantities. Another observation is that major consumer and producer centres in Asia are not well represented as international trading places.

Box 1 Major pulses in the Asia-Pacific region: major producing and consuming countries.

Pigeonpea	*Cajanus cajan*	India, Bangladesh
Chickpea	*Cicer arietinum*	India, Pakistan, Bangladesh, Nepal, Afghanistan, Iran
Lentil	*Lens culinaris*	India, Pakistan, Bangladesh, Nepal, Iran
Mungbean	*Vigna radiata*	India, Thailand, Burma, Sri Lanka, Indonesia, Philippines, China
Black gram	*Vigna munga*	India, Pakistan, Sri Lanka
Pea	*Pisum sativum*	Iran, Pakistan, India, Bangladesh
Cowpea	*Vigna unquiculata*	India, Bangladesh, Philippines, China
Lathyrus	*Lathyrus sativus*	India, Bangladesh, Nepal
Groundnut	*Arachis hypogaea*	India, China, Indonesia
Soybean	*Glycine max*	China, Thailand, Philippines, Indonesia, India, Korea
Drybean	*Vigna vulgaris*	Japan
Winged bean	*Psophocarpus tetragonolobus*	Papua New Guinea, Thailand

This study constitutes a structured exploration of markets for pulses. Pulses are not known for their global or regional economic importance. Nevertheless, pulses constitute the third largest processing market in India. Pulses have been described in many ways; they are sometimes regarded as “poor man’s crops”, as “poor man’s protein”, or as marginal products of marginal lands. Individual pulse species hardly receive attention in trade or even production statistics, probably because the group of crops classified under the caption “pulses” is rather large. Of course, one should recognize that the label “pulses” may reflect different crops

depending on which area one regards, even in the sub-region of South Asia.

Yet, it is important indeed to devote attention to pulses, even as a wide group of crops. Contrary to common opinion, demand for pulses as food and feed increases with income, and they are a source of cash income for millions of small farmers in the more arid areas of South Asia. International trade is on-going, and producers and consumers may indeed benefit from expanded domestic and international trade in pulses. Many changes have taken place in national and international trade of pulses.

In looking at pulses in the framework of a wider analysis of international trade, one deals with important issues in statistical coverage. In analysis one has to reach beyond the usual international databases compiled by ADB, ESCAP and FAO. To consider the pulses as a group is quite in order if one considers issues such as food availability, but in trade one needs clear and unambiguous classification of products, by species and quality class, and, most importantly, by price level.

Much internal trade in agricultural commodities remains unregistered; the same applies to registration in international trade. It is well-known that border trade plays an important role in continental Asia. In compiling this report, these issues were encountered, and by making them explicit in this report, it is hoped that more understanding can be generated regarding the importance of the "invisibles" in international trade. A report of this kind has a largely explorative nature, and it therefore focuses more on issue identification than detailed analysis.

The report uses a minimum of methodology, and it uses established terminology, such as comparative and competitive advantage and current descriptive terminology to analyze the structure of the markets. Competitive advantage in international trade is first and foremost a function of comparative advantage. In agriculture climate and soil play a paramount role in determining comparative advantage. In this regard it needs to be pointed out that India, Pakistan and Myanmar are all located roughly in the same agri-climatic zones; Sri Lanka also has a dry zone fit for production of pulses. They can be expected to score more or less even in comparative advantage in pulse production. One needs to take into account, however, that when one looks at the seasons, substantial temporal and spatial variation occurs.

Only when there is relatively little difference in comparative advantage, policy measures may result in shifting competitive advantages, i.e. the relative positioning of producer centres on the consumer markets. If comparative advantages differ substantially, policy measures become costly and tend to result in a negative economic benefit.

It should be well understood that the removal of impediments in international trade is usually only beneficial if domestic markets are well integrated, and second, if currency movement is not bound by restrictions. In this regard one should note that in recent decades several steps were taken by monetary authorities of the socialist economies in South Asia, which resulted in a freer flow of currency. It is also possible that a certain pulling power can be exerted by erasing impediments to trade, which then would induce the same in the national economies. In the analysis of trade in pulses, we have to take into account that the national trade system in pulses may still need strengthening before international pull factors can come into force. In the market assessment we anticipate the importance of production periodicities, storing, processing and transport in the market.

We will focus in the analysis on comparative advantage and trade regimes in the countries covered in this study. The analysis of the domestic market will focus on market integration, seasonal price movements, and processing against a background of consumption. First we will sketch the structure of international trade in pulses in South Asia.

2. Foreign Trade of Pulses in South Asia

Foreign trade in pulses in South Asia is analyzed in several steps. First, the structure of the international pulse market is analyzed in terms of policy options. The second paragraph pinpoints the basics of demand, and focuses on changes in income elasticity of demand. The third and fourth paragraphs analyze the geographical spread of the international market in pulses.

2.1 Structure of the pulse market

World trade in pulses resembles the trade in rice in terms of mobility, i.e. only a small proportion (~10%) of world production, estimated at some 60 million tons with a potential trade value of around 15 billion US dollars, enters the international market. Such a basic structure is only encountered if demand is located in the actual producer areas; this usually results in policy options in trade regimes. These are - understandably - often producer focused. Commodity markets of this nature usually give countries the option of operating a seasonally closed trade regime in order to curtail supply and boost producer prices, or - in a more consumer oriented version - to alternate the trade regime in the course of the season in order to maintain a steady supply and stable prices. Positive income elasticities of pulses are very important in this regard, because stable demand would make it possible to create policies which would benefit producers. Even though the proportion of pulses on the international market is small, the international trade in pulses can thus not be considered as a structurally fixed residual market. There are also other dynamic factors in play which point this way. These concern the rapidly shifting geographic locus of the international supply in South Asia.

2.1.1 Demand

The demand for pulses seems to be located all over South Asia, the Middle East, and, though not subject of this study, but important to note, in Africa and Latin America. The four country studies reveal that in India and Pakistan pulses have changed from more or less inferior goods, with a negative price elasticity of income in earlier years, to somewhat higher valued goods, consumption of which increases with income. Processing of pulses is widely spread in rural and urban areas, and consumption of pulses is virtually always in the processed form. Pulses are also used in feed formulas, and are linked to the rapidly rising demand for chickens. In the broad category of pulses, we distinguish chickpea, mungbean, green and black gram, pigeonpea and lathyrus as the major pulses. Minor pulses are lentils, urdbean, butterbean and others. These commodities fetch different prices, are used in different recipes, and also show variation in the temporal structure of production. The large number of different pulses accounts for the complexity of world and domestic trade. Not surprisingly, many countries and producer centres participate in international trade.

2.1.2 Market participants

Pulse trade has a small number of big and a larger number of smaller players. The major
importers are all located in Asia: India, Pakistan and China. The major exporters are China, Australia, Thailand and now also Myanmar. The export situation of India is still not entirely clear; it could well be that India is a surplus exporter, which would add an element of inter-year

uncertainty in supply in international trade in pulses. It is not surprising that very large countries such as China and India are both importing and exporting. The variety of tradeable species, the localities of major consumer centres and the variety of agricultural zones create a dynamic trade situation. One would in fact expect the same pattern for India; this is confirmed by reports of scattered exports to Nepal. Indeed, India seems to have moved from an import regime in the 1980s to exports, fluctuating around 40,000 tons per annum in the early 1990s.

Smaller players are the Middle Eastern countries of Turkey and Iran, Afghanistan, the East and Central European countries of Bulgaria and Hungary, and the South East Asia countries of Thailand and Vietnam and New Zealand. In addition some African countries, such as Tanzania, and Latin American countries, such as Mexico, export quantities to South Asia. Of the industrialized countries, Germany and Canada are exporters, in addition to Australia and New Zealand.

At this point in time countries in arid and hot zones in Central Continental Asia, such as Kazachstan, do not participate in international trade. Also, countries in the southern hemisphere in Africa and Latin America are not yet playing a role in international trade. One should remember that countries in these areas are in terms of climate and soil and seasonality very well positioned, and therefore can be expected to play a role in trade in pulses in the future.

2.1.3 Market connections

The import tables of India, Pakistan and Sri Lanka show geographically dispersed participation, involving production zones from all continents. Of significant interest is that high income and low income countries participate; one can conclude that all producer areas are in competition in the international market. As in other foodstuffs one can conclude that scale technologies in high income countries compete with small scale lower and higher cost technologies in the lower income countries. The determining mechanism is the seasonality of production and the induced monthly fluctuation in price movement. The participation of Australia and also New Zealand has emerged over the last decade because these countries produce at the time of low production in the countries north of the equator. Their participation constitutes an important element of price efficiency because of the temporal stability in supply and the reduction in storage costs in consumer centres. Yet, this does not mean that the international market is efficiently integrated through price setting and auction type mechanisms. The annual price fluctuations on the international market are significant. On the basis of the data available, it is not easy to explain the fluctuations, but it seems most likely that both local supply variations and implicit quality variations need to be taken into account.

There are many indirect signs of high transaction costs in international trade. Import trade seems to take place primarily on a station to station basis, while exports from Myanmar, with the exception of chickpea, run the same way. The problem on the import side seems to be late domestic market information, and hence late orders, with the tendency of price taking. There are also connections with private commodity movements, which, when not anticipated by importers, account for uncertainty in price variation. It should be recognized that these are very common problems in import regimes, i.e. for commodities which are domestically produced and consumed, in markets of a large geographical span with the accompanying high transaction costs. There are a number of traditional solutions to alleviate these problems. These will be discussed in the paragraphs on price mechanisms in the final section of the report. Yet, anticipating this discussion one should recognize that the solutions to these problems do not come fast, nor automatically as a consequence of changes in regulations.

2.1.4 Current trade in and policy on pulses in South Asia

Of the countries covered in this study, India, Pakistan and Sri Lanka are consistent

importers, while Myanmar has become the major exporter in Asia in the early 1990s. India exports fluctuate around 40,000 tons. This could have a potentially destabilizing effect on the supply and prices of pulses in the international South East Asian market. It is quite clear that the realigning of the Myanmar economy towards a market economy has resulted in a very sharp increase in exports. The strengthening of Myanmar's position in international trade in pulses constitutes an important dynamic element in the growing intra-regional trade. Table 2.1 summarizes the major characteristics of trade in pulses in India, Pakistan, Sri Lanka, the importing countries, and Myanmar, the exporting country in South Asia.

Table 2. 1 Summary of characteristics of trade in pulses in South Asia.

Indicator	Myanmar	India	Pakistan	Sri Lanka
Population (million)	920	127	18	46
GDP growth (%/yr)	5	4	<3	>5
Consumption (kg/capita)	5	7	3	~10
Consumption trend	positive	positive	positive	positive
Import (tons/yr)	600,000	50-100,00	35,000	nil
Export (tons/yr; trend sign)	40,000	small	small	+ 500,000
Production (million tons/yr)	13.280	0.614	0.035	1.2
Production trend	flat	negative	negative	positive
Trade regime	import/export	import	open	export
Policy	production focused, trade	licensing, open licensing	production/ some licensing	trade focused export licensing

The present situation, where Myanmar is on the way to catering to the demand in the region almost singlehandly, and where India seems well on the way in stabilizing its international market demand and emerging as an exporter, stands in strong contrast to the situation of around ten years ago. One issue needs attention before we take a look through time, and this concerns the export position of India in the medium term. The data available indicate rather large annual swings in exports. These, while price driven, may be the result of regional domestic fluctuations. The question is whether exports from India are seasonal or regional surplus induced exports, or whether India is seeking, aside from stabilizing production and domestic prices, to stabilize its exports.

In the late 1980s, Australia expanded its participation in food legumes (pulses), no doubt taking advantage of Myanmar's chosen isolation in those years. Though one has to assume that in the years of Myanmar's monetary isolation some barter trade and border trade occurred, there is no doubt that the positioning in the pulse market in South Asia has gone through structural change in the last decade. With the broad and persistent trade from China in a two way trade regime, and Australia in an export regime, Myanmar's performance reflects its comparative advantage in pulse production. It may be noted here that the potential for pulses and in particular pigeonpea and soybean in Myanmar was studied, accurately gauged and predicted in a study conducted by the CGPRT Centre in 1987 (Titapiwatanakun 1990).

A broad characterization of the current situation in Asia would include the following observations:

- India is the largest consumer, and has moved from an import to in an import/export regime.

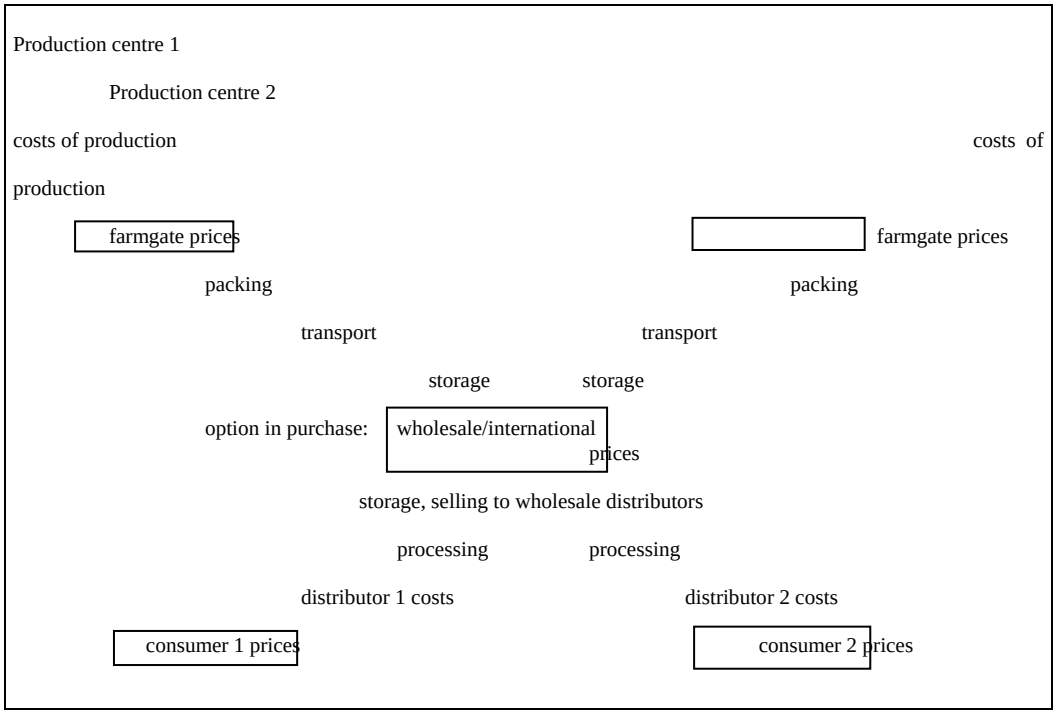
- China is probably the second largest consumer, and has moved to a two-way trade regime.
- Myanmar and Australia, characterized by interseasonality of supply, moved to export regimes.
- Thailand moved from an export regime to a two-way trade regime.
- There are signs that pulses moved from a negative income elasticity to a positive income elasticity in India and Pakistan.

In the following paragraphs the specific situations in the four countries are discussed. The discussion follows the following steps: price formation, currency and financial traffic, trade regime and basic policy, the domestic pulse market, consumption, processing and production. This sequence reflects the basic conditions for trade as set by monetary policy and the movement of money and goods, the specific policy of application to trade in pulses, and the domestic structure of trade options, the structure of the domestic pulses market, consumption, processing, and finally, production. This last item does require explicit attention in view of the dynamics of the pulse market in South Asia.

3. Price Formation

It is useful to briefly sketch the framework of understanding of price formation and the way international prices come into being. To keep things simple, one considers two areas of production (production centres) and one wholesale market and two consumer centres. The producers, packers, transporters and traders incur costs. They factor these into their prices, and prices increase with costs of collection, transport, storage, processing and distribution. Schematically the situation can be represented by the figure in Box 2. One wholesale market connects two production centres and two consumption centres in this scheme. We have chosen two production areas and two consumption centres because of the importance of season in the production of pulses. The actual timing of the entry of pulses in the market depends on rainfall, because pulses are virtually exclusively grown in rainfed areas. The inclusion of two production areas reflects thus the participation of production areas which produce in different seasons and production areas which produce at the same calendar time. Because consumption can be assumed to be more or less stable on a day to day basis, and because production varies in time, wholesale markets thus integrate the flows of goods and money in time as well as over space. We note that traders usually source from many production areas at any time of the year.

Box 2 Price formation, a stylized picture.



In looking at international trade one usually only looks at the actual level and the behaviour of international prices. One then identifies the various cost components connected with handling and regulation, as well as combinations of these two, and calculates the sum cost of actual trade itself. In looking at improvement or potential, one then considers this as a variable which can be reduced, and identifies possible consumer and producer gain as the result

of price changes.

In this study on the market of pulses we take a wider approach, because pulses are not only a consumer good, but are also produced in South Asia. This means that there is local demand, and that producer areas - and prices - will show highly seasonal behaviour; it also means that in looking at the pulse market one has to take into account both consumers and producers. In this chapter on price formation, we will therefore look at temporal behaviour of prices.

We note that theoretically there is not the slightest difference between a wholesale or import - export level in the chain of transactions and the formation of prices. The charges and levies at that point in the market simply constitute costs which are absorbed by the market participants. We will look at international prices and compare the price levels for specific species of pulses with wholesale prices. Where possible we will present detailed itemization of transaction costs of exports, as well as of imports.

Table 3.1 summarizes the levels of farmgate, wholesale, import, export and retail prices. It is a very rough summary which does not reflect the seasonality of trade except in the ranges of prices. In order to make the prices more or less comparable, they have been converted to US cents. One observes that most price ranges for the major pulses - chickpea, lentil, green gram or mungbean, and black gram overlap to some extent. This should be interpreted as a reflection of two factors: the price differences among countries and the seasonal differences in prices. The ranges in prices do not reflect the annual fluctuations; these are discussed in subsequent sections.

Table 3. 1 Price formation (US cents/kg) of major pulses in South Asia, summary of 1995 situation.

Price	Chickpea	Lentil	Mungbean	Black gram
Farmgate	~ 35 - 40	~ 47.5**	~ 35 - 50	~ 27.5 - 45
Import price	~ 35 - 50	~ 30 - 40	~ 35	~ 20 - 30
Export price*	~ 40		~ 42.5	~ 50
Wholesale**	~ 50	~ 55	~ 40 - 45	~ 40 - 45
Retail**	~ 70	~ 90	~ 60	~ 80

* Myanmar.
** Pakistan.

One observes that farmgate prices, import, export and wholesale prices fall in range for chickpea and for mungbean. Black gram export and wholesale prices also fall in the same range. Lentil does not seem to be exported at scale in South Asia; imports come from outside this region. There are significant differences in farmgate prices of pulses among India, Pakistan, Sri Lanka and Myanmar; these are analyzed to some extent in the subsequent sections.

Even the above price ranges are very rough; it is clear that there are quite important price differences among the four major pulses, and these are indicative of product differentiation in the group of pulses. This process is not likely to follow the exact same pattern in the four countries researched. It is not yet possible in this explorative study to compare the price variations among the pulses with price variations among the countries. Such a comparison would provide a more detailed picture of trade in relation to consumer preference.

3.1 International prices

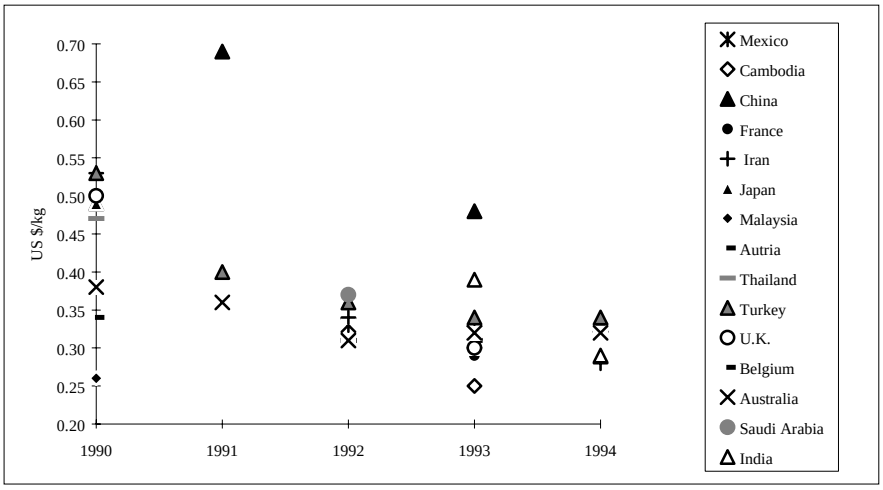
International prices are derived from two types of sources, the import prices and the export prices off-Yangon. These prices differ somewhat in build-up. For practical purposes the import prices can be considered as cost, insurance and freight (CIF) prices, while the export prices off-Yangon can be considered as proxies for free on board (FOB) prices. This analysis

covers the major pulses only, and includes green gram (mungbean), black gram, lentils, and pigeonpea. For CIF prices we have an intermittent series of prices. Though incomplete and not yet on a monthly basis, this series shows two things: it gives the prices of various species of pulses, and, though only in an impressionistic way, it gives some variations and trend of the species prices through time.

3.1.1 Import prices

Import prices are a reflection of international trends in prices and the effective market demand. Import prices of the same good in different countries therefore do not necessarily behave exactly similarly, but one would expect some congruence in major trends.

Figure 3. 1 Prices of imports of chickpea from various countries in Sri Lanka, 1990/1994.



The behaviour of import prices of chickpea in India, Pakistan and Sri Lanka (Figures 3.1, 3.2 and 3.3) does not run parallel. The price levels seem to have a rather larger range between 20 to 40 cents in 1992-1993. The Pakistan data suggest a 6 to 7 year cycle in price level of chickpea. However, the wide range of prices in India and Sri Lanka does not really support a conclusion in that direction, although the Indian import prices seem to support the occurrence of high prices in 1988-89 and lower prices in 1992-93.

In Figures 3.4 and 3.5 the import prices of lentils in India and Pakistan are given. The import prices of lentils in India display a fairly clear upward trend in a fluctuating pattern, at levels between 40 and 50 cents per kg. For Pakistan a measure of average import prices is available. The fluctuations in Pakistan import prices of lentils seem somewhat larger than in India, especially in the early 1980s. The price increases in recent years seem to track well in India and Pakistan, with price increases in 1991 and 1992. The price levels are currently similar at some 40 cents per kg.

Figure 3. 2 Prices of imports of chickpea from various countries, India 1987/88-1992/93.

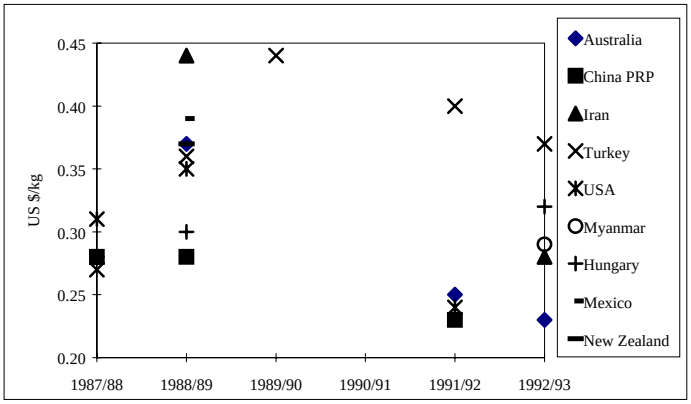


Figure 3. 3 Prices of imports of chickpea (split & whole) in Pakistan 1981/82-1994/95.

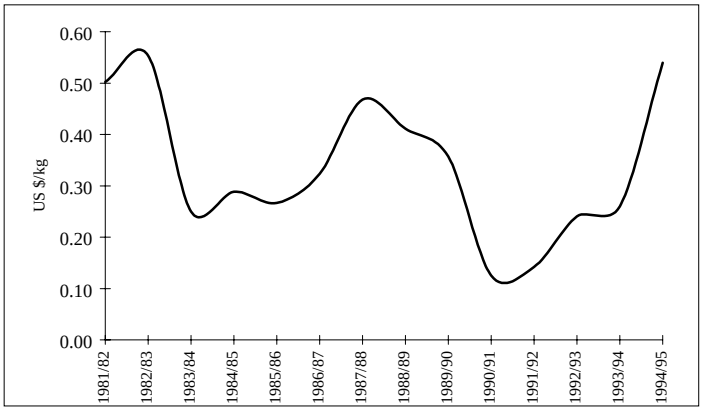


Figure 3. 4 Prices of imports of lentil from various countries in India, 1985/86-1992/93.

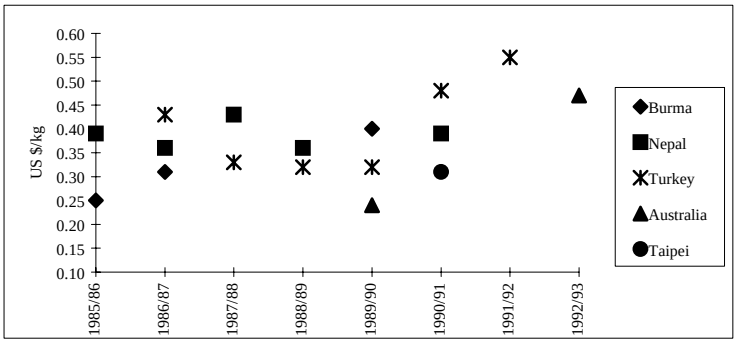


Figure 3. 5 Prices of imports of lentil (split & whole) in Pakistan, 1981/82-1994/95.

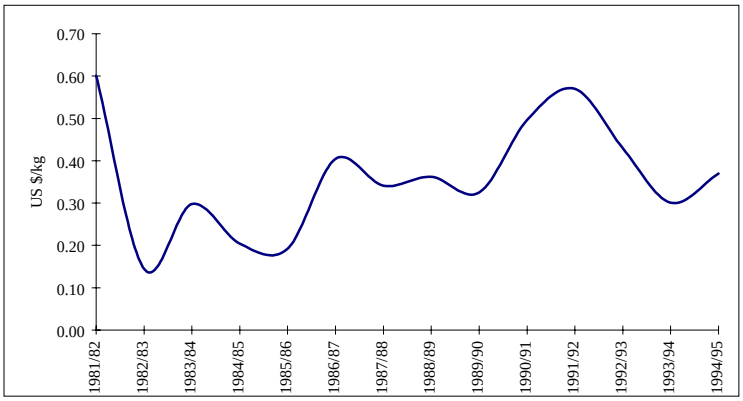


Figure 3. 6 Prices of imports of mungbean (split & whole) in Pakistan, 1981/82 to 1994/95.

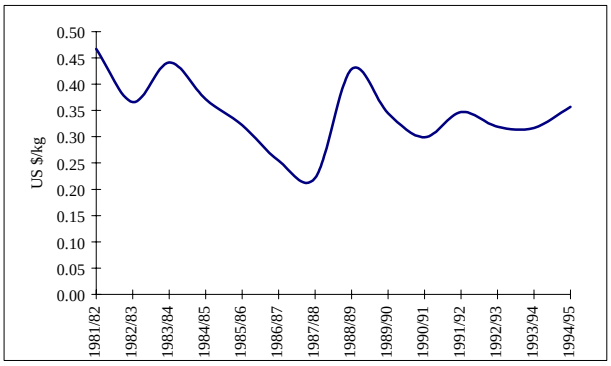
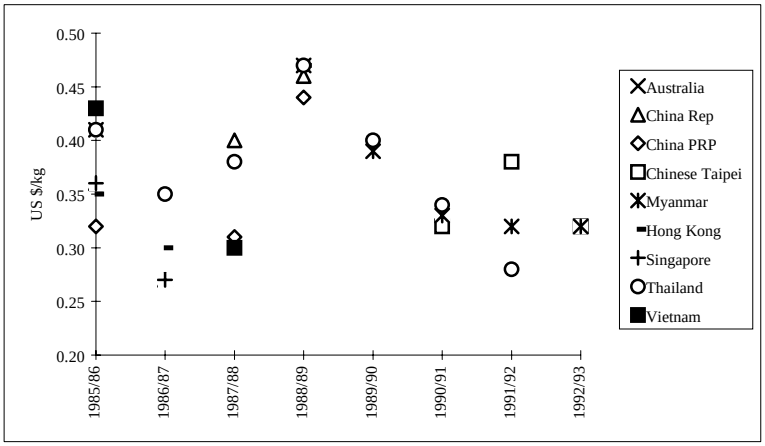


Figure 3. 7 Prices of imports of moong from various countries India, 1985/86-1992/93.



For mungbean we have import prices from India and Pakistan. As in the case of lentils, the import prices track well among these importers. High prices occurred in 1988-89 and lower levels at around 30 cents per kg were registered in 1992-93. Price ranges at 20 to 40 cents and price shifts seem to be smaller than in chickpea.

There are quite acceptable signs of the existence of similar price ranges for lentils, chickpea and mungbean in the South Asian importers, and import prices behave more or less in a similar way among the importers. It is most striking that the price behaviour of lentils, chickpea and mungbean is crop specific. This observation is important in view of the supposed strong substitution on the production side as well as in consumption. The individual behaviour could indicate that pulses do not necessarily substitute for one another, and could confirm the on-going process of product differentiation.

On the other hand, the occurrence of continuous shifts in relative prices of lentils, chickpea and mungbean in a similar price range indicate some economically determined relation between the prices. The fluxes in relative prices also show possibilities for trade in a range of pulses, and point at the requirement of timely market information.

3.1.2 Export prices

Although India exports some pulses, for example to Sri Lanka, which in turn exports to the Maldives, we will concentrate in the analysis of export prices on price formation in Myanmar. We note, however, that for a more complete picture, one would need to take into account price formation in the other major exporting countries in Asia, especially Australia and China.

Export prices are directly linked to producer prices which are discussed in the section on farm prices. In the first section we compared export prices to wholesale prices for major pulses in importing countries and found that the prices are in the same range.

Table 3.2 shows that the costs of handling and various loadings and unloadings and inspections fall in the range of US $ 10 and US $ 14 per metric ton. This equals around 5% of actual price of exported pulses. This excludes the export duty of 5%. There are no clear standards by which one can measure whether such a cost is too high or too low, but it seems quite reasonable. There is one element in the cost picture which deserves further analysis: the items of packing and transport. Modern shipping combines marketing, i.e. goods are packed into a form which maximizes access into the target distribution market. This means that packing for shipment is done in collection. For bulk goods such as pulses or grains, many transport technologies are available, and investment should be able to reduce the export costs.

Table 3. 2 Details of export costs of pulses, Myanmar (1995/96).

No.	Description	Unit	Kyat Min.	Max.
1	New gunny bag (30-35 kyat/bag)	20 bags for 1 mt	600	700
2	Labour charges (from warehouse to truck)	1mt	40	60
3	Transport charges	1mt	100	200
4	Port charges for export of pulses			
	Conservancy charges	1mt	8	-
	Shipping charges	1mt	20	-
5	Custom duty for export of pulses			
	Export duty (5% duty on total value)			
6	Labour charges			
	Loading	1mt	40	60
7	Fumigation costs	1mt	60	-
8	Inspection costs (weight & quality)	1mt	25	60
9	Phytosanitary certificate	1 sample	100	-
10	Contingency	1mt	100	200
Total			~1,090	~1,470

1 US $ = 100 - 125 kyat.

Table 3.3 gives an example of price formation in the collection market. In practice one would have to account for price variation. For pigeonpea, farmers receive 1,500 kyat per basket of 72 lbs, which equals between 37 and 47 US cents/kg. Anticipating analysis in the next section, it must be stated that this price seems to be very high. The exporter acquires the produce at a cost which is between 5 and 10% of the actual farmgate price, which seems quite reasonable taking into account technology level and transport. Transport would, in the example account for one third of the market costs, and it should be clear that this cost will increase the farther away the supplier is from the Yangon port. Farmgate prices can therefore be expected to be lower in the more remote production areas.

Table 3.3 Estimates of price spread, marketing costs and margins for pigeonpea in Myanmar (Mahlaing, Mandalay Division, 1995/96).

			Kyat/basket	US $/kg
1. Farmer's sale price			1,500	0.47 - 0.375
2. Brokers' house township level)				
	Purchase price		1,500	
	Sale price		1,550-1,565	0.48 - 0.49
	Gross margin		50-65	
	Market costs:			
		Labour	8	
		Packing material	20	
		Miscellaneous	12	
		Total cost	40	
	Net margin		10-25	
3. Traders (Yangon)				
	Purchase price		1,550-1,565	
	Sale price		1,620-1,650	0.50 - 0.51
	Gross margin		70-85	
	Market costs			
		Transport cost	45	
		Labour	5	
		Storage	2	
		Miscellaneous	8	
		Total cost	60	
	Net margin		10-25	
4. Exporters				
	Purchase mrice		1,620-1,650	0.50 - 0.51

Exchange rate: 1 US $ = 100 - 125 kyat.
One basket = 72 lbs = 72 * 0.4535 = 32.65 kg.

3.2 Domestic prices

Of the domestic prices, we will analyze the wholesale and retail prices as well as the producer prices. Wholesale prices can be compared to import and export prices, while the temporal movements displayed by the series are analyzed on crop specific basis.

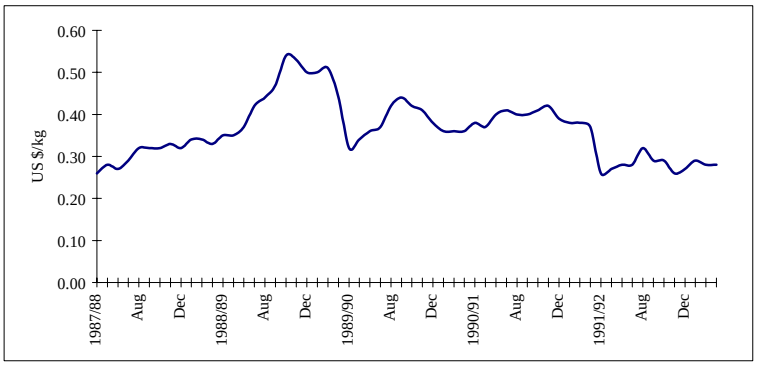
3.2.1 Wholesale and retail prices

Even though information on the price behaviour of different pulses in the domestic wholesale markets is scanty, it may serve the purpose of illustration to include some information. Figures 3.8 and 3.9 show behaviour of wholesale prices of gram in Uttar Pradesh India. Prices have been converted to US $, to make comparison with import and export prices possible. The focus should be on the monthly prices, and one can observe that the movement is somewhat erratic. The sudden price drops in 1989 and 1991 are the consequence of exchange

rate corrections and can be discarded as market movements. It is clear that price variation is not very substantial, which would indicate adequate supplies year-round at the wholesale market level in Uttar Pradesh. One has to be cautious in assuming that this will be the case in other wholesale markets in India or elsewhere because of the seasonality of supply. It is unfortunate that we do not have a longer time series on a year to year basis to establish the medium term trend on wholesale prices of gram.

Figure 3. 8 Annual price of gram (mean), India, 1987/88-1991/92.

Figure 3. 9 Monthly prices of gram in Uttar Pradesh, India, 1987/88-1992/91.



For Pakistan we have longer year to year time series for the major pulses (Figures 3.10-3.14). Lentils are in an upward medium term trend, and chickpea prices also seem to have increased since 1990. Year to year fluctuations are not small at around 30% of the moving averages. There is no discernable relationship between the behaviour of the wholesale price of lentils and the price of chickpea. Mungbean and black gram, however, behave more or less in the same way, they show coinciding drops and increases.

In Pakistan, wholesale prices of the grams, mungbean and black gram track quite well with peaks in 1988-89 and in general, a downward trend. The price swings of black gram seem to be somewhat larger than the swings in mungbean, but the general movements seem more or less the same.

Figure 3. 10 Wholesale prices of lentil in Pakistan, 1980/81-1994/95.

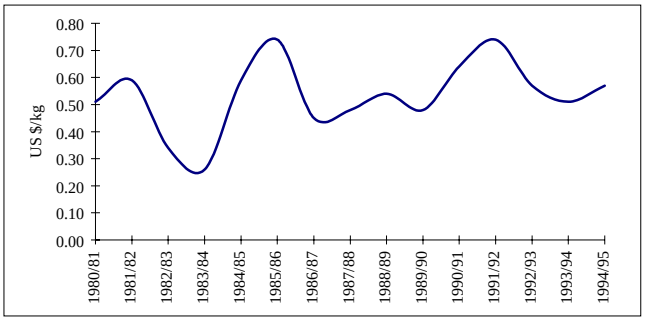


Figure 3. 11 Wholesale prices of chickpea in Pakistan, 1980/81-1994/95.

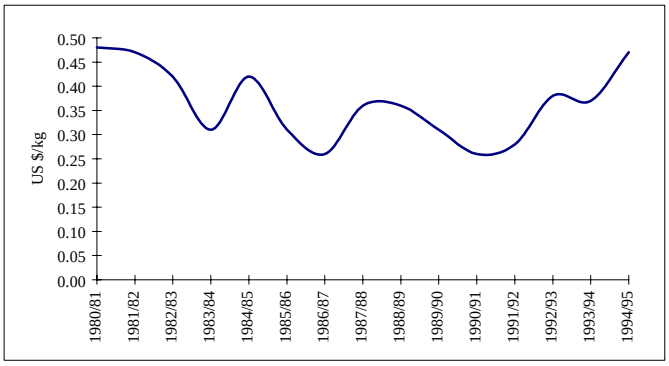


Figure 3. 12 Wholesale prices of mungbean in Pakistan, 1980/81-1994/95.

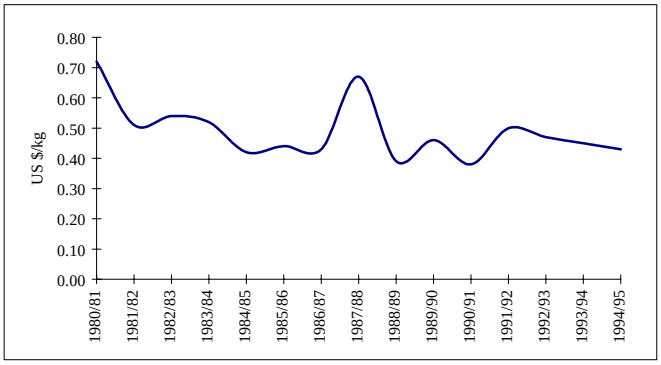


Figure 3. 13 Wholesale prices of black gram in Pakistan, 1980/81-1994/95.

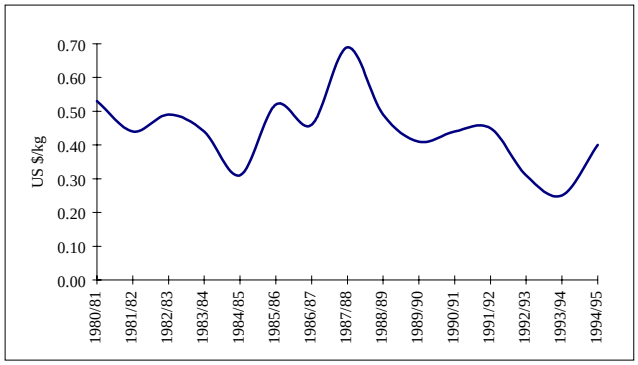
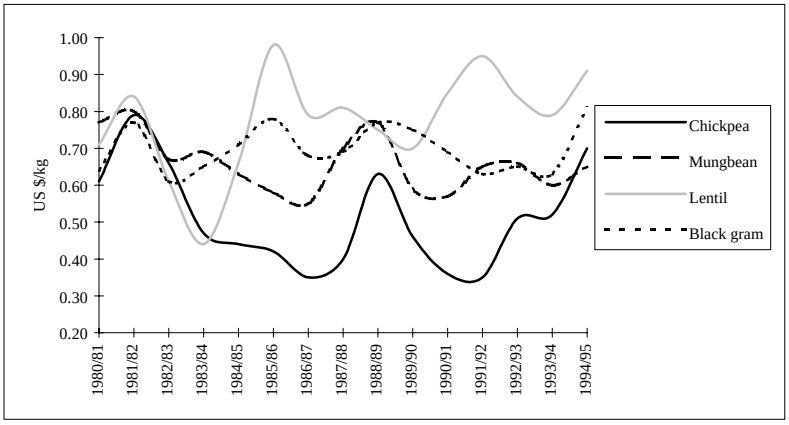


Figure 3. 14 Retail prices of pulses in Pakistan, 1980/81-1994/95.



The behaviour of the retail prices in Pakistan reflect the different characteristics of lentils, chickpea, mungbean and black gram, and they also show at retail level the same characteristics as the wholesale prices. It is again most striking to observe the price cross-overs. These are to be expected for the two grams, but they also occurred in the mid 80s and early 90s between lentil and the grams. It seems that lentil is now established as the more expensive of the pulses, while chickpea is consistently cheaper in the retail market. If the price movements as analyzed are correct, one might conjecture that market capturing has taken place in lentils, and that lentils have moved to a higher type economic good. There is reason for this conjecture; the larger question is what happens to the many other pulses in this regard.

3.2.2 Producer prices

We have producer prices from Myanmar, Pakistan and Sri Lanka (Figures 3.15 to 3.23). In the analysis we will take two steps; (i) compare the actual US $ level of producer or farmgate prices, and (ii) compare the temporal behaviour of the major pulses.

A few remarks are necessary regarding the comparison of producer prices of crops in different national economies and regions. Economically it is most important to acknowledge that such a comparison disregards the existence of national currencies, and the costs of comparison. It is, of course, quite imaginable that at some time in the future collection traders in Asia can take into account in their transactions in rural areas convertability of various currencies. This, however, is not the reality; in most countries in Asia currency conversion has penetrated to larger towns. The expansion of banking services however, is going quite fast,

under the influence of the importance of overseas remittances.

An interfering issue is that differences in converted prices may reflect differences in actual price levels. There is also the classic issue of isolated and artificial exchange rates of currency, as referred to in the section on export prices in Myanmar. It is obvious that in a closed exchange rate regime with a closed capital account, i.e. without economic foundation, transaction costs for conversion are very high. The behaviour of farmgate prices of major pulses in Myanmar is quite important as an example of the behaviour of prices in a process of monetary reform. In the conversion of prices in kyat, the exchange rate was approximated by assuming a 60 kyat to 1 US $ exchange rate in 1990-1991, and proportional increase to 100 kyat in 1996.

The comparison of the actual price levels thus yields an insight into possibilities for trade, and competitive advantage under the influence of exchange rates. Table 3.4 provides an overview.

Table 3. 4 Producer prices of major pulses compared, 1995, US cents/kg.

Species	India*	Pakistan	Sri Lanka	Myanmar
Lentil	25 - 30	47.5		
Chickpea		37.5		40
Green gram	27.5 - 32.5	40	50	35
Black gram	25 - 30	27.5	30	45
Pigeonpea	30 - 35			45

* Estimation.

It is clear that in India the farmgate prices are at the lowest level, compared to the other countries. We start with chickpea because it is the most frequently traded pulse. Myanmar exports and Pakistan imports. If Pakistan would use its import position to influence producer prices, one would expect in Pakistan higher producer prices than in Myanmar. We observe that producer prices of chickpea in Myanmar are in fact higher than in Pakistan. This would, on the basis of the exchange rates used for conversion, indicate that Pakistan is indeed in an open import regime.

Figure 3. 15 Annual producer prices of pulses in Sri Lanka.

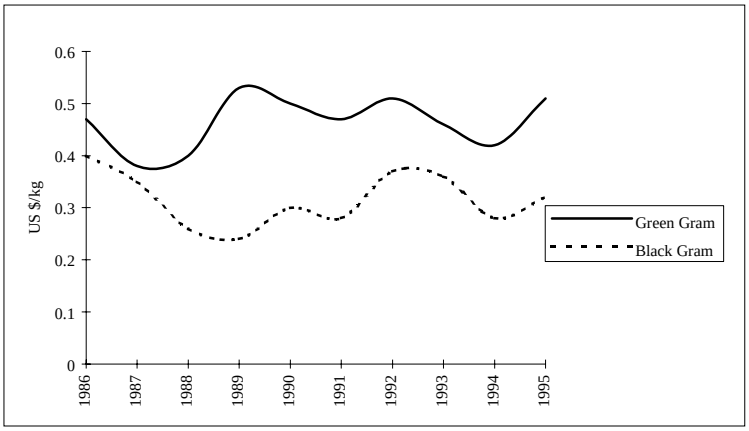


Figure 3. 16 Farmgate prices of black gram of in Myanmar, 1990/91-1995/96.

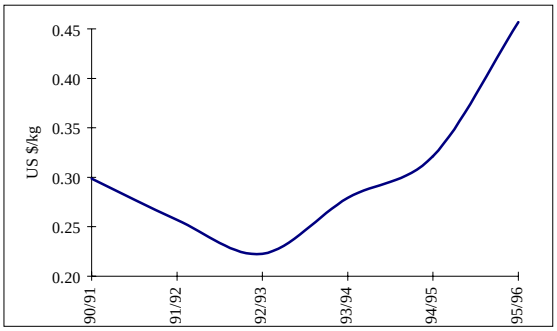
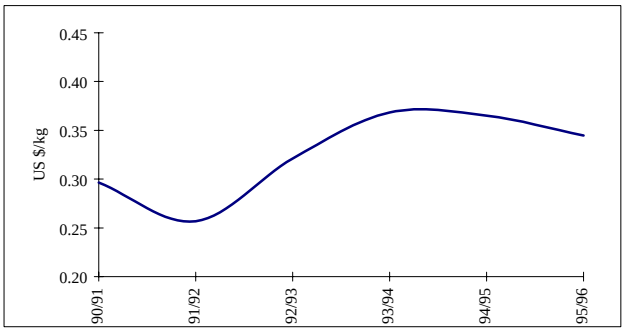


Figure 3. 17 Farmgate prices of green gram in Myanmar, 1990/91-1995/96.



Also of interest is green gram. Here prices in Pakistan are somewhat higher than prices in Myanmar, while in Sri Lanka prices (Table 3.4) are substantially higher. This pattern is to be expected. For black gram the situation is the opposite again, in Myanmar prices are at 45 cents substantially higher than the level of around 30 cents in Pakistan (Figure 3.20) and Sri Lanka. It should be noted that black gram seems to be in short supply in Myanmar. As a result of the many changes in relative prices in partly substituting crops in Myanmar, the situation is still not in equilibrium.

Figure 3. 18 Farmgate price of mungbean in Pakistan, 1981/1995.

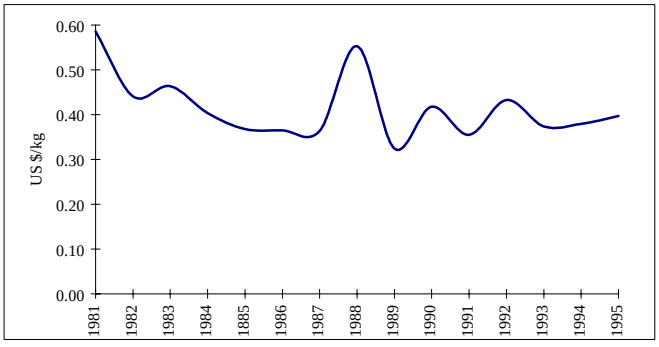


Figure 3. 19 Farmgate price of black gram in Pakistan, 1981/1995.

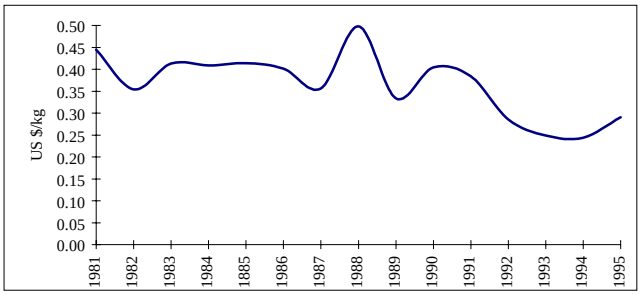


Figure 3. 20 Farmgate prices of pigeonpea in Myanmar, 1990/91-1995/96.

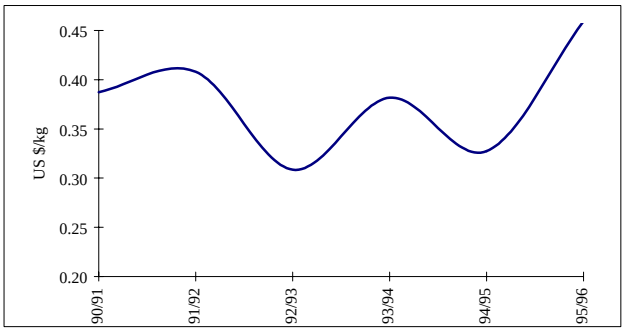


Figure 3. 21 Farmgate price of chickpea in Pakistan, 1981/1995.

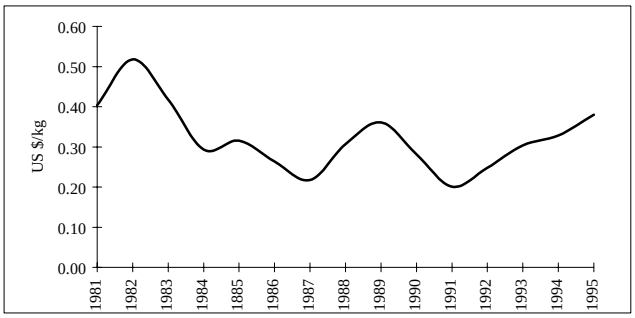


Figure 3. 22 Farmgate prices of chickpea in Myanmar, 1991/91-1995/96.

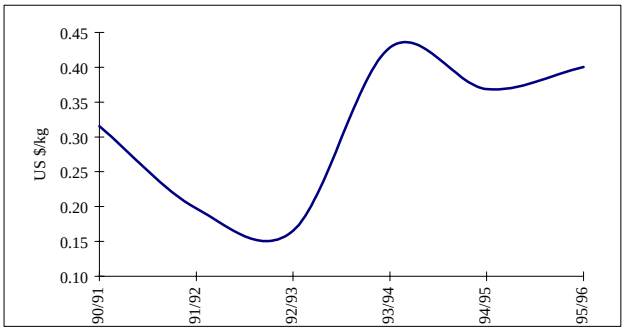
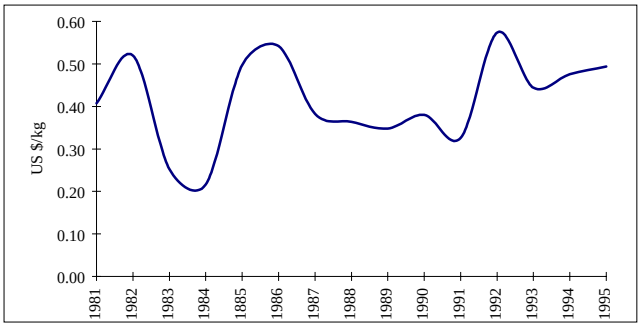


Figure 3. 23 Farmgate price of lentil in Pakistan, 1981/1995.



The timeseries data reveal price cross-overs and shifts in relative prices. Only in Sri Lanka, (Figure 3.16) though, the producer prices of green and black gram seem very stable, with black gram prices consistently below prices of green gram.

In Myanmar the prices of the grams show completely different patterns; in Pakistan prices of green and black gram show again a clear relationship. It would seem that in general green gram is priced higher than black gram, and that the situation is Myanmar is exceptional. The behaviour of the chickpea prices in Pakistan and Myanmar shows, aside from the major fact that prices move more or less in the same range, no temporal similarity. Again, the explanation has to be that Myanmar the situation is still in flux. In Myanmar pigeonpea growers seem to enjoy slightly more stable prices than the growers of other pulses in the 1990s.

3.3 Transactions, currency and financial traffic

It is most important to recognize that monetary and financial policy, i.e. convertability of currencies against market rates and free capital movement, constitute the basic determinants of international trade in general and therefore also of agricultural commodities. Although monetary issues have not explicitly been taken into account in the studies, the issue deserves discussion at this point. It may well be possible that exchange rates in India in earlier years functioned as an impediment to import of goods. In Myanmar the reverse has obviously occurred. The situation has improved rapidly in recent years, but probably still needs looking into. It should also be noticed that in Pakistan the rupee is in a medium term slide versus the US dollar, and in India a similar trend is noticeable. One may assume that this exchange rate policy is used as a measure to keep the terms of trade as favourable as possible in the short term. It may be so that the slide leans toward favouring exports.

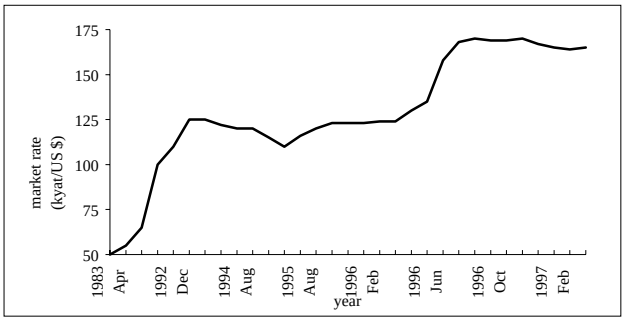
In Myanmar, as in other centrally planned socialist states, in the absence of direct financial traffic, barter trade has effectively been the major transaction structure in the years before the improvements in financial mobility. Barter can be an effective transaction form if the companies involved trade in more than one commodity. They can save transaction costs, and on occasion offer opportunities for substantial profits. One needs, however, to recognize that for barter to be an effective transaction form, substantial expertise and asset control capability is necessary. Few companies possess it; domestic export trading companies that depend on domestic supply of goods face considerable time and domestic cash flow constraints. A problem involved with barter as main transaction form is that international price signals rarely penetrate properly into the domestic market. It tends to favour the buyers of exported goods.

The present situation where the US dollar functions as the trade currency is a substantial improvement over the previous situation. It should be stated, though, that the

banking system required to facilitate transactions and (inter) national trade needs strengthening, especially in Myanmar. The efficient handling of finances is of special importance in view of the rather small lot sizes in the pulse trade.

There is no evidence of major players running the pulse market. Although the aggregated quantity of imported pulses is considerable, the actual lots involved in trade are not very large, and they come from a large number of different places. The lots are of such a size that it is clear that the actual transport occurs in vessels carrying assortments of goods. This means that transport of lots - and the arrival in the distribution market - is likely time-constrained. Export lots from Myanmar show potential for customized shipping schedules, but it is not clear however if these options are being used by exporters and importers.

Figure 3. 24 Exchange rate evolution in Myanmar, April 1983 - April 1997.



4. Explorative Market Assessment

This chapter gives information on the markets for pulses by country. The markets are treated in five sections; these discuss and analyze policy, marketing and trade, consumption, processing, and finally, consumption. The sequence of the discussion is by country, with India as the starter, followed by Pakistan and Sri Lanka as other importing countries, and finally Myanmar, as the exporting country.

4.1 Policy and opportunities

This section describes current policy and discusses the recent changes in broad policies on trade and the relations with consumption and production. Suggestions are made for follow up and further study.

4.1.1 India

The policy on pulses in India seems to be ambivalent. Policy-makers and planners recognize quite explicitly the importance of pulses in the diet of less-affluent people, and have consistently drawn up plans to secure an adequate domestic supply. The practice is the setting of production targets, based on consumption estimates. The consumption targets are tagged to population, and have consistently outstripped domestic supply, by as much as around 3 million tons annually.

Current findings, however, show that the income elasticity for pulses is positive, and that demand seems to be well entrenched in lower as well as middle income groups. This would indicate that a redefinition of the need and the demand for pulses is necessary. If the demand for pulses is indeed well entrenched, the government of India would be able to use import controls as a mechanism to steer domestic supply, and so influence prices. There are indeed signs that this is happening. While there are many observations that prices in international markets are too high for the domestic consumers, imports, and minor exports are taking place, albeit at a very small scale in comparison to the domestic market. The Indian pulse market is thus not entirely segregated from the international supply, but there are quite clearly price differentials. The government has until recently controlled imports by establishing a ceiling on imported pulses wholesale and retail traders may hold. The import of pulses is open under the Open General License, with a 5% duty. It seems that the policy has to some extent contributed to a controlled import regime; however, this needs further study.

The position of India in the world market of pulses is rather peculiar. In terms of quantity produced and consumed, its position is dominant. Its production is 23.11% of the world production, but its import is only 6.64% of world import; its exports (since the early 1990s fluctuating around 40,000 tons per annum) are 0.35% of world export. The country is in short supply of pulses by an estimated 3 million tons (recommended diet estimate) annually. The gap is bridged partially through imports at around 600,000 tons: black gram from Myanmar and China, lentil from Turkey, and kabuligram from Australia and Turkey.

The high international prices give India the option to induce high domestic prices through control imports. These would obviously benefit producers and neglect consumer

interest. Yet, this policy option does not seem to enjoy attention. Government policy seems to be based on the importance of pulses to poorer income groups. It needs to be researched in more depth whether the current findings, which show that the demand for pulses actually increases with income, are indeed correct. In doing this, attention is also necessary for the consumption and the production side. There are signs that the consumption of dal, the major processed consumer product is tagged to the consumption of rice and maybe bread. If this could be confirmed, and a relationship with quality classes established, it may be possible to refine the stance on the social importance of pulses somewhat. On the production side one often hears and reads the explanation for the downward trends in production of pulses. The government targets of production were initially based on assumptions of land use (irrigated land), which were not born out in actual practice. It was originally assumed that pulses would be grown in newly irrigated areas. Farmers, however, shifted to more renumerative crops, and growth of pulses was less than expected because they continued to be grown on marginal lands.

If the above account is indeed correct, then it is clear that the Government of India has missed the early opportunity of influencing farm-gate prices through supply control. Posing this question is easy, but one can not know whether such a policy could actually have been brought to bear.

On the consumption side one can make the following observations. Aside from the earlier mentioned link between consumption of dal, rice and bread, there is a steep increase in the consumption of milk, which is the major supplier of protein in partly vegetarian India. Since the production of pulses is also likely linked to the raising of livestock, pulse producers may not be in desperate need of their own supply of protein. The same argument would hold in general for consumers, who consume increasing volumes of milk.

4.1.2 Pakistan

Over recent decades, Pakistan has remained an importer of various pulses. The major reason of Pakistan's dependence on imports is the increased demand, carried by population increase and higher per capita consumption of pulses. It is also possible that prohibitive prices of animal sources of protein continue to stimulate the demand for pulses. As in India, consumption of milk has increased substantially over the last decade, providing an alternative source of protein. In the animal sub-sector a widely observed development has occurred; in urban areas goat and sheep meat has in the last decade largely been replaced by chicken.

As in India, the question arises whether Pakistan has the option to induce high domestic prices through import control. The matter of competition between the various sources of protein needs investigation.

Pakistan procures Kabuli chickpea, lentil, mungbean, and black gram mainly from Myanmar, Australia, Iran, Turkey, and Singapore. Mungbean is imported from a few countries such as Myanmar and China. Lentil is imported from Turkey, and also Australia, China, and Nepal. Small quantities of black gram are imported from Afghanistan.

4.1.3 Sri Lanka

Sri Lanka is in an import regime. Sri Lanka does not export pulses regularly. For some years there were a few exports: in 1990 and 1991, 4,519 tons and 444 tons of black gram were exported. The principal reason for lack of export market is absence of quality products and irregular production.

Sri Lanka's total requirements of red lentils and chickpea are met through imports because none of these pulses is yet grown domestically. Red lentil is the most imported pulse. Dal curry is very popular among bread consumers. Its import increased over 1990-94 from

25,940 tons to 79,431 tons, a three-fold increase. Sri Lanka spent Rs 1.526 million in 1994 for importation of red lentils. The major countries exporting to Sri Lanka are Turkey, Nepal, Syria, and India. A small amount of yellow lentils are exported to Sri Lanka from Australia.

After 1977, import of red lentils has been allowed through a importing body and because imported lentils were cheaper than domestically produced lentils, consumption of locally produced lentils declined. The policy on imports has changed in recent years. The Cooperative Wholesale Establishment (CWE) had a monopoly on lentil import until 1991. In that year private sector participation was permitted but traders were required to obtain an import license based on a quota system which depends on the country's requirements. The CWE was granted 50% of the requirements as quota. The licensing and quota system was abolished in 1994. The CWE's market share of total red lentil imports is now about 35%.

Imports of chickpea increased from 6,570 mt in 1990 to 11,114 mt in 1994 with a peak of 16,949 mt in 1992. The country spent Rs 195 million in 1994 for importation of chickpea. The major countries exporting chickpeas to Sri Lanka are Turkey and Australia. The imports are mainly handed by the private sector.

4.1.4 Myanmar

Myanmar is in a straight export regime and is a price taker on international markets. Important policy changes have taken place in the recent years. Before 1988, the Myanmar Export and Import Services (MEIS) controlled the export of all Myanmar agricultural commodities. After 1988, trade in all crops was liberalized both in the domestic market as well as for export, with the exception of rice. There are no restrictions for export of pulses except for chickpea. Chickpea exporters have to sell some portion of export volume to the government at fixed price.

Most of the pigeonpea, black gram, green gram, chickpea, and lentil is exported to India, Pakistan, Singapore, Japan, Malaysia, Indonesia, Bangladesh, UAE, Korea, Hong Kong, and the Philippines. According to reliable information, the volume of border and unregistered sea-borne trade may be 10% of the total regular trade.

Production of pigeonpea and black gram has increased very fast in the last five years. It is clear that Myanmar has settled as the major export country in South and South East Asia. It has overtaken Thailand very quickly in total production. The various domestic production trends by pulse will be discussed in more detail in the section on production, because these to some degree reflect international demand trends.

The timeframe of the response by producers to the policy of 1988 shows that by the early 1990s momentum was achieved. To some extent the initiating curve shows the weaknesses of the financial system needed to back up the transactions.

4.2 Marketing and trade of pulses

The key characteristic of any agricultural market is that production is virtually always seasonal, and that consumption takes place on a continuous basis. The market smoothes out the temporal differences through moving, storage and processing and distribution of goods. Marketing and trade starts with farmers who sell to collection traders, who sell in turn to wholesale traders, who provide processors or distributors with pulses. Through these traders the pulses enter the domestic distribution channels, and are ultimately made available to consumers.

One issue needs mention in advance of the discussion of the marketing systems. This concerns the still widespread myth that pulse growers are always located on marginal lands, and are therefore subsistence farmers. Pulse growers can be located on marginal soils, but this is not automatically so. The idea that pulse farmers are subsistence farmers in the sense that they eat their own product is wrong. Pulses can not serve as a staple, as farm people know quite well.

Farm produce is usually sold, and only seed requirements are commonly withheld from entry in the product market.

4.2.1 India

The domestic market for pulses dominates completely. In recent years India exported between 30,000 and 60,000 tons, while imports fluctuated between 400,000 and 1.2 million tons, possibly absorbing annual production fluctuation. (Table 4.1). The short term shifts in international trade could be interpreted as indicative of a successful turn-around of the trade balance in the pulse market. It is, however, not possible to distinguish whether import control or production shifts have played a role in this course of events. This issue may deserve some attention.

Table 4.1 Pulse production, import and export, 1990/91 to 1994/95 in India ('000 tons).

Year	Production	Import	Export
1990/91	14,260	1,273	-
1991/92	12,002	313	-
1992/93	12,815	383	34
1993/94	13,300	628	44
1994/95	14,120	555	60

The geographical span of India suggests that inter-regional and inter-state movement of pulses is very important to satisfy the requirement of regular supply at more or less stable quality to processors. The processors purchase from wholesale suppliers, and distribute to the wholesale distribution agents, making the produce available to consumers. Because supply is seasonal, and consumption takes place on a daily basis, one has to take into account seasonality of production, storage and transport at all stages of the market.

Table 4.2 shows that marketable surplus in pulse farming is estimated at around 60% of production. One has to take into account that farm production is small and that even minor household consumption and seed use will quickly lead to low marketable surpluses.

Table 4.2 The percentage of marketable surplus in different pulses.

Commodity	Percentage of Marketable Supply
Gram	40.30
Arhar	50.00
Urad	61.30
Masoor	53.50
Moong	59.01

Source: Report of the working group on Agricultural marketing for the Eight Five Year Plan 1990/1995. Department to Rural Development, DMI, Government of India Faridabad.

Transport (Table 4.3) is the major determinant of efficient and cost effective marketing. In India, it would seem that the collection market externalizes the cost of transport from the field to the buying point to producers. This means that farmers' marketing costs are a function of their locality and access to roads. Various surveys show that farmers transport their produce mainly by animal carts (58%); the other means of transport are tractor-trolleys (28%) and trucks (5%). Small farmers may bring their produce by head-load, carrying the load mostly in gunny bags. Large farmers usually receive higher prices than small farmers. Farmers located near the markets receive higher prices than those located further away. Farmers who have road links with markets receive higher prices than those who have no road links. This is logical, and

a universal observation in the marketing of agricultural goods.

Table 4.3 shows that in India the marketing costs constitute a large proportion of value added in the pulse market. This is to be expected.

Table 4.3 Marketing and processing costs of major pulses 1991/1992 in Rs/quintal, India.

Particulars	Pigeonpea	Lathyrus	Horse Gram	Green Gram	Black Gram	Lentil	Total Pulses
A. Cost of Raw Material	883.44	336.28	621.52	736.38	699.63	685.99	540.31
B. Marketing Cost							
(i) Transportation	32.27	9.80	16.96	21.26	29.76	20.55	16.67
	(31.86)	(25.80)	(22.35)	(25.34)	(37.45)	(31.83)	(26.33)
(ii) Mandi Tax	8.83	3.36	6.22	7.36	7.00	6.86	5.40
	(8.72)	(8.67)	(8.20)	(8.78)	(8.81)	(10.62)	(8.53)
(iii) Sales Tax	7.84	5.98	11.57	13.62	12.87	12.59	10.74
	(7.74)	(15.42)	(15.25)	(16.24)	(16.20)	(19.50)	(16.96)
(iv) Labour Charges	2.18	2.18	2.18	2.18	2.18	2.18	2.18
	(2.15)	(5.62)	(2.87)	(2.60)	(2.74)	(3.38)	(3.44)
(v) Commission	3.06	1.98	1.91	3.14	3.48	2.00	2.20
	(3.02)	(5.11)	(2.52)	(3.76)	(4.38)	(3.10)	(3.47)
Sub-total	54.18	23.30	38.84	47.56	55.29	44.18	37.19
	(53.49)	(60.10)	(51.19)	(56.70)	(69.58)	(68.43)	(58.73)
C. Processing Cost							
(a) Variable Cost:							
(i) Salaries & Wages	6.84	2.38	3.47	3.42	5.36	4.17	3.55
	(6.75)	(6.14)	(4.57)	(4.08)	(6.75)	(6.46)	(5.60)
(ii) Power & Fuel	7.12	2.67	4.31	3.42	5.02	2.65	3.82
	(7.03)	(6.89)	(5.68)	(4.08)	(6.32)	(4.10)	(6.03)
(iii) Repairs & Main.	2.60	1.50	2.84	2.02	1.79	0.85	1.97
	(2.57)	(3.87)	(3.73)	(2.41)	(2.25)	(1.32)	(3.11)
(iv) Overhead Exp.	2.29	1.00	2.06	2.63	1.23	1.38	1.50
	(2.26)	(2.58)	(2.71)	(3.13)	(1.55)	(2.14)	(2.37)
(v) Tax, Insurance &	4.46	0.09	1.27	1.93	1.21	1.31	1.44
Licensing Fee	(4.40)	(2.40)	(1.67)	(2.30)	(1.52)	2.03	(2.27)
(vi) Interest on	13.04	4.21	13.18	16.07	4.52	4.88	7.78
Working Capital	(12.87)	(10.68)	(17.37)	(19.16)	(5.69)	(6.94)	(4.29)
(vii) Depreciation on	9.30	2.55	8.49	6.00	3.84	4.90	5.25
Building & Plants	(9.18)	(6.58)	(11.19)	(7.15)	(4.83)	(7.59)	(8.32)
(viii) Miscellaneous	1.47	0.23	1.42	0.83	1.20	0.64	0.81
	(1.45)	(0.28)	(1.87)	(0.10)	(1.51)	(0.99)	(1.28)
Sub-total	47.12	15.47	37.04	36.32	24.17	20.38	26.12
	(46.51)	(39.90)	(48.81)	(43.30)	(30.42)	(31.57)	(41.27)
Total Value Added	101.30	38.77	75.88	83.88	79.46	64.58	63.31
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Total Cost	984.74	375.05	697.40	820.26	779.09	750.55	603.62

Note: Figures in parenthese indicate the percentage to the total value added in marketing and processing.
Source: Gupta and Gauraha 1995.

Case studies on the marketing of pulses show that farmers have options in choosing partners. Agency-wise, farmers sell 7.56% of their marketable surplus to village traders, 88% to wholesaler traders, 35% to processors, and only a very small proportion of 0.76% to consumers directly. This last number shows that there is little direct consumption of pulses. An in-depth study reveals that a very large number (28) of marketing channels exist for gram. The percentage quantities moving in these channels show the mobility of pulses. Around 24% of gram reaches the consumer in the state of production; the quantity going outside the state in trading channels is nearly 74%. Gram traded through government channels is around 2%. Approximately half of the pulses channeled to consumers outside the state goes as grain flour.

The easiest way to classify pulse markets is by scale, i.e. the turnover. There is a clear relationship between the number of participating traders and the actual size of a market. The number of participating traders increases with the turn-over. Some authors conclude that pulse markets show the tendency to be oligopsonistic, i.e. a situation where a small number of suppliers serves a large number of buyers. This may be true on occasion. It is important to recognize that any agricultural market has oligipolistic tendencies; traders tend to operate in a geographical area, which is defined by their transportation span and, most importantly, their acquaintance with producers. In foodcrops such as pulses, many producers always supply several collectors, who in turn supply a number of wholesalers and processors, who supply in turn a large number of consumers. It depends therefore entirely at which market stage one looks how one classifies the market.

In India one can also distinguish between local collection wholesale markets in terms of transaction structure. The majority of markets are producer area based direct transaction markets, without a coordinating mechanism. Price setting is the result of negotiation between trader and producer. This is the most common type of agricultural collection wholesale market. Another type is encountered in areas where state governments have set up auctions in producer centres, often linked to cooperatives.

The government has tried to set up auctions in pulses in order to create competition in the collection/wholesale trade. These efforts seem to have resulted in higher producer prices, and also in higher costs. The expectations of an auction system may have been somewhat high. A description of auction markets in Rajasthan, reported by Acharya (1985), illustrates the course of events and expectations:

> " [In Rajasthan] the number of wholesalers and commission agents has increased over time, but the number of brokers has decreased. Brokers operate in very few markets, mostly secondary ones. Though the number of wholesalers or commission agents in one [researched] market was 157, on average only 10 to 30 assembled for auction at a time. The number who actually participated in bidding for a specific lot was only 2 to 6.

It is logical that when commission agents increase in number, the number of brokers decreases. A good sign is that the number of wholesale traders increases, this is usually a sign of expanded inter-regional trade and strengthened market integration. In regulated market, the open auction method is prevalent. Auction type markets are not necessarily cheaper than direct marketing. A comparison of the situation in Rajasthan, where two-thirds of farmers sell their pulse produce in the auction market, and the situation in Gujarat, where two-third of the farmers sell their produce to cooperative societies, shows that the marketing cost in the regulated market is higher than the costs of direct, party-to-party, transactions. The main cost factor is the transportation cost. The commission agent, through whom the farmers produce is auctioned, plays an important role through participating in the bidding to ensure that his clients receive a reasonable price. Though the number of pulse traders over time shows a steady increase over time, there is a tendency for the number of traders to increase swiftly during scarcity years, presumably with the aim of benefiting from high prices. In such situations, traders prefer to buy and sell in local markets, at the village or block level. In Uttar Pradesh, for example, a large quantity of grain is sold in this type of market.

The importance of inter-regional or in India, inter-state, trade is borne out by differentials in the use of existing capacity for processing. Taxation and regulations differ among states, inducing flows of produce towards the lower cost regions. A study (Gupta and Gauraha 1995) found that the capacity utilized by processing units is very low (about 40%) for all the pulses, except lathyrus. One of the reasons for low capacity utilization is that grain is sent out to other adjoining states, particularly to Maharashtra, where it is completely free from sales tax either on raw material or on final products.

One should, however, also take into account that inter-state movement and low

utilization ratios of the processing industry are a sign of a complex temporal pattern of supply. The returns to storage are positive in the seven months from August to February, the probability of profits increases the closer the storage time comes to the beginning of the production period of March, June, when supplies are lowest.

Transportation and commission are two important items which vary according to the place from where the raw material is purchased. The cost varied on these two items from 25% in horse gram to 42% in black gram depending on the distance. The total marketing cost was 58.73% on average with a maximum (89.58%) and minimum (51.19%) in black gram and horse gram respectively.

Box 3 Dal marketing in India.

A good illustration of the mobility and the complexity of produce distribution is provided by the marketing of dal. In India, dal milling is the third largest agri-industry, after rice and wheat flour milling. We can distinguish two types of dal mills, small and medium scale. There are around 10,000 medium scale facilities in India, with a capacity of around 10 to 20 tons per day. Small capacity dal mills sell their produce in local markets. Medium to large capacity dal mills sell it to agents. Dal is marketed in other states where the sales tax is low or exempted for dal. The marketing of dal in the different regions of India is as follows:

- Southern India: mainly locally marketed, rest to outside state through agents.
- Eastern India: urad and 50% of moong is locally marketed.
- Central India: 40% is marketed within the zone. The balance (30% each) is marketed in Tamil Nadu and Andhra Pradesh.
- Western India: 35-45% is marketed within the zone. The balance is marketed in Kamataka, Tamil Nadu, Andhra Pradesh, and West Bengal (13.75%-16.25% each).
- Northern India: 45-50% is marketed in region. The balance (25-26.5% each) is marketed in Maharashtra and Karnataka.

Processed pulses show a very high mobility. Processors purchase 49% of the raw material (pulse grains) from the local *mandi* either through direct bidding during auction or from the local wholesalers. Processors also buy raw materials from neighboring states (on average 10%) and export the dal to outside the state (on average 75%). The processor's dal selling price was 38% higher than pulse grain purchase price in gram and earned 14% as net margin. In other pulses, with different recovery rates (70 - 87%), and different scale of production, the gross margin is higher, at 52% in moong and 71% in urad.

4.2.2 Pakistan

In Pakistan, the major pulses traded are chickpea, mungbean, lentil, and black gram. The main growing areas are the Punjab Province and a few areas in the North West Frontier Province. There are a number of pulse markets in each area (five in Punjab and three in NWFP). The crop harvested is sold to village traders, commission agents and brokers. A few large and resourceful farmers manage to transport their produce to the main markets for better prices. The village traders and brokers dispose off the produce to commission agents of the main markets of pulses producing areas. Pulse processors purchase their requirements from the commission agents and *arhties* in the open market with competitive prices. Pulses are transported to other provinces on trucks and vans.

4.2.3 Sri Lanka

Purchasing of domestically produced pulses in Sri Lanka is mainly handled by the private sector. The share of government run organizations (the Cooperative Wholesale Establishment/CWE, Paddy Marketing Board/PMB, and Multi Purpose Cooperative Societies/ MPCS) is less than 5% of the marketed production which is 95% of the total production.

Farmers have two major market outlets for sales of their pulses: periodic markets or rural fairs and collectors. Periodic markets operate once or twice a week and farmers bring their stock for sale. They can also directly sell to town wholesalers who come from distant areas. Collectors have established trading centres located in the producing areas. Farmers bring their stocks for sale. Farmers often take loans from the collector. The purchasing price is based on

the Colombo wholesale price where the principal market is situated.

The collector is the major supplier to town wholesalers and to the Colombo wholesale market. The collector holds stocks, anticipating higher price during the off-season. Collectors are small scale business entrepreneurs with limited working capital. They lack financing.

The largest market for pulses is in Colombo. Trading takes place on a commission basis (5%). The major buyers are retailers followed by contract suppliers who supply the processors. Consumers purchase from retailers in nearby areas.

4.2.4 Myanmar

In Myanmar the food grain trade has been a state monopoly; distribution for domestic consumption at both wholesale and retail levels was largely carried out by free market agents. In 1963, the trading of 11 agricultural products (rice, wheat, maize, pulses, and selected crops) was brought under direct control of government in line with the centrally planned economy. Agencies in agricultural marketing have been the Myanmar Agricultural Produce Trading (MAPT) and Myanmar Export and Import Services (MEIS). Since the State Law and Order Restoration Council (SLORC) assumed power in September 1988, a market economy was adopted, and procurement, marketing, transport, and storage of crops were liberalized. The government is also encouraging private sector participation in agricultural activities

The present market structure in Myanmar consists of state economic enterprises, cooperatives, joint-ventures, and private traders. The state economic enterprises purchase pulses from all available sources (traders, cooperatives, middlemen, and farmers). The cooperatives, joint-ventures, and traders have their own brokers (commission agents) and they also buy from individual traders. Farmer sell their products to brokers who come to the village or farmers go to the nearest town to sell their products in the broker's house or market. Most farmers keep the seed for the next season and the rest are sold. There are no regulations concerning the market for food grain in Myanmar. Sometimes farmers in need of cash have to sell their products before harvesting regardless of the price.

4.3 Consumption

This section discusses major trends in the consumption of pulses and describes the role of pulses in the diet.

4.3.1 India

Pulses are an integral part of the Indian diet. They are an important source of protein especially for the vegetarians and the economically poor and rural population of the country. Pulses are generally two to three times richer in protein than cereals and hence a cheap source or protein. They are also rich in lysine and threonine, the essential amino acids in which cereals are deficient and thus they complement the amino acid profile available from a cereal based diet.

There is pressure to stimulate the consumption of pulses. According to a suggestion put forward by the National Commission on Agriculture (NCA Vol. III, 1976), the consumer demand for pulses in 1985 of 14.83 to 17.73 million tons and in 2000 of 20.70 to 24.70 million tons has to be raised to 17.45 to 20.86 million tons and 25.56 to 30.49 million tons respectively because of the post-harvest losses and requirement of seed and feed (about 15% of gross production in 1985 and 19% of gross production in the year 2000). According to the NCA

projection, the country has the potential to meet the anticipated demand of pulses through domestic production. NCA projected that pulse production in India can reach 22.0 mt in 1985 and 35.0 mt in 2000 AD. Whether India is indeed capable of meeting this production remains, however, in doubt.

It is clear that a closer look at the prevailing trends in consumption of pulses and its relation to income and prices is warranted. In 1987, the year of the latest fully analyzed consumption data, per capita consumption was 11 kg per capita in rural areas and 12 kg per capita in urban areas. Rural consumption of pulses increased faster than urban consumption of pulses over the years 1977-1987. On a per capita basis, consumption of pulses is highest, at 11 to 17 kg per year, in the two highest income classes in rural and urban areas. However, inquiries indicate also that expenditure elasticities for pulses are higher than 1 in the two lowest income classes. This matter needs further confirmation in view of the recent study (Kumar 1996), that found expenditure elasticities around 0.3 in rural areas and 0.2 in urban areas. In that study it is assumed that demand for pulses is highly price elastic for the lower income groups, yet as a whole in India the demand for pulses is price inelastic, at around -0.5.

In the situation just described, it is best to differentiate among the various species and qualities of pulses, in order to disentangle the seemingly contradictory signals emanating from research on the whole group. There are bound to be quality preferences. This is also of specific relevance to the rewards for storage and quality in the market. With more specific information it may also be possible to restructure and refine the target setting practices in India.

4.3.2 Pakistan

Consumption of pulses in Pakistan has changed as has the status of pulses as a consumer good. Until recently pulses were considered as minor crops. However due to gradual changes in the diet of people as well as because of the high prices of meat, the status of pulses has had to be redefined. An overall increase of 15% in per capita consumption of all pulses took place over the years 1986-1990. Chickpea has the highest per capita consumption at (2.9 kg) in rural and (2.8 kg) in urban areas; the second most important pulse is mungbean with a per capita consumption of 1.2 kg/annum, followed by black gram (1.1 kg/annum) and lentil (0.7 kg/annum).

Consumption of pulses in urban Pakistan increased from 6.36 kg/capita per year in 1986 to 9.00 kg in 1993; in rural Pakistan consumption increased from 6.00 kg in 1986 to 7.86 kg/capita per year. With regard to income groups, consumption is somewhat bifurcated in rural Pakistan: the lowest and the highest rural income groups consume most pulses. In urban Pakistan, the second lowest income group consumes most pulses. It is quite possible that this bifurcated structure of consumption disappears if one analyzes the consumption of the individual pulses.

It is interesting to note that in the years 1979-1985 the trends in consumption of pulses have been down-going. In the years 1986-1993 these trends have reversed. It may be that the open import regime and the slow slide of exchange rate of the Pakistan Rupee versus the US dollar, which started in the mid 1980s, have contributed to the reversal of the consumption trend in Pakistan.

Box 4 Some uses and dishes of pulses in Pakistan.

Chickpea is the major pulse crop of Pakistan and contributes about 70% of the total pulse production of the country. More than 30% of the farm production of chickpea is utilized as seed, feed, and pre- and post-harvest losses. It is used in a wide variety of dishes and snacks. Chickpea is used in roasted as well as fried form. It is also a standing dish in restaurants and hotels where it is most liked by the people. Chickpea is eaten with rice and delicious dishes are prepared when mixed with meal and potatoes. *Desi* chickpea is used in village as green gram and leaves. Dal chickpea is a popular dish in the rural and urban areas. Boiled chickpea is used for preparing salads and other dishes. Dal flower (*basa*) is also used for preparing household dishes and sweet fried snack. During winter the people of rural areas eat spicy bread made of wheat-chickpea flour.

Mungbean is consumed in several ways: curries, soups, noodles, bread and sweets. The seeds roasted with spices are also popular. Mungbean dal is cooked in urban households along with fried rice or mixed together. Mungbean is not a common dish in restaurants and hotels; it has fewer uses in rural areas compared to urban areas. In hospitals mungbean dal is prescribed for the patients and usually served with bread.

Lentils are an excellent source of nutrition for people who cannot afford animal protein. Lentil are generally consumed as dal (split and cooked) or roasted and used as snacks. Lentil dishes are more popular in rural and rainfed areas in Pakistan. It is hardly found in mediocre restaurants and hotels, but it is served in salad or snacks in high class hotels. Since it is an important crop of the rained farming system, the crop residues as well as grains are highly valued for livestock feed, especially for small ruminants. Lentil starch is also used in the textile industry.

Black gram seed grain is a rich source of protein for human consumption and animal fodder. Black gram is the second most preferred and popular dish in urban as well as rural areas. Black gram fried dal is a common dish in medium class hotels and restaurants and it is served with bread. The seeds are used in various snacks and dishes. Black gram dal is also cooked along with rice and meat.

Lathyrus (mattri) is a dual purpose pulse crop. It is used as green fodder, grain seed as livestock feed and as a pulse cooked for human consumption. About 70% of mattri seed is used as cattle feeds and the remaining 30% is consumed as dal. Usually mattri pulse is considered a low quality dal. The principal consumers are rural people of the poorest segment with meager resources. Mattri seed contains a toxic substance which can cause paralysis of the lower limbs in both human beings and animals, therefore the middle class and higher income households avoid the use of this pulse.

4.3.3 Sri Lanka

Consumption of mungbean and lentils has increased rapidly while that of cowpea and black gram has decreased considerably in recent years. Per capita consumption of mungbean increased from 26.9 grams/month in 1978-79 to 59.4 grams in 1986-87, more than two-fold. Per capita consumption of lentils went up by over 50% from 144 grams/month to 220 grams/month during this period. The consumption of black gram declined from 7.1 grams/month to 1.1 grams during 1978-79 to 1986-89 while cowpea dropped from 54.4 to 20.6 grams.

The highest consumption of all the pulses (except lentils) is in the estate sector where the majority are Tamils. The consumption of black gram is four times higher than the national average, and consumption of cowpea was more than three-fold when compared to the urban sector which is the lowest. The highest consumption of red lentils comes from the urban sector; this is due to high bread consumption in which red lentils are used as curry.

The average Sri Lankan family spends 5% of food expenditure on pluses, which is 3% of the total expenditure. There is no marked variation in expenditure on pulses proportionately to food expenditure among different income groups; expenditure on pulses increases with income increase.

4.3.4 Myanmar

Myanmar's basic food requirements are rice, edible oil and salt. In addition, fish and prawn and pulses are the main sources of protein in the diets of people in a developing country like Myanmar, especially among the poor.

Annual average consumption of pulses per head (kg/year) in the last four years among the people of Myanmar fluctuated but seems on the rise. It was around 13 kg/capita per year in 1995. In 1978 per capita consumption of grain legume was reported at 7.13 kg per year (or 19.52 grams daily). In 1991 it was estimated at 9 kg, in the years 1992 and 1993 at around 5 to

6 kg. The fluctuations are caused by the method of estimation, which uses food balance sheets. In this method, fluctuations in production are automatically reflected in fluctuations of consumption.

Box 5 Varieties of pulses consumed in Myanmar.

Peas and beans constitute very important daily protein intake for the people of Myanmar, especially for the lower income groups. The number of species is very high. The percentage composition of food legumes in the Myanmar diet is presented below:

Food legume:	Percent
1. Chickpea	29.0
2. Peas	16.9
3. *Sultani/pya* (colored lima bean)	10.3
4. Lablab bean	9.3
5. *Pebyugale* (white lima bean)	8.0
6. Pigeonpea	6.4
7. Soybean	4.7
8. Black gram	3.6
9. Cowpea	4.7
10. Others	7.1
Total	100.0

Most of the domestic chickpea production is used in domestic consumption. Chickpea is consumed in many forms. It has two major culinary uses, namely dal soup and dal meal. Hard tofu, soft tofu, pea-noodle and varieties of snack food are made from chickpea. Chickpea is popular among all people in Myanmar because of its taste, flavour, and usefulness.

The Indian people in Myanmar mostly use pigeonpea, black gram and green gram as their food. Rural people and Myanmar physicians value pigeonpea for its properties. In the central zone of Myanmar, characterized by high rice prices, rural people cook rice mixed with pigeonpea to save money. Other pulse crops mixed with rice are used as breakfast for rural and urban people, or as snack food. Lentil soup with pea noodles is very popular among the urban people.

Harvest residue of legumes (pods, cracked seed, and leaves) is widely used for animal feed. In the dry zone, the pigeonpea plant (stems after harvest) is used as a source of fuel for domestic purposes. The seed rate is 0.75 basket per sown acre and wastage is estimated as 2% the production.

4.4 Processing

The following sections provide information on processing. Efficiency in processing usually relates to efficiency in marketing. Losses and costs, and ultimately consumer prices can be reduced through the use of good technology.

4.4.1 India

Seventy-five percent of pulses produced in India is processed, therefore post harvest

technology plays an important role in per capita availability. Pulses are processed in different ways. Processing is also done at the consumer's level. Pulse processing units vary in size from cottage industries to multistory plants using pneumatic conveyers. The steps involved in dal or besan making at home or in the mills are the following:

- cleaning (removing of foreign matter from pulse grain);
- dampening (soaking of the grain in water for desired time);
- tempering (keeping soaked grain for sundrying);
- splitting (grinding of grain to make dal);
- husking (removal of husk from dal); and
- grinding of dal (broken or otherwise) is done to convert it to besan (flour).

Processing of pulses or dal milling is the next largest food processing industry after rice and flour milling. There are about 10,000 pulse mills with 10 to 20 tons/day processing capacity and with an approximate annual turn over of Rs 45,000 crore. They are privately owned. They work on an average of 200-250 days/year. The majority of the dal mills use conventional technology with locally fabricated machinery which consumes high electricity and time and they are labor inefficient. The Central Food Technological Research Institute (CFTRI) has developed the appropriate technology (mini dal mill) suitable for the common varieties. It is suitable for family use and creates jobs in the rural areas (during off season). As compared to traditional milling, CFTRI technology is far superior. In the large traditional milling, the pre-treatment is largely traditional. It is time consuming and fully dependent an climate conditions.

A study made by National Productivity Council (1993) of dal mills in India revealed the following features:

- 90% of dal mills in India are privately owned, 8% under cooperative, and 2% under government.
- 90% of the units earn profits.
- Only 6% of the units use CFTRI technology.
- The majority of units are semi-mechanized; they use the touch method to determine moisture content.
- Most units (around 90%) sun dry the pulses.
- The packaging material used is gunny bags.
- Commission charges, sales tax, patent charges vary significantly across the states.

A earlier study (Kulkarni 1986) found that in the 1980s 40% of mills operated at their rated capacity, 16% at 75% capacity, and 24% operated at 25% of rated capacity. The reasons for this were in the mid 1980s insufficient power input to the mill and lack of capital. One would also assume that the supply would have some significance.

Output of the dal mill depends on the availability of raw material, capital and energy, and the also capacity of the mill and the number of working days. The major portion of the pulses processed is milled by the dal mills with daily capacity ranging from 0.5 ton to 10 tons/day. Packing and storage of dal is related with loss of quantity as well as quality. The packing material is seldom of good quality.

The pulses contain 11-14% husk and 2-5% germ and the rest endosperm. The extraction rates of processing are between 70 and 88% of raw material. The main by-products of pulse milling are in the form of brokens (6-13%), mixture of germ and powder (7-12%) and husk (4-14%). Small brokens and husk are used as cattle feed; brokens are either used for human consumption, as an ingredient in cattle feed or fed to swans and elephants. Husks of lentil are used in poultry feed; brokens of Bengal gram are fed to horses and used in *besan* preparation. Brokens of green gram and black gram are milled to produce flour and are used in *papad* making. Normally, brokens fetch more than half the price of dal; husks fetch about 30% of the dal price.

Among the post-harvest losses (9.5%), storage losses account for major losses (7.5%), processing accounts for a 1% loss, and threshing and transportation for 0.5% each. Around 80% of the storage losses are due to insects, rodents and micro-organisms. The grains in the village are stored in mud bins, paddy straw mud plastered bin, bamboo mud plastered bin, reed, mud bricks, baked mud plastered pitchers, etc. The traditional structures can be improved by sandwiching a 700 gauge polythene sheet in between. The Pusa bin developed by the Indian Agricultural Research Institute is yet another improved storage structure. The Indian Grain Storage Institute also has developed modern farm storage structures of 14.5 mt capacity to meet farmers' requirements. Fumigation controls the insect infestation.

The major issues and constraints in the processing industry in India are summarized below:

- faulty layout of machinery (design does not meet specific or exacting requirement of grain properties);
- lack of storage facility; insect and rodent infestation and mold growth during post-harvest handling, storage and distribution cause substantial losses both qualitatively and quantitatively. Birds and rodent account for considerable losses during drying and storage;
- sun drying practice resulting in lengthy processing line and complete dependence on climatic condition;
- limitation of drying yard facilities;
- fluctuations in the availability of raw materials and their milling characteristics;
- arbitrary use of oil and water;
- high labor requirements;
- low yield and poor quality dal of mills;
- very low equipment utilization and high cost of processing;
- dust pollution inside the mill;
- costly packaging material; and
- lack of awareness of modern dal milling technology available in India.

4.4.2 Pakistan

In Pakistan there are three types of pulse processing methods, which coincide with the scale of production. One can distinguish household level processing, village level processing, and small scale processing units located in towns/cities of major pulse producing areas. Sargodha, Mianwali, and Multan districts are the major locations of pulse processing industries in Pakistan.

At the household level, the traditional method is used for splitting and decorticating seed pulse into dal for consumption purposes. Pulse seed grains are spread on a cemented or brick floor and ground by hand with a manageable piece of stone. Pulses are dehusked, split and decorticated into the form of dal. Another method used at the household level is a hand-driven machine to crush and split the pulse seeds into dal, after removing the husk and pulse flour. At the village level, flour mills crush and decorticate pulse seeds supplied by the local producers and villagers. These crushed seeds are cleaned and husked; broken seeds are separated from dal to be used as animal feed. These mills are primarily wheat flour mills.

The relatively large scale processing units are the dal mills. More than 100 such pulse seed processing units (dal mills) are located in Punjab province alone. They operate seasonally and usually below their designed capacity. Chickpea and lentil produce is available during March-April, whereas mungbean and black gram is harvested during September-October. Hence, the operations do not exceed 100 - 200 days in a year. Not more than 10% of the available produce is crushed with the stone-flour method. Almost 15% of produce is processed by hand operated household level stone made machine, while the rest (75%) of produce is

acquired by dal mills for processing.

Specialized pulse storage facilities are rare. The majority of the dal millers cannot hold more stock than 50,000 bags; the major storage capacity is located in the milling facilities. Out of a bag of 100 kg pulse, 80 kg is turned into dal and 2 kg is resold as seed, 8 kg flour and 10 kg husk is obtained. The owners of mills are also wholesale dealers of pulses and procure all types of pulses from town markets.

In Pakistan the number of dal mills has increased during the past few years but the owners do not consider it a profitable enterprise because of several reasons and problems. Important constraints are summarized below:

- The majority of dal mill owners do not have adequate grain storage facilities to hold stocks for operating mills; existing facilities are of poor quality without any proper shelter.
- Short term storage of pulse seeds (4-6 weeks) at the mill involves high risk of insect/pest attack, which sometimes causes losses more than 50%.
- Dal milling is a seasonal and part time activity, with little incentive for investment.
- All the dal mill owners buy their requirements from the open market at competitive prices. This causes extreme fluctuations in the supply and demand of pulses and only the efficient millers survive.
- The government has imposed heavy taxes on pulse processing machinery and transport.
- The operational costs of dal mills have increased tremendously due to high increase in the wages of skilled and unskilled labor, electricity and other supporting services.
- Dal mills/pulse processing industries, like other industries, have not so far received any incentive or tax exemption from the government.

4.4.3 Sri Lanka

The processing industry in pulses in Sri Lanka is not yet very large. Very few companies are involved in it. Most of them use huller machines made in India. Mungbean, cowpea, black gram, and pigeonpea are processed into split (dal) form. The average extraction rate is 80%. Black gram is also processed into flour with an extraction rate of 83%. In rural areas processing is undertaken at the household level using traditional methods, namely pounding or milling followed by winnowing. The government has developed a low cost motor driven dehuller for processing of pulses. This machine had become popular among rural farmers until the imported red lentils were made cheaper on the domestic market by removing import tariffs in 1994.

A major issue and constraint of the pulse industry in Sri Lanka is that processed pulses could not be marketed after 1978 when the import ban was removed. Locally produced dal can not compete with imported red lentils. There are two factors affecting this: consumers prefer imported red lentils due to taste and short cooking time; due to this preference, locally processed pulses have very limited demand even at half the price of the imported variety (in 1994 red lentils dropped in price by over 50% as a result of removal of import tariff). Since then demand for locally producer lentils declined rapidly and they have disappeared from the market.

4.4.4 Myanmar

The pulse processing industry in Myanmar focuses mainly on chickpea. In addition to the chickpea processing industry, all pulses, except soybean, are used to make transparent noodles. Chickpea is the most important pulse in the pulse processing industry in Myanmar. Almost all of the dal mills process the split gram and split gram flour. These products are also used as raw materials for food processing.

Chickpea dal mills are located in Sagaing, Mandalay, Bago and Yangon divisions.

Most are in Sagaing and Mandalay divisions. The processing method is very old and simple: chickpea is put in a wooden tank of 9 feet length, 5 feet width, and 5 feet height, water is sprayed over the chickpea and it is kept in moist condition for 24 hours. The next day the chickpea is split by roller and separated by sieve. The recovery of split gram is 75% to 78% of the total chickpea weight. About 10 - 14% is seed coat and 10-12% small broken pieces and powder, by-products used for animal feed. The split gram is ground to make flour. Processors realize about 90% out-turn of split gram flour out of the total split gram; 70% is good quality and 20% is poor quality flour, the rest is gram bran and wastage. Of the total split gram produce, 60-70% is consumed as dal and 30-40% is used for making gram flour.

Box 6 Making noodles from pulses.

All pulses (chickpea, pigeonpea, black gram, etc.) can be used to make noodles, except soybean, lablab bean, and horsegram. Well-cleaned pulses are first soaked in water for 24 hours and stirred occasionally. After draining, pulses are ground with a sour starter solution obtained from a previous batch. Than it is settled in a small tank and the liquid is removed. The residual meal is transferred into a wooden tub for 8 hours; it is then transferred into cloth bag which is hung up to drain out the water for about 15 hours. Then, the material is put into tanks in an air-tight room for sulfur fumigation, after which the product is allowed to dry for 2 days, after which a second sulfur fumigation takes place. After the second fumigation, the product is mixed with a sago solution (starch solution) and extruded into boiling water. The noodles are taken out of the hot water after 5 minutes when they are soft and put into cold water. After that, the noodles are put into an air-tight room for sulfur-fumigation again. The noodles are then dried on poles or drying racks for 1to 2 days. A typical pea noodle mill, uses about 70-100 baskets of pulses daily as raw material, and operates 200-300 working days/year. All of the processes are manual. Grinding is the only mechanical process; it uses electric motors. Generally, one basket (31 kg) of pulses yields 7.35 to 8.17 kg of noodles. The total number of mills are 32 in Monywa, 2 in Mandalay, 2 in Shwebo, and 2 in Bago divisions.

A constraint in processing of pulses in Myanmar is the very old and simple technology. This constraint is faced both by the chickpea processing industry and in pea noodle processing. Most of the processes are carried out by manual labor; grinding is the only mechanical process, using electric motors.

4.5 Production

This section presents the medium term trends on production, area and yield of the pulses. As far as possible within the scope of this explorative study, the pulse market is desegregated. This section includes data on the seasonality of production and indicates the true scope of the pulse market through listing of the many different pulses, and their performance. In this connection the relative area and yield developments reflect short and medium term demand and consumption shifts. One should keep in mind that while the time trends in area are usually fairly reliable as indicators of the medium term trends, yields are usually estimated spatially (and even temporal, i.e. yields of different seasons are often averaged). One cannot really speak of averages, only of average estimations. Yet, productivities reflect the nominal outcome of benefit - cost relations, and remain the cornerstone of comparative advantage in production among countries. Therefore, as a first step we compare the yield levels among the countries (Figure 4.1).

Figure 4.1 Yield of major pulses by country, South Asia

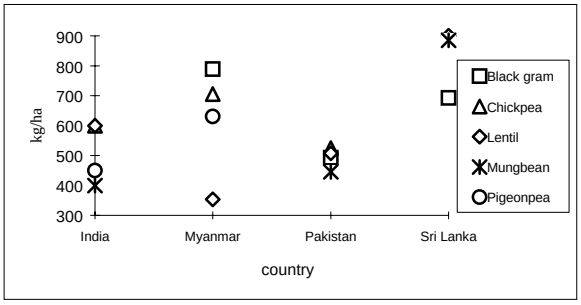


Figure 4.1 gives the level of productivity of the major pulses in India, Pakistan, Sri Lanka and Myanmar. These are but crude averages, and are in fact composed of productivities in two land types, irrigated and non-irrigated land. Yields under irrigated conditions are much higher than yields in non-irrigated land, and, most important, producer risk is far smaller.

Sri Lanka has the highest productivity levels, and in current production centres little potential for investment in productivity expansion. Yields in India and Pakistan are low, reflecting production in non-irrigated conditions. In Myanmar yields seem to vary quite a bit, while risk in rainfed conditions will be the main factor in Myanmar, one must also assume that the factor markets may not progress evenly among the main and more minor pulses; the recent fluxes in year-to-year farm gateprices suggest as much.

4.5.1 India

India is the major pulse growing country in the Asia-Pacific region, with 60% of area and 50% of production. Pulses account for about 20% of the acreage under food grains but only about 8% of the food grain production in India.

Production of pulses in India has remained below the government targeted supply of pulses. The country could only produce 12.65 million tons of pulses against the target 17.45 mt for 1995. The gap can be explained due to the failure to realize the expansion of area under pulses and the adoption of yield increasing inputs in 6.3 million ha under gram, arhar and moong. The other factor is that not enough and timely attention was given to technological, institutional and pricing framework in which pulses are produced and marketed. Also, research and development aspects have received little attention in regard to pulse crops, either in marketing or in pricing.

Some pulses already give relatively high yields, eg. soybean, broad bean and peas. But the production of pulses as a whole is stagnant. Several conditions have caused this situation. Cereal crops as staple food receive most of the attention from farmers and agricultural scientists; cereals are grown on the better lands, with improved agronomic practices, and receive policy support and development efforts. On the other hand, pulses are cultivated on marginal conditions and receive only minimal support, therefore "survival" technology become more important than high yields.

Among the pulses, gram, arhar, moong, urad together account for 75% of the area as well as production. Pulses are grown under rainfed conditions. They are generally grown in kharif (June to September; about 45% of area) and rabi (October to December; about 55% of area) seasons.

The major pulse producing states in India are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Orissa, and Bihar which account for 73% of the area and 78% of the total production of pulses.

Box 7 Species and trade names of pulses in India.

No.	Species	Common name	Trade name (in India)
1	*Cicer arietinum*	Bengal gram	Chana
2	*Vigna mungo*	Black gram	Urad
3	*Cyamopis tetragonoloba*	Clusterbean	Guar
4	*Vigna unguiculata*	Cowpea	Lobia
5	*Vigna radiata*	Green gram	Mung
6	*Dolichos biflorus*	Horse gram	Kulthi
7	*Vigna aconitifolia*	Kidney bean	Moth
8	*Lense culinaris*	Lentil	Masur
9	*Pisum sativum*	Peas	Matar
10	*Cajanus cajan*	Red gram (Pigeonpea)	Tur (Arhar)
11	*Glycine max*	Soybean	Soybean

During the last decade, the area under pulses in India covered around 22.0 to 22.5 million ha and production reached around 12.5 to 13.0 million tons. In the last four years, however, the production has increased from 12.0 million tons to 14.1 million tons with a productivity rise of 532 kg/ha to 609 kg/ha. But a comparison across different Five-Year Plans indicates stagnation of area and marginal increase in production and productivity.

India faces a number of problems affecting pulse production. These are as follows:

- The areas cultivated are dry/rainfed and marginal. But when irrigation comes HYV of cereal replace them pushing pulses to marginal lands. Pulses are less profitable and hence farmers divert better lands and resources for the cultivation of cereals.
- HYVs, as compared to cereals, are scarce. The existing varieties have little yield advantage.
- Lack of good quality seeds and very poor replacement ratio.
- Very poor extention efforts of even existing technologies to farmers.
- Low use or no use of modern inputs such as fertilizers, pesticides, micronutrients, etc. because of risk of low yield.
- Susceptible to number of diseases like yellow mosaic and powdering mildew on moong, urad, and cowpea, sterility mosaic and wilt in arhar and blight in gram. Also, pulses are vulnerable to termites and susceptible to pests.
- The production of pulses in the off season, that is summer/rabi, is affected by stray cattle and blue bull which damage pulse crops such as arhar, moong, and urad more than any other crop.
- They are mostly grown by people whose socio-economic conditions are poor.

4.5.2 Pakistan

In Pakistan, although pulses are of some importance in the national economy and in the diet, they have not been given much importance when compared with major cereals (wheat, rice, maize) and other cash crops. They are considered minor crops and are confined to rainfed areas. They occupy an area about 1.481 million ha of the total cropped area of 22.150 million ha, or about 7% of the total cropped area (in 1994-95) of the country. Pulses contain 20 - 27% protein, which helps in balancing the daily diet of rural Pakistan. Pulses are also an important component of animal feeds, and their dry straw is used as hay fodder.

Pulses are grown all over Pakistan, but their cultivation is concentrated in rainfed areas on the poorer soils. The major pulses grown in Pakistan are chickpea, lentil, mungbean and black gram. The minor pulses in Pakistan are cowpea, lathyrus, moth, fababean, common beans, and pigeonpea. The four major pulses (chickpea, mungbean, black gram, red lentil) share around 90% of the whole area under pulses and contributed 87% of the total pulse production of the country in 1994-95.

Of the pulses, chickpea, lentil and lathyrus are grown during winter (October-March) and are known as ”rabi pulses”. The rabi pulses contribute about 80% of total pulses. Mungbean, black gram, cowpea, moth and pigeonpea are grown in summer (July-November) and are called the ”kharif pulses”. Pulses are short duration and low input crops; they need minimum care and are drought tolerant. Therefore they fit well in many cropping systems.

Chickpea shows an increasing trend in the past 15 years. Its area increased from 843,000 ha in 1980-81 to more than 1,000,000 ha in 1994-95. The long-term (1981-1995) growth rate of chickpea area is + 1.7%/year, which, though positive, is significantly below the current population growth rate of 3.1% per annum. The chickpea production increased in 1980-81 to 1994-95 from 300,000 tons to 600,000 tons. Impressive increases (3.7%) in production were witnessed in the years 1980-81 to 1994-95. Productivity of chickpea in Pakistan is 300-500 kg/ha. Mixed trends of chickpea yields are due to high risk associated with this crop; however, over the long term the yields show an increase of 2%.

Chickpea is grown in three cropping systems: (i) the rainfed system, constituting 88% of the total chickpea area; (ii) the rice-based system, constituting 11% of the total area, where the crop is grown on residual moisture after rice; and (iii) the irrigated system, constituting only 1% of the total area. More than 85% of the chickpea crop is grown on sandy loam soils, and 13% on clay or clay-loam. This crop can be cultivated on soils of extremely marginal fertility.

Mungbean is grown all over Pakistan, but its cultivation is mainly concentrated in the Punjab. There are two mung-producing regions in Pakistan: (i) the northern region has high rainfall, so mung is grown under rainfed conditions and contributes 25% of the crop area and production; (ii) the central region constitutes about 75% of the total area and production of the country. Mungbean has almost consistently increased its area during the years 1980-81 to 1994-95, from 67,000 ha to 180,000 ha. The long-term average annual growth rate from 1980-81 to 1994-95 is 7.3% per annum. The increase in area planted to mungbean resulted in enhanced production. Production increased from 32,000 tons in 1980-81 to 64,000 tons in 1994-95 (a twofold increase). Mungbean yields range from 375 to 500 kg/ha. The major shift in production is obviously mainly due to the impressive increase in mungbean area.

Land preparation in mungbean cultivation is minimal. Planting time for the kharif crop starts from mid June and continues to the end of July, while for the spring crop, planting starts from mid February to the end of March. Mungbean is cultivated with other crops and cultivated in rotation; for example: wheat - mungbean - wheat, wheat - mungbean - fallow, sorghum/maize, fallow - sugarcane + mungbean (intercropped) in spring, and wheat - cotton + mungbean (intercropped) - wheat.

The lentil area has declined consistently from 73,000 ha in 1980-81 to 61,000 ha in 1994-95. Lentil production also declined during the same period. Lentil is usually grown on marginal lands without irrigation. It is grown as a sole or mixed crop and may be intercropped with wheat, mustard, and chickpea. It is an important source of human nutrition in the semi arid regions of the country. Lentil is a drought resistent crop and can be grown in low rainfall areas. It can be grown on marginal fertility lands (sandy to clay soils), but it is sensitive to salinity and waterlogged soils. Two or three ploughings are enough for planting. Lentil is planted during the third week of October to mid-November. Farmers use 20-25 kg/ha for seed and the crop is planted by the broadcast method. Weeding and hoeing are rarely practiced. The crop is harvested manually during mid April to the first week of May. Threshing and cleaning of lentil seeds are also carried out manually. The yields are low at 400-500 kg/ha.

Black gram occupies an important position in Pakistan’s agriculture. It grows in marginal lands where other corps perform poorly. It is dependent on intensity and distribution of rain, and yield is highly unstable. Compared to chickpea and mungbean, black gram is planted on a smaller area. Plantings range from 55,000 ha in 1994-95 to 89,000 ha in 1980-81, and experiences large year to year fluctuations. The black gram area has consistently declined since 1980-81. The yield shows a mixed trend and yields range from 396 to 565 kg/ha. Trends

in both area and yield of black gram contribute to the considerable reduction in production.

Lathyrus (mattri) is grown after rice in residual moisture, mainly in the districts of Jacobabad, Shikarpur, Larkana, part of Dadu in the Province of Sindh, and the Nasirabad division of Baluchistan. Mattri is a cool crop in Pakistan. It can grow from the sea level to an elevation of over 1,000 metres. Mattri is a crop that can withstand drought, excessive moisture, and salinity. The mattri area was about 120,000 ha during 1980-81, and reduced to 94,000 ha in 1994-95. Production of mattri is also declining; it was the lowest (41,900 tons) in the year 1982-83. Lathyrus yields range from 400 to 500 kg/ha.

Pulse crops have been neglected subsector of Pakistan's agriculture. The research and development efforts on food legumes are less then one decade old. Constraints to the advancement of pulse research and production in the country include:

i. Mostly pulses are grown on rainfed marginal and poor soil where the application of improved practices are not feasible due to lack of irrigation water.
ii. Slow release new improved varieties with high yield. Lack of diversified pulse germplasm.
iii. In the absence of any improved seed and technology or extention support for improved practices, farmers mostly depend on traditional practices and hesitate to use modern inputs, such as fertilizer, irrigation and pesticides.
iv. All pulses face insect damage both in the field and storage, causing quality and quantity deterioration.
v. Small average size of land holdings does not allow the growers effective use of improved production technology.
vi. Several diseases are major impediments to pulses production. Diseases cause substantial losses and pulse crops involve high disease risk.
vii. Because of uncertain weather and risk of insect pest attack, farmers prefer to use traditional practices requiring minimum cash input.
viii. As pulses are generally grown on poor and marginal soils, the productivity per unit area is very low, which in certain cases does not cover the costs of production. Therefore, pulse cultivation does not attract farmers.
ix. Absence of support prices, and marketing and storage problems.
x. Lack of improved seed production system.
xi. Lack of appropriate incentives for pulses grower such as loans to purchase inputs, improved seeds, fertilizer and chemicals for plant protection.
xii. Constant support of government for increased production of major crops such as wheat, rice, cotton, and tobacco has been pushing pulses to more marginal areas resulting in low productivity. National programs give little attention for pulse research and development.

4.5.3 Sri Lanka

Sri Lanka's agricultural sector has three main sub-sectors: (a) tree crops (rubber, tea, coconut), accounting for 40% of the cultivated area; (b) paddy accounting for a little more than 40% of the cultivated area, and (c) alternative crops, mainly subsidiary food crops and minor export crops. Subsidiary food crops include pulses, oilseed, condiments, roots and tubers, and vegetables. Minor export crops cover cinnamon, cardamon, cocoa, coffee, chinchona, citronella, cloves, ginger and pepper. The major pulses grown in Sri Lanka are mungbean, cowpea, black gram, and soybean. The government introduced pigeonpea as a close substitute for red lentils in the early 1980s, but it has not yet been successful. Red lentils and chickpea are not grown in Sri Lanka.

Production is mainly concentrated in 7 districts out of the total 25 districts, namely Kurunegala, Anuradhapura, Moneragala, Ampara, Puttalam, Vavuniya and Hombontota. Production of mungbean mostly (72%) comes from four districts, 69% of cowpea from five

districts, and 83% of black gram from only two districts. Over 70% of the annual production and area cultivated occurs during October to March, the Maha season. Planting is carried out during October and November and harvesting takes place from January to March. The rest takes place during the other season, the Yala season, running from April to September.

The largest area under mungbean during the period 1986-1995 was reached in 1990 with an extent of 33,245 ha, and since then the area planted has continuously declined to 18,097 ha in 1995. The largest area under cowpea was reported in 1986, totaling 27,705 ha. Since then it has continuously declined to 22,808 ha in 1989; after that year it increased to 26,304 ha in 1990, and then it declined again. The trends in black gram differ. Area cultivated fluctuates widely from the lowest level of 3,005 ha in 1991, to the highest level of 12,045 ha in 1993. Pigeonpea, which was introduced in the 1980s, is still very limited in its area. The highest extent amounted to 182 ha in 1988; the figure for 1995 was 30 ha.

As far as production is concerned, the peak production of mungbean during 1986-1995 was recorded in 1990 as high as 26,951 tons and since then it has been on the decline. The 1995 production was 16,013 tons, a 40% decline from the peak production. The highest production of cowpea was 24,607 tons in 1986; it declined continuously to 19,074 tons in 1989, and again production declined from 22,864 mt in 1990 to 16,110 tons in 1995. Production of black gram and pigeonpea fluctuates considerably from 5,161 tons to 9,434 tons for black gram and 27 mt to 235 mt for pigeonpea.

The average yield remains less than 1 ton/ha throughout the period of 1986-1995, except for pigeonpea, the productivity of which reached a little over one. Also, there is no marked variation between the two seasons.

Farmers who cultivate pulses follow traditional cultivation practices. Since cultivation depends entirely on rain, production risk is high.

Sri Lanka faces current the following problems affecting production:

i. Production of pulses has either stagnated or declined since the 1980s after introduction of the open economic policy. Under this new economic policy, red lentils were allowed to be imported without any quantitative restriction and since 1994 imports were zero tariff. Red lentils then enjoy high consumer preferences; and since they are not grown in the whole the Sri Lanka the entire country requirements depend on import. This hinders pulse production considerably, and results in the decline in production of other pulse crops by as much as 20% to 25%.
ii. Because pulses are not considered as high value crops as other crops such as chilies, onions, and paddy, and there is no strong demand in the domestic market. Since no exports pulses are grown in the high-lands and very limited on irrigated land, and they are still grown following traditional farming practices, the result is low yield.
iii. Pulses are crops grown by economically weak farmers because cost of production is comparatively low due to non-application of fertilizer and agro-chemicals.

4.5.4 Myanmar

In Myanmar, pulse crops occupy the third position of importance of agricultural products. But the total sown and cropped area is rapidly increasing, because pulses are promoted year by year. Pulses have become an important source of foreign exchange earnings among agricultural commodities for Myanmar.

For many years the area planted to pulses has been stable around 2 million acres (0.81 million ha), but due to the trade liberalization policy of Myanmar since the late 1980s, by 1995 the area under pulses has increased to 5.03 million acres in response to the market demand, and the potential for expansion of pulse production for export is still enormous.

The data show that within the last 10 years all the selected crops generally fluctuate in their planted area, harvested area, production and productivity.

Chickpea is mainly grown as a relay or sequential crop with rice. There are some upland areas where chickpea follows sesamum, maize and green gram. Sowing of chickpea on upland farms begins between late September and October, while on rice land it starts two weeks before harvest in a relay-cropping system. During the last 20 years, chickpea areas vary from 300,000 acres to 500,000 acres.

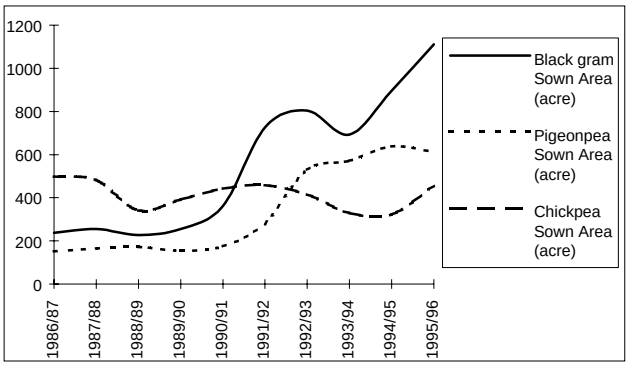
Box 8 The major food legumes of Myanmar and their yield and production in 1995/96.

No.	Botanical Name	English Name	Myanmar Name	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1	*Cicer arietinum*	Chickpea	Kalape	442,810	8.74	3,868,007
2	*Cajanus cajan*	Pigeonpea	Pe-sin-gon	592,484	7.8	4,622,942
3	*Vigna mungo*	Black gram	Mat-pe	1,110,808	9.78	10,866,231
4	*Vigna radiata*	Green gram	Pedisein	1,170,986	9	10,542,764
5	*Vigna umbellata*	Indian rice bean	Peyin	35,518	8.09	287,401
6	*Vigna unguiculata (cylindrica)*	Cowpea	Pelun	210,820	8	1,687,596
7	*Vigna unguiculata (unguiculata)*	Cowpea	Bocate-pe	195,389	9.18	1,793,671
8	*Phaseolus lunatus*	Butter bean,	Htawbutpe	88,680	10.52	932,914
		Lima bean,	Pegya	34,227	7.74	264,984
		Duffin bean	Pebyugale	8,178	8	65,451
			Sultani	18,247	10.52	191,983
			Sultapya	106,437	8.42	896,171
9	*Phaseolus vulgaris*	Haricot bean, French bean. Kidney bean	Myehtaukpe			
10	*Lablab purpureus*	Indian bean, Lablab bean	Pegyi	173,855	7.26	1,262,143
11	*Dolichos biflorus*	Horse gram	Pebizat			
12	*Lens esculenta*	Lentil	Peyaza	6,601	4.38	28,920
13	*Glycine max*	Soybean	Peboke	191,111	10.21	1,951,363
14	*Pisum sativum*	Garden pea Pea	Sadawpe	96,246	8.5	818,091
15	*Pisum arvense*	Field pea	Sadawpe			
16	*Vicia faba*	Field bean, Broad bean	Bosape			
Other pulses				202,082	9.35	1,890,046

one basket = 32 kg.
one acre = 0.42 ha.
ten baskets per acre is equivalent to ~ 760 kg per hectare.

Figure 4.2 gives the short and medium term movements in area planted of three pulses. One observes great variation among black gram, pigeonpea and chickpea. Black gram especially is in an explosive development, with an increase from 300,000 acres in 1991 to over 1 million acres in 1996.

Figure 4.2 Area development of black gram, pigeonpea and chickpea in Myanmar, 1987-1996.



Black gram is sown as the mid-rain crop in the Sagaing and Mandalay Divisions. In the Ayeyarwady, Bago and Yangon Divisions, black gram is mainly sown in winter as the second crop after paddy and also on the river banks when the water subsides. As a result of the market economy, the area under black gram has increased from about a hundred thousand acres in the 1960s up to 1 million acres in 1995-96 crop year.

Green gram is mainly sown as second crop after paddy in Bago, Yangon, and Ayeyarwady divisions. With the onset of the monsoon, the crop is grown in the upland areas of Central and Upper Myanmar. Due to the attractiveness of price, the crop sown area has dramatically increased up to 1.2 million acres within a short time span.

Lentil is mainly sown in the Sagaing Division as a winter crop, and is normally sown after the end of the monsoon rains from late October to December with residual soil moisture. The area under this crop is not more than 10,000 acres. It prefers cold weather and good soils. The productivity of lentil crop is very low in Myanmar due to the low genetic production potential of the varieties grown and poor agronomic practices. Hence, the lentil cultivation area cannot be increased in the short term.

The cost of production for selected pulses are the costs paid for labor, power and input materials. The total costs range from 4,425 kyat to 4,600 kyat, consisting of 2,700 kyat to 3,000 kyat for labor and power, and 1,500 kyat to 1,730 kyat for input materials. The cost also includes activities such as land preparation, cultural practices, harvesting, seed, cow dung, fertilizer, and insecticides.

The cost of production for pulses are still lower than for the other competitive crops like groundnut, maize, cotton, wheat, and summer paddy. This is an important encouraging factor for growing pulses by the resource poor farmers.

Considered regionwise, 90% of the total area under pulse crops is concentrated in Ayeyarwady, Magway, Bago, Mandalay, Sagaing, and Yangon Division. Almost all pulse cultivation in Myanmar is dependent on monsoon rains. Early monsoon crops (like pigeonpea) are planted with the onset of the rains. Mid-monsoon crops (like cowpea) benefit from the receding monsoon rains, and late-monsoon crops (like chickpea and lentil) are grown on conserved soil moisture. In Ayeyarwady, Bago, and Yangon Division (lower Myanmar) all of the pulses are grown in late-monsoon season or winter season. Sowing and harvesting times of selected pulses are shown in Table 4.4.

Table 4. 4 Sowing and harvesting time of selected pulses, Myanmar.

No.	Crop	Sowing Time	Harvesting Time
1	Black gram		
	- Rain	May - Jun	Aug - Sept
	- Winter	Oct - Nov	Jan - Feb
2	Green gram		
	- Rain	May - Jun	Aug - Sept
	- Winter	Oct - Nov	Jan - Feb
3	Chick pea	Oct - Nov	Jan - Feb
4	Pigeonpea	May - Jun	Jan - Mar
5	Lentil	Oct - Nov	Jan - Mar
6	Sultani / Sultapya		
	- Rain	Aug - Sep	Dec - Jan
	- Winter	Nov - Dec	Feb - Mar
7	Pelun (Cowpea)		
	- Rain	Aug - Sept	Dec - Jan
	- Winter	Oct - Nov	Jan - Mar
8	Butter bean		
	- Rain	Aug - Sep	Dec - Jan
	- Winter	Oct - Nov	Jan - Mar

Source: Myanmar Agriculture Service.

In Myanmar, the following factors affect pulse production:

- Before 1988, pulse production was low due to low yielding varieties, poor agronomic practices, low level of inputs, and especially low level of profitability for the farmers.
- Area expansion for pulses which was boosted by new policy measures applied after 1988 by the government faced limited land resource. A major constraint on the expansion of multiple cropping or cropping intensity is the limitation in both irrigation as well as drainage systems. More irrigated area (83%) is under the major crop paddy and other crop groups account for only about 17% in 1994-95 crop year.
- Low genetic yield potential is still one of the main constraints for lower production. Very little research have been done to produce high quality seeds; most of the farmers are still using local varieties. High quality seed distributed by the government agriculture service is still very low in quantity compared to the pulse sown area.
- Farmers cultivating pulses are poor, so they cannot afford to follow good agronomic management. The use of fertilizer and insecticides is very low in pulse production.

5. Potential for Enhancing Trade: Summary and Issues for Further Investigation

5.1 Dynamics of the pulse trade in South Asia

International trade in pulses in South Asia shows many signs of increasing dynamics. The dynamic factors are summarized below:

- In India and Sri Lanka changes have occurred in import policy; restrictions in terms of imported quantity and market participation were lifted. In Myanmar broader reforms, involving exchange rate and the financial sector, are being realized. Results are unambiguous in Sri Lanka, where imports went up, and in Myanmar, which rapidly increased exports in pulses to become the region's major pulse supplier. Exports from India fluctuate.
- Uncertainty in South Asian pulse trade depends ultimately on supply fluctuation, and in terms of international trade, on India's exports.
- While participation in international trade in pulses in South Asia has remained broad, in fact world-wide, over the last ten years, significant increases have occurred in Australia's and in Myanmar's market shares.
- Positive, and possibly increasing, income elasticities of some pulses suggest demand for these may increase with actual economic growth and growth in expendable income. With the expected economic growth in South Asia, consumption can be expected to increase.
- In the major consuming and producing countries in South Asia, i.e. India, Pakistan and also Myanmar substantial potential exists for improvement of productivity. Successes in these countries will affect both the import potential, India and Pakistan being the main importers, and the export potential, Myanmar recently having emerged as the major pulse exporter of the South Asia.
- The production systems in South Asia show their responsiveness to changes in prices. The developments in Myanmar are especially illustrative of adaption of farmer's behaviour to price signals. The changes in relative farmgate prices of major pulses in India and Pakistan are likewise signals of further formation of the pulse market.
- One may expect that in the coming years strengthened differentiation will occur in market behaviour of the various pulses. This process will involve two types of diffentiation, among species, say lentils versus chickpea, and within the species, namely in terms of variety, origin and user specific quality characteristics. This points to returns to investment in development and production of improved varieties.
- We can distinguish two sources of potential or expanded international trade: (i) expanded consumption, including use for feed, and (ii) shifts in the ratio domestic production and domestic consumption. There are good reasons to assume that consumption of specific pulses will grow, while the consumption of others may reduce.
- One may expect that, despite the relative climatic homogeneity of the sub-region, the existing difference in daylength, rainfall and temperature is sufficient to induce regional differential efficiencies in production cost, which if accompanied by an efficient market mechanism, will continue to excert a dynamic influence on the market,

by shifting comparative advantage among producer regions in different countries.

5.2 Institutional market issues: an exploration

There are no clear signs of market distortions; price levels fall throughout the region more or less in the same range. This does not mean that there are no inefficiencies in transport, storage or processing. The main issue here is the seasonality of supply, and the need to rely on inter-regional trade for supply of local consumption. The technical efficiency of the pulse market therefore hangs together with the structure of the market, and the institutional issues, such as market control, market information and communication. The following paragraphs analyze and summarize the main issues, and suggest ways of follow-up.

5.2.1 Market control and oligopolistic effects

Before moving to suggestions for follow-up study, we need to assess the actual situation and influence of international trade - imports and exports - on domestic trade and pulse markets. In the main body of the report, reference was made in case of Sri Lanka and India to oligopolistic import markets, i.e. the participation of relatively few import traders. An oligopolistic import market would tend to result in voluntary quantity restraints and price increases, in order to maximize profits under conditions of zero-ordered marginal returns (least cost). Nevertheless, one needs to be very careful in ascribing an automatically distortive and negative influence on the over-all efficiency of the market. First, agricultural markets tend at collection, wholesale and distribution levels to be asymmetrical in terms of the number of participants selling and the number of buyers. For example, in India a relatively low number of traders in any area specific market was observed. Asymmetry in import markets is thus not by itself anything striking; it is part of the structure of any market for agricultural produce. Second, in large importing countries, the importers rely heavily on realized opportunities in the wholesale distribution market, in other words on trade and price information. In the dense and complex markets for pulses, where local produce as well as locally imported produce enters the market, and where inter-regional lots tend to be fairly small, the geographic span of traders is likely limited.

The above two reasons for not automatically ascribing negative influences to an oligopolistic import market are perhaps strengthened by the observation that the voluntary quantity controls would induce higher domestic prices, which would benefit domestic producers. It is a matter of further investigation to verify whether the actual influence of price signals spreads geographically over very large consumer markets, such as in India.

5.2.2 Market information

In pulses, which are grown in rainfed conditions, and therefore subject to seasonal and yearly variation in supply, market information is essential and costly. To some extent, the same complexities in getting market information and adjusting the scale of the lots, seem to influence the international market. Import prices of regularly traded pulses, such as chickpea, seem to track fairly well, but of many other pulses price variations seem common. A few observations may be in place on the frequency and basic structure of international trade flows. First, it is probable that import transactions are seasonally structured, whereby import prices fall below national wholesale prices. It seems likely that wholesale prices in major consumer centres are also seasonally structured. To some extent this observation is borne out by the participation of countries who produce pulses at different times of the calendar year. Their participation in South Asian trade would mean that storage time and costs are minimized. This reasoning stands and falls with the dominance of seasonal price fluctuation in major producer and consumer

centres of the world. Though it is evident that supplies from many directions, produced at different times of the year participate, it still needs to be proven that importers effectively minimize costs through inter-seasonal sourcing.

5.2.3 Centering the information flow

From a policy point of view there seems to be no specific hindrance to international trade. Usually some type of staple trading markets emerge at locations of concentrated demand and/or supply. It should be noted that the expansion in international trade in pulses in the sub-region seems to have taken place without the inclusion of pulses in the international mainstream commodity futures. Such markets usually include cash trading prices and also futures. The rationale of entering trade a international marketplace is to stabilize prices and to spread risk over larger geographical areas as well as in time. The advantage of derived and option markets is that the costs of information and transactions decrease, and that the resulting price formation may incorporate risk. Box 5 presents some transactional options which would result in the reduction of price risks by traders, and possibly also of the other market participants.

Conditions for such trade are many: (i) some continuity in trade; (ii) sufficiently large turn-over to support the information and transactional infrastructure; (iii) accountability and credibility of firms; and (iv) constant market demand channeled through industry. On the surface it seems that because of the absence of a structured futures market in pulses in South Asia these conditions are not met, and the accompanying trade mechanisms are not in place. However, there are many reasons to assume that most of the trading mechanisms are in place; in fact some pulses and their products, noteably soybean, meal and oil, and redbean are listed commodities in Chicago and Tokyo (See Box 6, and the Appendix on recent trade news). Importers and exporters of pulses most likely use risk spreading transactional options through their trading networks; collection and local wholesale traders and possibly also processors also use risk spreading transactions on the basis of price expectations. The point is that trade in pulses is primarily regional. The total volume of trade in South Asia is quite considerable at almost one third of world trade; it is thus not the size of the market, but the spatial structure of the pulse trade which constrains size and information. For information improvements one has to focus on domestic wholesale markets as well as the international market. The current efforts in India to improve the local collection market is most interesting and needs careful monitoring and analysis.

It is most important to recognize that an international trading system as such can never make up for weaknesses in the domestic market, whether these be located in production, transport or processing, or in all three fields, as is usually the case. A mature domestic market would also offer traders the opportunity of time bound options and transactions; in other words the same options and market information are accessable in international markets. These options are sometimes, rather misleadingly, called parallel trade; a better term would be direct trade. Among the recommendations for improvement of the domestic market are contract farming and other ways to secure supply in a more or less fixed timeframe. Nevertheless, it is most likely that current trade already includes the purchase of farm products in advance as well as contract farming. Such transactions may well cause shifts in land allocation of producers if prices justify, or in general investment in pulse production. Experiments with auction type trade in production centres may be expanded with direct trade information, linking producer prices in import prices in trade centres. Likewise, direct trade information links with production centres may strengthen the efficiency of major consumer centre markets.

The idea of expanding the geographic span of trade through improved access to trade information is the bread and butter of private traders. One must realize that traders in agricultural produce tend to stabilize and even define their business by limiting their exposure to information and to concentrate on - and to some extend capture - a market they know well. Innovation in terms of information is likely to be connected to generations of people, education

and exposure to information, and, most importantly, to investment in rural information and transport infrastructure. The process of expanding the accessability of market information will depend on technical innovation, improvement in infrastructure and a healthy agricultural industry. The issue for follow-up is therefore the functioning of the domestic market and its prospects for innovation, both technical and in terms of information.

Box 9 Commodity risk management instruments.

A forward contract is an agreement to purchase or sell a specified amount of a commodity on a fixed future date at a predetermined price. If, at maturity of the contract, the actual price is higher than that in the forward contract, the buyer makes a profit, and the seller suffers a corresponding loss. If the actual price is lower, the reverse occurs. Nevertheless, the predetermined price arrangement eliminates the risk of price changes for both buyer and seller.

A futures contract is also an agreement to purchase or sell a specified amount of a commodity on a fixed future date at a predetermined price but - unlike a forward contract - physical delivery of the commodity is not necessarily implied. To hedge, a seller who has contracted to deliver a specific quantity of a commodity at a future date at the price prevailing at that date would, simultaneously, sell a futures contract for the same quantity at the current price for future delivery. When he actually delivers the physical commodity, he also buys back his futures contract. If the market price at the date is lower than the price in the futures contract, the loss on the physical market is offset by the gain on the futures contract, (he gains because he can buy back the contract at a price lower than the one at which he sold it). Conversely, if the price in the physical market is higher than that for which he sold the futures contract, the gain on the physical market is offset by the loss on the repurchase of the futures contract.

An option contract gives the right to buy, or sell, a specific quantity at a predetermined price on, or before, a specified date. Options giving the right to sell ('put' options), provide protection against price declines, while allowing for profit-taking on price increase. Conversely, options giving the right to buy ('call' options) provide protection against price increases.

A swap contract includes two prices, *viz*. a price fixed at the date of the contract, and a variable price (e.g. the price of a futures contract for the commodity concerned). Exporters would sell their commodities on the physical market, but under the swap they would be compensated for (or pay) the difference between the two prices. Thus, swaps are, in effect, long-term hedges.

Box 10 A look at soybean and views on demand for it.

Soybean is both a food and feed legume, as all the other pulses. It is not implied here that the pulse prices will behave exactly as the soybean price, but one can assume that because the uses and the production environments are somewhat similar, that the pattern will be the same, in conditions of expanded pulse trade. It is very important to note that trade in soybean in Asia is undergoing rapid changes in the current years. China seems to be switching from a primarily export regime towards a role as a major importer, while likely maintaining some exports. The current direction in world trade clearly shows the influence of interseasonality of production. The major suppliers of soybean are now Brazil and Argentina, both located south of the equator, and therefore well positioned to supply producer/consumer centres located north of the equator. One would expect that production from the south African region will pick up, if the basic socio-economic conditions permit.

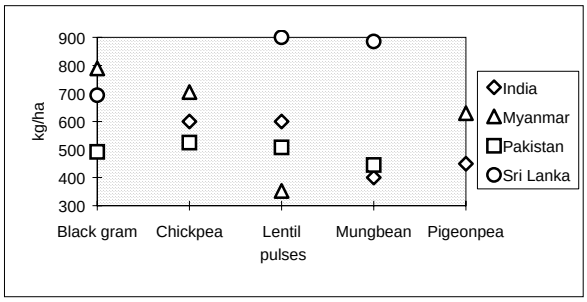
China imported around 2.7 million tons of soymeal and 1.7 million tons of soybeans in 1996-7, whereas it still exported some 2.41 million tons of soymeal and 1.3 million tons of soybeans in 1989-90. The shift in China's trade position is presumably the consequence of the growth of its animal feed sector, the growth of which runs consistently in the double marks over the last few years. Many pulses can substitute for soybean in animal feed, and it may therefore be wise to include all Asia in follow-up work on pulses.

(Adapted from Reuters, April, 1997).

5.2.4 The production side of the market

Improvement in trade needs a counterpart in improvement in efficiency at all levels of the market, including production. In this connection we refer to the classic Heckscher-Ohlin model of trade. Heckscher and Ohlin's approach focuses on the relation between natural resource endowments and the tendency of countries to export goods, the production of which uses abundant production factors. In agriculture, more than in any other business, the Heckscher-Ohlin model refers to land and its use. We can not analyze in detail the various technologies in use in the various land-types in South Asia, nor can we analyze the actual land endowments in this report. But we can compare the actual yield levels of the major pulses in India, Pakistan, Sri Lanka and Myanmar. Figure 5.1 ranks yields of major pulses by country.

Figure 5. 1 National productivities of major pulses.



For a reasonably justified medium term view on trade in pulses, one needs the following information: (i) the trend in consumption of pulses, and (ii) production potentials in domestic production and in other producer areas and regions. There is strong support to consider the current level of consumption in pulses as at least indicative for the quantities needed in the future, and there are clear signs that differentiation is occurring in the pulse markets in South Asia.

Assuming that short term consumption will be stable, the second given in terms of potential, is the production potential. This ranges around 1,000 kg/hectare. It is clear that substantial potential to expand productivity exists in India, Pakistan and Myanmar. In Pakistan and India the realization of such potential depends to large extend on the allocation of irrigated land. As irrigated lands are usually under cereals, but also cotton, for which price and other support policies are at the core of public efforts to channel funds to rural areas, a dampening in shift in the allocation of land to crops is the result. There are many ways to improve the availability of water in rainfed areas, such as pumps and wells, surface wells and so on; the on-going improvements in this regard would mean that possibilities in productivity improvement do exist, in Myanmar probably more so than in India, Pakistan and Sri Lanka.

Finally, pulses are important as sources of income throughout South Asia. Investment in productivity will have a beneficial effect on farm income.

5.2.5 The allocation of land

The expansion of water-supplied land to pulses is a function of the relative prices of pulses and cereals. There are signs that some pulses have made in-roads into irrigated land, such as garden peas and broad beans in India, and it would seem useful to identify higher value pulses as well as to gauge the expenditure elasticities of the many species and varieties of pulses to identify on-going and anticipated shifts in the allocation of land to pulses.

Noting that the production of pulses is characterized by seasonality and fluctuation, and that also farmgate prices as well as domestic trade flows fluctuate, it would seem that at the wholesale level the consumer would benefit from more stable supplies. A stabilization of supply at the wholesale level would enable market participants to reduce distribution costs, which would result in more stable consumer prices. Under conditions of low market entry costs in distribution of pulses, this would result in lower consumer prices. The entry costs, as the ratio to annual turn-over, may actually not be very low. It is likely that wholesale distributors and retailers have mutual transaction ties, which bind the parties through time. Since pulses are widely consumed it does not seem likely that macro-type direct consumer marketing through distribution centres and supermarkets will expand rapidly, although in the bigger cities it may

be possible. This means that an actual improvement on the consumer side requires the fulfillment of quite a few conditions.

One can distinguish the sources of goods for any given wholesale distribution market; these production areas can be classified in over-the-border areas and domestic producer areas. In theory the inclusion of more sourcing or producer areas should always result in greater stability of supply. The inter-seasonality between the sources of international supplies suggests that the pulse market has already entered the stage of using this mechanism, but this matter needs follow-up.

5.2.6 Price risk and production variability

There are no reasons to assume that price formation in the global pulse market itself, i.e. the sum of individual trade flows and prices, would be stable. The behaviour of import prices do suggest price movement, and there is no evidence that these price movements can be predicted. Domestic price formation is of course a function of both domestic supplies as well, and an important question concerns the consequences of coincidence of low supplies and high prices. Especially in agriculture, where the tradeable items are also used as reproductive means - seed - this could result in explosive Cob-Web price behaviour. Therefore, connection with the world market does not automatically result in more supply and greater price stability.

We distinguish thus two sources of fluxes, domestic supply and price variability, and international supply and price variability. It shall be clear that the larger the share of domestic production is of actual consumption, the larger the influence of domestic supply and price variability; inversely the smaller the share of domestic production in consumption, and the larger the share of international supply, the larger the influence of variability in the international market. If one is to actually asses the current situation with regard to price risk in the international and the domestic markets, follow-up investigation is necessary.

5.3 Recommendations

As follow-up activities the following measures are recommended:

- Investigate whether seasonal price formation patterns structure international trade among producer and consumer centres.
- Investigate whether seasonal price formation dominates and whether risk absorption mechanisms in price formation exist in major consumer centres.
- Investigate whether risk absorption transactions and a structured pulse trading centre would be feasible in the South Asia region.
- Identify in more detail the differences in market behaviour of the various pulses within the region.
- Investigate actual consumer behaviour and quality characteristics.
- Research in detail the behaviour of wholesale collection prices of the national market in dynamic pulses, and relate these to the behaviour of farmgate prices.
- Identify major processing and product conversions, and assess the efficiency of technology and market performance.
- Identify regions with potential for actual investment in dynamic pulses.
- Take into account, in investment decisions, current trends in the various producer regions in the various countries participating in trade.
- A regional resource cost study on the allocation of different land types to pulses and various substituting crops should be considered.

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Annexes

The annexes contain relevant information, including sections on price formation (Annex A), consumption (Annex B), processing (Annex C), and production (Annex D). The final section (Annex E) contains some news items and futures on red bean and soybean derived from international business informations systems.

Annex A Price formation

Figure A. 1 Price of imports of urad by various countries, India 1985/86-1992/93.

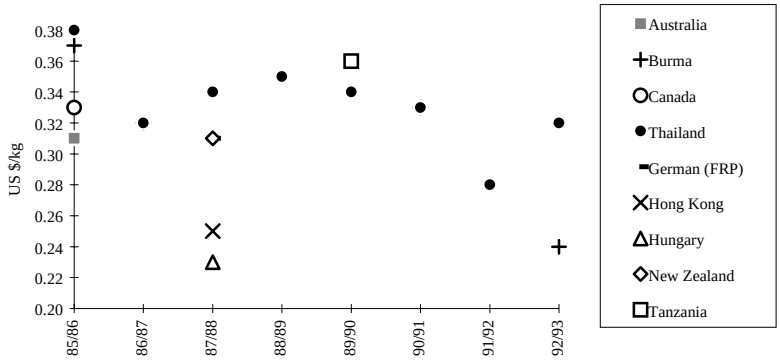

Figure A. 2 Price of imported tur by various countries, India 1985/86-1992/93.

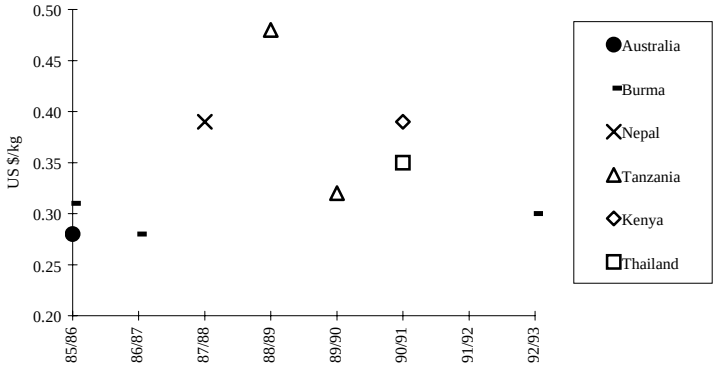

Figure A. 3 Import price of black gram (split & whole) in Pakistan, 1981/82-1994/95.

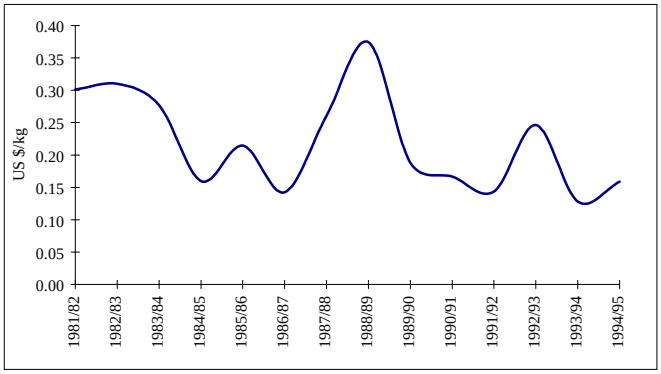

Figure A. 4 Import price of mungbean (split & whole) in Pakistan 1981/82-1994/95.

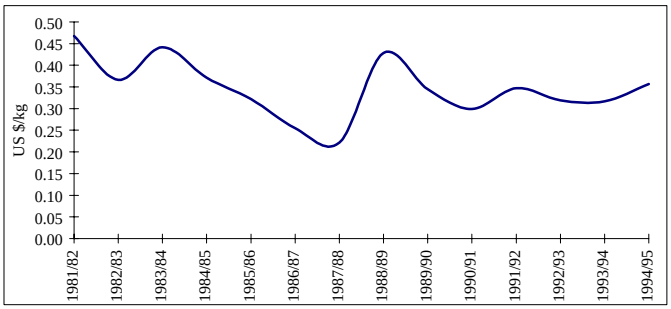

Figure A. 5 Prices of imported masoor dhal by country in Sri Lanka, 1994/1994.

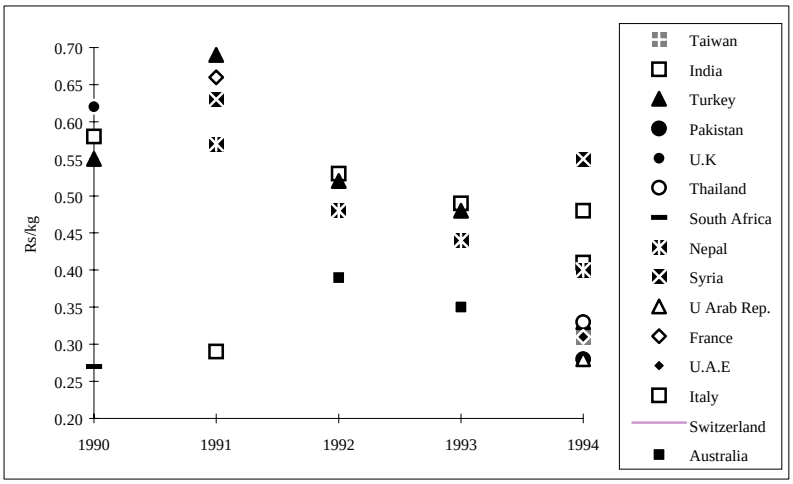

Table A. 1 Farmgate prices (kyat/ton) of important crops and selected pulses at the time of harvest, Myanmar.

Crop	1985/ 86	1986/ 97	1987/ 88	1988/ 89	1989/ 90	1990/ 91	1991/ 92	1992/ 93	1993/ 94	1994/ 95	1995/ 96*
Paddy	454	454	1,102	4,340	4,340	4,397	4,207	8,651	11,481	10,517	14,356
Maize	801	801	1,635	3,351	3,565	4,412	7,554	8,629	13,891	16,610	17,091
Groundnut	6,257	7,884	8,952	9,364	11,766	15,861	24,994	29,271	28,362	29,570	38,632
Sesamum	8,559	8,622	12,705	12,787	13,031	20,704	26,331	35,856	37,337	51,105	74,941
Sunflower	5,438	5,675	7,078	8,866	10,151	13,576	17,736	27,569	31,049	31,005	44,789
Cotton (long staple)	4,287	4,287	4,287	4,900	4,900	7,962	17,235			36,742	
Black gram	1,531	1,531	3,365	5,513	6,156	11,944	13,352	14,241	21,223	28,272	45,693
Green gram	1,225	1,225	3,277	7,228	7,228	11,852	13,352	20,543	27,991	32,125	34,466
Chickpea	3,803	3,803	4,186	7,989	9,492	12,624	10,253	10,579	32,567	32,457	40,061
Pigeonpea	1,072	1,072	2,756	5,573	5,758	15,496	21,223	19,753	29,002	28,807	45,938
Garden pea	4,226	4,869	6,248	10,167	10,412	15,404	15,741	16,936	26,521	27,554	40,504
Sultani	959	959	2,716	4,602	4,730	6,232	7,127	7,415	16,875	19,160	20,054
Butterbean	959	959	2,716	6,806	7,862	9,045	10,515	12,944	20,039	28,706	32,514
Soybean	2,695	3,185	3,644	5,237	5,972	8,177	11,362	14,914	29,155	18,963	26,266
Pelun	2,083	2,174	2,634	4,196	5,145	8,514	9,892	10,474	24,071	21,160	27,095
Sultapya	959	959	2,716	5,113	6,967	9,300	7,150	7,766	14,126	24,764	25,140

* provisional.

Table A. 2 Estimates of price spread, marketing costs and margins for chickpea (Monywa, Sagaing Division, Myanmar 1995/96.

Item			Kyat/basket	
1. Farmer's Sale Price				1,100
2. Brokers' House (Township Level)				
	Purchase price			1,000
	Sale price		1,145-1,160	
	Gross margin		45-60	
	Market costs:			
		Labour		5
		Packing material		20
		Miscellaneous		10
		Total cost		35
	Net margin		10-25	
3. Traders (Yangon)				
	Purchase price		1,145-1,160	
	Sale price		1,245-1,275	
	Gross margin		100-115	
	Market costs			
		Transport cost		75
		Labour		5
		Storage		2
		Miscellaneous		8
		Total cost		90
	Net margin		10-25	
4. Exporters				
	Purchase price		1,245-1,275	

Table A. 3 Estimates of price spread, marketing costs and margins for black gram (Letpadan, Bago Division, Myanmar 1995/96).

Item			Kyat/basket
1. Farmer's Sale Price			1,450
2. Brokers' House (Township Level)			
	Purchase price		1,450
	Sale price		1,500-1,515
	Gross margin		50-65
	Market costs:		
		Labour	7
		Packing material	20
		Miscellaneous	13
		Total cost	40
	Net margin		10-25
3. Traders (Yangon)			
	Purchase price		1,500-1,515
	Sale price		1,555-1,580
	Gross margin		55-65
	Market costs		
		Transport cost	25
		Labour	5
		Storage	2
		Miscellaneous	8
		Total cost	40
	Net margin		15-25
4. Exporters			
	Purchase price		1,555-1,580

Table A. 4 Annual export volume of pulses from Myanmar in tons.

Crop	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	Destination
Black gram	55,086	12,192	26,507	58,024	79,779	148,054	132,974	117,436	214,633	India, Pakistan, Japan
Green gram	1,517	496	14,541	47,183	66,514	85,802	108,675	128,154	131,194	India, Pakistan, Singapore
Pigeonpea	2,261		6,482	35,529	20,154	108,758	132,761	109,624	125,836	India, Pakistan, Singapore
Chickpea	3,028	945	2,399	38,084	38	64,501	74,947	13,455 *		India, Pakistan, Bangladesh
Lentil					10	1,554	165	779 *		India, Pakistan
Cowpea (Pelun)				4,222	7,483	13,427	35,671	33,501 *		India, Singapore, Korea
Cowpea (Bocate)				140	1,764	1,308	314	1,000 *		India, Japan
Butter bean	7,661	2,178	3,646	5,824	9,779	12,101	15,373	9,734	17,390	Japan, Singapore, India
Sultani/Sultapya		839	708	2,228	2,762	4717	3,943	1,751 *		Japan, Korea, Malaysia
Pebyugale						90	-	-	-	Singapore
Lablab bean					95	130	156	523 *		India, Malaysia, Singapore
Rice bean				1,073	3,208	3,026	2,159	3,061 *		India, Japan, Malaysia, Singapore
Kidney bean						4,502	4,348	3,116 *		India, Singapore, Japan
Soybean					1,295	1,300	1,550	240	20	
Others	5,773	827	5,584	33,744	10,708	76,306	1,255	2,506	88,423	
Total	75,326	17,477	599,9867	226,051	203,589	525,576	514,291	424,880	577,505	

* crop-wise data are not available so it was combined in the other group.
Source: Foreign Trade Statistics of Myanmar (C.S.O.).

Table A. 5 Monthly export quantity of selected pulses for 1994 and 1995 (thousand metric tons), Myanmar.

Month	Black Gram		Green Gram		Other Pulses		Total	
	1994	1995	1994	1995	1994	1995	1994	1995
January	11.3	2.2	7.0	6.9	17.6	21.4	35.9	30.5
February	6.7	5.0	14.2	5.8	21.0	22.4	41.9	33.2
March	14.3	14.0	16.6	10.1	21.2	22.6	52.1	46.7
April	15.7	40.3	24.3	12.6	11.6	22.6	51.6	75.3
May	12.5	41.9	13.1	11.5	10.3	28.6	35.9	82.0
June	11.7	33.4	5.1	6.5	11.5	33.2	28.3	73.1
July	18.6	14.3	4.3	10.7	11.2	39.4	34.1	64.4
August	12.8	16.5	9.1	22.7	18.3	32.1	40.2	71.3
September	6.0	4.6	10.3	11.0	11.1	6.9	27.4	22.5
October	9.2	2.6	9.7	11.9	14.7	10.9	33.6	25.4
November	4.7	1.2	15.3	23.1	5.5	14.6	25.5	38.9
December	1.4	2.9	10.6	9.4	11.2	5.8	23.2	18.1
Total:	124.9	178.9	139.6	142.2	165.2	260.3	429.7	581.4

Source: Foreign Trade Statistics of Myanmar (C.S.O.).

Table A. 6 Export (FOB) prices (US $/ton) of pulses as per export license issued by directorate of trade during 1995, Myanmar.

No	Description	Quality	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Black gram													
		S.Q.	500/550	500/525	510/560	525/550	525/560	525/560	525/615	525/655	525/665	525/650	525/650	440/625
		F.Q.	410/470	420/480	420/500	440/460	440/505	440/590	440/610	440/610	440/580	440/580	440/530	440/600
		O.Q.	415/425	310/425	420/425	420/441	420/460	420/460	420/590	420/420	420/590	420/590	N.A	N.A
2	Green gram													
		S.Q.	400/475	400/430	400/462	400/462	400/450	430/500	400/460	400/525	400/435	400/400	400/450	400/435
		F.A.Q.	340/405	340/405	340/400	340/450	340/450	340/450	340/440	340/435	340/425	340/440	340/465	340/460
3	Gram whole													
		F.A.Q.	450/450	455/455	N.A.	455/455	N.A	455	455	N.A	N.A	N.A	N.A	N.A
4	Pigeonpea													
		F.A.Q.	305/400	305/365	305/380	380/420	380/435	380/570	380/605	380/550	380/565	380/540	380/420	380/430
5	Lentil													
		F.A.Q.	510/510	500/500	500/500	500/500	500/500	500/510	500/510	500/510	N.A	N.A	N.A	N.A

Note: S.Q.= Special Quality; F.Q.= First Quality; O.Q.= Ordinary Quality; F.A.A.= Fair Average Quality.

Table A. 7 Sowing and harvesting time of selected pulses, Myanmar.

No.	Crop	Sowing Time	Harvesting Time
1	Black gram		
	- Rain	May - Jun	Aug - Sept
	- Winter	Oct - Nov	Jan - Feb
2	Green gram		
	- Rain	May - Jun	Aug - Sept
	- Winter	Oct - Nov	Jan - Feb
3	Chickpea	Oct - Nov	Jan - Feb
4	Pigeonpea	May - Jun	Jan - Mar
5	Lentil	Oct - Nov	Jan - Mar
6	Sultani / Sultapya		
	- Rain	Aug - Sep	Dec - Jan
	- Winter	Nov - Dec	Feb - Mar
7	Pelun (cowpea)		
	- Rain	Aug - Sept	Dec - Jan
	- Winter	Oct - Nov	Jan - Mar
8	Butter bean		
	- Rain	Aug - Sep	Dec - Jan
	- Winter	Oct - Nov	Jan - Mar

Source: Myanmar Agriculture Service.

Table A. 8 Comparison of imported pulse prices with domestic prices, India.

Pulse	Source	International FOB Price (Rs) as of 10.7.95	Landed Cost (including 5% duty)	Local Price (wholesale) (Rs)	Harvesting Season in the Country of Origin
Hungarian Yellow Peas	Hungary	8,707.00	10,301.00	10,000.00	July-October
Hungary Green Peas	Hungary	9,149.00	10,789.00	11,000.00	July-October
Green Moong	Burma	14,024.00	15,923.00	15,700.00	March-May
Green Moong Beans	China	14,513.00	16,466.00	17,000.00	December-March
Black Matpe	Thailand	20,507.00	23,581.00	22,500.00	November-January
Black Matpe	Myanmar	21,170.00	24,827.00	23,000.00	January-March
Red Whole Lentils	Turkey/ Syria	15,302.00	17,722.00	13,500.00	August-October
Chick Peas	Turkey/ Syria/Iran	33,127.00	37,785.00	32,000.00	August-October November-February September-November
Pigeonpeas whole	Myanmar Tanzania	20,034.00	23,048.00	20,000.00	March-May August-October
Lentil	China	10,254.00	12,041.00	11,500.00	August-October

Table A. 9 Inter and intra-year variations in prices (Rs/quintal) of gram in Uttar Pradesh, India.

Month	Intra year						
	1987/88	1988/89	1989/90	1990/91	1991/92	Mean	Variation (%)
April	331.50	486.87	552.10	677.00	635.00	536.49	87.60
May	368.50	493.80	579.00	674.50	658.00	554.76	90.58
June	353.90	511.88	616.00	713.50	667.00	572.46	93.47
July	371.15	592.10	634.00	736.00	677.00	602.05	98.30
August	418.52	616.35	705.70	725.00	767.00	646.52	105.56
September	416.93	652.50	745.00	728.00	693.00	647.09	105.66
October	421.10	756.00	720.00	746.50	688.00	666.34	108.80
November	428.30	745.00	690.50	753.00	629.00	649.16	106.00
December	421.10	701.40	645.00	698.00	648.40	622.78	101.69
January	437.00	698.90	619.50	691.00	690.00	627.28	102.42
February	438.15	715.50	615.00	684.00	683.00	627.23	102.41
March	429.00	617.50	611.50	658.00	669.00	597.14	97.50
Mean (Rs/q)	403.00	632.32	644.44	707.08	675.37	612.44	
Inter Year Variation (%)	65.80	103.20	105.20	115.50	110.30		
Procurement Price (Rs)	280.00	290.00	325.00	370.00	450.00		
Increase from Procurement Prices (%)	143.90	218.00	198.30	191.00	150.10		

Table A. 10 Per farm marketable surplus and price realised in different markets in Western Maharashtra, 1992/93, India.

Crop	Production (Quintal)	Marketable Surplus	% to Production	% to Marketed Surplus	Proportion Qty in (%) Village Market	Weekly Market	Regulated Market	Village Market	Weekly Market	Regulated Market
Tur	0.57	0.49	85.96	0.48	2.17	13.31	84.52	899.54	833.55	888.77
Gram	0.45	0.27	60.00	0.21	9.18	3.36	87.46	765.00	765.91	769.57

Source: Suryawanshi et al. (1995).

Table A. 11 The percentage of marketable surplus in different pulses, India.

Commodity	Percentage of Marketable Supply
Gram	40.30
Arhar	50.00
Urad	61.30
Masoor	53.50
Moong	59.01

Source: Report of the working group on Agricultural Marketing for the Eight Five Year Plan 1990/1995.
Department to Rural Development, DMI, Government of India Faridabad

Table A. 12 Marketing costs of pulses in Western Maharashtra, 1992/1993, India.

	Item	Tur	Gram
1	Quantity sold (Q)	127.01	57.18
2	Labour charges for trading	0.57	0.81
		(1.35)	(1.94)
3	Packing		
	a. Wage for packing	0.07	0.03
		(0.17)	(0.07)
	b. Packing material	3.94	3.82
		(9.33)	(9.13)
4	Transport	8.19	9.31
		(19.40)	(22.24)
5	Octroi	0.56	0.41
		(1.33)	(0.98)
6	Marketing expenses		
	a. Hamali	1.29	1.24
		(3.06)	(2.96)
	b. Weighting	0.68	0.79
		(1.61)	(1.89)
	c. Commission	24.42	20.11
		(57.85)	(48.04)
	d. Tapal Levy etc.	0.02	0.07
		(0.05)	(0.17)
7	Other expenses	2.47	5.27
		(5.85)	(12.58)
8	Total marketing cost	42.21	41.86
		(100.00)	(100.00)

(Figures in paranthese indicate percentage of total)
Source: Suryawnashi et al. 1995.

Table A. 13 Inter and intra-year variations in arrvials (tons) of gram in Uttar Pradesh, India.

Month	1987/88	1988/89	1989/90	1990/91	1991/92	Mean	Intra Year Variations (%)
April	799,922.00	844,493.00	57,902.00	499,060.00	603,657.00	665,626.80	192.90
May	1,112,190.00	575,781.00	646,268.00	600,456.00	840,233.00	754,985.60	218.90
June	532,000.00	393,151.00	619,030.00	533,485.00	463,758.00	508,284.00	147.40
July	431,810.00	292,620.00	271,760.00	244,967.00	288,056.00	305,842.60	88.70
August	235,790.00	152,940.00	240,531.00	223,846.00	250,451.00	220,711.00	64.00
September	159,560.00	228,493.00	251,124.00	187,095.00	281,213.00	221,497.00	64.20
October	310,320.00	216,868.00	236,282.00	399,354.00	302,511.00	293,067.00	85.00
November	359,510.00	187,946.00	230,385.00	198,403.00	3,218,369.00	259,616.00	75.30
December	273,305.00	203,747.00	272,661.00	136,538.00	256,186.00	228,487.40	66.20
January	285,930.00	129,929.00	223,318.00	184,161.00	262,126.00	217,092.80	62.90
February	166,188.00	114,063.00	201,112.00	187,308.00	216,670.00	177,068.20	51.30
March	300,650.00	242,220.00	284,761.00	313,624.00	294,800.00	287,211.00	83.30
Total	4,967,175.00	3,582,251.00	4,056,734.00	3,708,297.00	4,381,497.00	4,139,489.40	
Mean						344,932.00	
Inter Year Variation (%)	120.00	86.60	98.00	89.60	105.90		

Source: Prakash and Srivastava (1994).

Table A. 14 Coefficients of correlation in market arrivals and prices of gram in Uttar Pradesh, India.

Year	Coefficient of Correlation
1987/88	0.68
1988/89	0.75
1989/90	0.72
1990/91	0.26
1991/92	0.40

Source: Prakash and Srivastava 1994.

Table A. 15 Marketing and processing cost of difference pulses 1991/1992 (Rs/Q), India.

Particulars	Pigeonpea	Lathyrus	Horse Gram	Green Gram	Black Gram	Lentil	Total Pulses
A. Cost of Raw Material	883.44	336.28	621.52	736.38	699.63	685.99	540.31
B. Marketing Cost							
(i) Transportation	32.27	9.80	16.96	21.26	29.76	20.55	16.67
	(31.86)	(25.80)	(22.35)	(25.34)	(37.45)	(31.83)	(26.33)
(ii) Mandi Tax	8.83	3.36	6.22	7.36	7.00	6.86	5.40
	(8.72)	(8.67)	(8.20)	(8.78)	(8.81)	(10.62)	(8.53)
(iii) Sales Tax	7.84	5.98	11.57	13.62	12.87	12.59	10.74
	(7.74)	(15.42)	(15.25)	(16.24)	(16.20)	(19.50)	(16.96)
(iv) Labour Charges	2.18	2.18	2.18	2.18	2.18	2.18	2.18
	(2.15)	(5.62)	(2.87)	(2.60)	(2.74)	(3.38)	(3.44)
(v) Commission	3.06	1.98	1.91	3.14	3.48	2.00	2.20
	(3.02)	(5.11)	(2.52)	(3.76)	(4.38)	(3.10)	(3.47)
Sub total	54.18	23.30	38.84	47.56	55.29	44.18	37.19
	(53.49)	(60.10)	(51.19)	(56.70)	(69.58)	(68.43)	(58.73)
C. Processing Cost							
(a) Variable Cost:							
(i) Salaries & Wages	6.84	2.38	3.47	3.42	5.36	4.17	3.55
	(6.75)	(6.14)	(4.57)	(4.08)	(6.75)	(6.46)	(5.60)
(ii) Powers & Fules	7.12	2.67	4.31	3.42	5.02	2.65	3.82
	(7.03)	(6.89)	(5.68)	(4.08)	(6.32)	(4.10)	(6.03)
(iii) Repairs & Main	2.60	1.50	2.84	2.02	1.79	0.85	1.97
	(2.57)	(3.87)	(3.73)	(2.41)	(2.25)	(1.32)	(3.11)
(iv) Overhead Exp.	2.29	1.00	2.06	2.63	1.23	1.38	1.50
	(2.26)	(2.58)	(2.71)	(3.13)	(1.55)	(2.14)	(2.37)
(v) Tax, Insurance &	4.46	0.09	1.27	1.93	1.21	1.31	1.44
Licensing Fee	(4.40)	(2.40)	(1.67)	(2.30)	(1.52)	2.03	(2.27)
(vi) Interest on	13.04	4.21	13.18	16.07	4.52	4.88	7.78
Working capital	(12.87)	(10.68)	(17.37)	(19.16)	(5.69)	(6.94)	(4.29)
(vii) Depreciation on	9.30	2.55	8.49	6.00	3.84	4.90	5.25
Building & Plants	(9.18)	(6.58)	(11.19)	(7.15)	(4.83)	(7.59)	(8.32)
(viii) Miscellaneous	1.47	0.23	1.42	0.83	1.20	0.64	0.81
	(1.45)	(0.28)	(1.87)	(0.10)	(1.51)	(0.99)	(1.28)
Sub total	47.12	15.47	37.04	36.32	24.17	20.38	26.12
	(46.51)	(39.90)	(48.81)	(43.30)	(30.42)	(31.57)	(41.27)
Total value added	101.30	38.77	75.88	83.88	79.46	64.58	63.31
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Total cost	984.74	375.05	697.40	820.26	779.09	750.55	603.62

Note: Figures in parenthese indicate the percentage of the total value added
Source: Gupta and Gauraha 1995.

Table A. 16 Average farmgate prices (Rs/40 kg) of pulses in four districts of Pakistan, 1981/1995.

	Pulse			
Year	Chickpea	Mungbean	Lentil	Black gram
1981	193.81	281.28	195.52	213.32
1982	269.14	229.13	270.00	184.15
1983	233.64	259.61	141.41	231.32
1984	175.85	242.12	129.67	245.43
1985	201.70	235.61	318.05	264.95
1986	179.58	248.03	368.33	273.12
1987	156.50	261.99	275.12	256.50
1988	233.15	419.93	276.16	378.26
1989	302.89	272.22	292.41	279.97
1990	247.48	367.77	334.66	355.98
1991	200.82	355.05	326.08	383.61
1992	257.49	449.86	596.21	297.06
1993	364.41	448.35	532.62	289.88
1994	406.75	470.05	590.28	301.86
1995	486.48	507.92	632.12	371.59

Source: Federal Bureau of Statistics, Statistics Division, Ministry of Finance and Economic Affairs, Islamabad.

Table A. 17 Wholesale prices (Rs/40 kg) of pulses in Pakistan, average of 12 market centres, 1980/81 to 1994/95.

	Pulse			
Year	Chickpea	Mungbean	Lentil	Black gram
1980/81	210.99	315.15	225.92	232.25
1981/82	225.14	247.05	281.37	212.06
1982/83	220.25	278.89	179.15	256.35
1983/84	175.50	291.90	146.34	244.60
1984/85	250.15	250.29	351.45	285.19
1985/86	200.75	280.99	476.31	335.35
1986/87	175.29	291.21	304.13	310.66
1987/88	260.19	484.16	346.70	493.46
1988/89	275.15	298.73	409.43	372.06
1989/90	258.13	390.26	402.01	343.84
1990/91	225.78	336.33	559.53	386.79
1991/92	279.17	498.19	742.39	453.46
1992/93	390.50	486.87	592.28	318.60
1993/94	445.25	539.33	613.11	301.22
1994/95	577.60	530.67	701.00	494.25

Source: Economic wing, Ministry of Food, Agriculture and Livestock.

Table A. 18 Retail prices (Rs/40 kg) of pulses in Pakistan, average of 8 market centres, 1980/81 to 1994/95.

	Pulse			
Year	Chickpea	Mungbean	Lentil	Black gram
1980/81	6.75	8.50	7.77	6.99
1981/82	9.50	9.54	10.08	9.26
1982/83	8.59	8.68	7.96	7.96
1983/84	6.58	9.71	6.19	9.06
1984/85	6.58	9.47	9.96	10.58
1985/86	6.79	9.33	15.66	12.43
1986/87	5.90	9.36	13.37	11.61
1987/88	7.24	12.59	14.57	12.35
1988/89	11.98	14.71	14.30	14.66
1989/90	9.73	12.44	14.71	15.69
1990/91	7.85	12.64	18.77	15.19
1991/92	8.70	16.16	23.70	15.75
1992/93	13.35	17.09	21.75	16.95
1993/94	15.72	18.09	23.87	18.91
1994/95	21.77	20.24	28.20	24.98

Source: Economic wing, Ministry of Food, Agriculture and Livestock.

Table A. 19 Annual producer prices of pulses in Sri Lanka (Rs/kg).

Year	Green Gram	Black Gram
1986	13.49	11.48
1987	11.89	10.94
1988	13.16	8.58
1989	21.38	9.50
1990	20.10	12.06
1991	20.34	12.04
1992	23.64	17.14
1993	23.16	18.15
1994	22.41	15.05
1995	29.35	18.81

Source: Department of Census.

Table A. 20 Farmgate prices (kyat/ton) of important crops and selected pulses at the time of harvest, Myanmar.

No.	Crop	1985/86	1986/97	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96 (Prov.)
1	Paddy	454	454	1,102	4,340	4,340	4,397	4,207	8,651	11,481	10,517	14,356
2	Maize	801	801	1,635	3,351	3,565	4,412	7,554	8,629	13,891	16,610	17,091
3	Groundnut	6,257	7,884	8,952	9,364	11,766	15,861	24,994	29,271	28,362	29,570	38,632
4	Sesamum	8,559	8,622	12,705	12,787	13,031	20,704	26,331	35,856	37,337	51,105	74,941
5	Sunflower	5,438	5,675	7,078	8,866	10,151	13,576	17,736	27,569	31,049	31,005	44,789
6	Cotton (long staple)	4,287	4,287	4,287	4,900	4,900	7,962	17,235			36,742	
7	Black gram	1,531	1,531	3,365	5,513	6,156	11,944	13,352	14,241	21,223	28,272	45,693
8	Green gram	1,225	1,225	3,277	7,228	7,228	11,852	13,352	20,543	27,991	32,125	34,466
9	Chickpea	3,803	3,803	4,186	7,989	9,492	12,624	10,253	10,579	32,567	32,457	40,061
10	Pigeonpea	1,072	1,072	2,756	5,573	5,758	15,496	21,223	19,753	29,002	28,807	45,938
11	Gardenpea	4,226	4,869	6,248	10,167	10,412	15,404	15,741	16,936	26,521	27,554	40,504
12	Sultani	959	959	2,716	4,602	4,730	6,232	7,127	7,415	16,875	19,160	20,054
13	Butten bean	959	959	2,716	6,806	7,862	9,045	10,515	12,944	20,039	28,706	32,514
14	Soybean	2,695	3,185	3,644	5,237	5,972	8,177	11,362	14,914	29,155	18,963	26,266
15	Pelun	2,083	2,174	2,634	4,196	5,145	8,514	9,892	10,474	24,071	21,160	27,095
16	Sultapya	959	959	2,716	5,113	6,967	9,300	7,150	7,766	14,126	24,764	25,140

Source: Myanmar Agriculture Service.

Table A. 21 Estimates of price spread, marketing costs and margins for pigeonpea (Mahlaing, Mandalay Division, 1995/96), Myanmar.

Item			Kyat/basket
1. Farmer's Sale Price			1,500
2. Brokers' House (Township Level)			
	Purchase Price		1,500
	Sale Price		1,550-1,565
	Gross Margin		50-65
	Market Costs:		
		Labour	8
		Packing Material	20
		Miscellaneous	12
		Total Cost	40
	Net Margin		10-25
3. Traders (Yangon)			
	Purchase Price		1,550-1,565
	Sale Price		1,620-1,650
	Gross Margin		70-85
	Market Costs		
		Transport Cost	45
		Labour	5
		Storage	2
		Miscellaneous	8
		Total Cost	60
	Net Margin		10-25
4. Exporters			
	Purchase Price		1,620-1,650

Table A. 22 Estimates of price spread, marketing costs and margins for chickpea (Monywa, Sagaing Division, 1995/96), Myanmar.

Item			Kyat/basket
1. Farmer's Sale Price			1,100
2. Brokers' House (Township Level)			
	Purchase Price		1,100
	Sale Price		1,145-1,160
	Gross Margin		45-60
	Market Costs:		
		Labour	5
		Packing Material	20
		Miscellaneous	10
		Total Cost	35
	Net Margin		10-25
3. Traders (Yangon)			
	Purchase Price		1,145-1,160
	Sale Price		1,245-1,275
	Gross Margin		100-115
	Market Costs		
		Transport Cost	75
		Labour	5
		Storage	2
		Miscellaneous	8
		Total Cost	90
	Net Margin		10-25
4. Exporters			
	Purchase Price		1,245-1,275

Table A. 23 Estimates of price spread, marketing costs and margins for black gram (Letpadan, Bago Division, 1995/96), Myanmar.

Item			Kyat/basket
1. Farmer's Sale Price			1,450
2. Brokers' House (Township Level)			
	Purchase Price		1,450
	Sale Price		1,500-1,515
	Gross Margin		50-65
	Market Costs:		
		Labour	7
		Packing Material	20
		Miscellaneous	13
		Total Cost	40
	Net Margin		10-25
3. Traders (Yangon)			
	Purchase Price		1,500-1,515
	Sale Price		1,555-1,580
	Gross Margin		55-65
	Market Costs		
		Transport Cost	25
		Labour	5
		Storage	2
		Miscellaneous	8
		Total Cost	40
	Net Margin		15-25
4. Exporters			
	Purchase Price		1,555-1,580

Annex B Consumption

Table B. 1 Consumption of foodstuffs in Myanmar (kg/capita/year).

Year	Rice		Edible Oil	Pulses	Vegetables	Meat	Fish
	Fresh Milk						
1991/92	172	7	9.9	13	4.31		17.8
	0.13						
1992/93	190	7	6.0	15	3.63		18.0
	0.12						
1993/94	211	8	5.4	15	4.59		18.3
	0.12						
1994/95	208	9	13.0	16	4.78		6.6
	0.12						

Table B. 2 Per capita consumption (kg/yr) of selected pulses in Pakistan.

	1985/86			1990/91		
Pulse	Rural	Urban	All Pakistan	Rural	Urban	All Pakistan
Chickpea	2.88	2.76	2.88	3.00	2.76	3.00
Lentil	0.72	0.84	0.72	0.96	1.2	1.08
Mungbean	1.08	1.32	1.20	1.44	1.32	1.38
Black Gram	0.96	1.20	1.08	1.44	1.32	1.44
Other Pulses	0.36	0.24	0.36	0.36	0.24	0.36
Total	6.00	6.36	6.24	7.20	6.84	7.3

Source: Federal Bureau of Statistics, Statistics Division, Ministry of Finance & Economic Affairs, Islamabad.

Table B. 3 Per capita consumption (grams/month), Sri Lanka.

Period	Mungbean	Cowpea	Black Gram	Lentils
1973	9.9	-	6.1	252.6
1978/79	26.9	54.4	7.1	144.0
1981/82	30.3	55.8	2.6	106.8
1986/87	59.4	20.6	1.1	220.0

Source: Consumer Finance Surveys, Various Issues Central Bank of Sri Lanka.

Table B. 4 Per capita consumption (grams/month) by sector in 1986/87, Sri Lanka.

Period	Urban	Rural	Estate	All
Mungbean	60.70	56.70	80.80	59.40
Cowpea	11.90	21.20	34.60	20.60
Black Gram	1.10	0.70	4.60	1.10
Lentils (Red)	261.60	190.00	188.10	202.80
Lentils (other)	8.49	6.29	6.33	6.69

Source: Consumer Finance Surveys, Various Issues Central Bank of Sri Lanka

Table B. 5 Proportions of food legumes in production.

Food Legume	Percent
1.Chickpea	29.0
2.Peas	16.9
3.Sultani/pya (Coloured Lima bean)	10.3
4.Lablab Bean	9.3
5.Pebyugale (White Lima bean)	8.0
6.Pigeonpea	6.4
7.Soybean	4.7
8.Black Gram	3.6
9.Cowpea (Pelun & Bocate)	4.7
10.Others	7.1
Total:	100.0

Annex C Processing

Table C. 1 Recovery and loss in pulse milling technologies, India.

Pulse	Maximum theoretical recovery (%)	Maximum practical recovery (%)			Milling loss (%)		
		Domestic	Conventional	Modern	Domestic	Conventional	Modern
Sengal gram	88.00	75.00	75.00	84.00	13.00	13.00	4.00
Urad	87.00	68.00	71.00	82.00	24.00	16.00	5.00
Arhar	88.00	68.00	75.00	85.00	20.00	13.00	3.00
Moong	89.00	62.00	65.00	83.00	27.00	24.00	6.00

Source: National Productivity Council, 1993.

Table C. 2 Processing and marketing information of pulses at processing units, 1995, India.

No.	Particulars	Pigeonpea	Lathyrus	Horse gram	Green gram	Black gram	Lentil
I	Plant Information						
	(i) Potential Capacity (tons/year)	2,129.25	3,825.00	3,825.00	1,020.00	8,935.85	1,020.00
	(ii) Average Quantity Processed (tons/year)	605.89	2,413.33	1,095.80	31.60	400.00	370.70
	(iii) Capacity utilized (%)	28.45	83.09	28.65	3.10	42.74	36.34
II	Market Information						
	A. Percentage of Raw Material Purchased from						
	(i) Chhattisgarh	10.00	80.00	37.50	20.00	20.00	18.33
	(ii) Madya Pradesh	53.33	20.00	62.50	80.00	63.33	81.67
	(iii) Other states	36.67				26.67	
	B. Percentage of Final-products Sold in						
	(i) Chhattisgarh	28.33	43.33	31.25	66.67	66.67	30.00
	(ii) Madya Pradesh	46.67	23.33	41.25	33.33	33.33	46.67
	(iii) Other states	25.00	33.34	27.50			23.33
	C. Percentage of By-products Sold in						
	(i) Chhattisgarh	43.33	63.33	57.50	73.33	73.33	56.67
	(ii) Madya Pradesh	30.00	10.00	42.50	26.67	26.67	33.33
	(iii) Other states	26.67	26.67				10.00

Source: Gupta and Gauhara 1995.

Table C. 3 Returns and the input-output ratio in the pulse processing, India.

Particulars	Pigeonpea	Lathyrus	Horse gram	Green gram	Black gram	Lentil	Total Pulses
A. Main Product							
(i) Recovery (kg)	74.58	71.52	77.23	85.00	82.50	87.00	75.41
(ii) Price (Rs/Q)	1,316.51	479.75	898.00	975.00	948.18	850.00	764.15
(iii) Total Value (Rs)	981.85	343.02	693.52	828.75	788.25	739.50	576.24
B. By Product							
(i) Recovery (kg)	24.21	26.30	22.02	14.00	15.67	11.00	22.96
(ii) Price (Rs/Q)	262.96	210.56	221.36	242.00	278.86	290.42	226.08
(iii) Total Value (Rs)	63.67	55.38	48.74	33.83	43.70	31.95	51.91
C. Returns							
(i) Gross Returns (Rs)	1,045.52	389.40	742.26	862.83	825.95	771.45	628.17
(ii) Net Returns (Rs)	60.78	23.35	44.83	42.37	46.86	20.90	24.53
(iii) Input-output Ratio	1-1:06	1-1:06	1-1:06	1-1:05	1-1:06	1-1:03	1-1:4

Source: Gupta and Gauraha 1995.

Annex D Production

Table D. 1 Chickpea, mungbean of pigeonpea production priorities in Pakistan.

Crop	Practice	Details
Chickpea	preparing tillage	2 dry ploughing
	seed bed preparation/planking	2 ploughings and 2 plankings
	seed rate	50-55 kg/ha
	hoeing and weeding	manual, 4-5 mandays/ha
	planting period	October-November
	harvesting period	mid March to mid April
	harvesting and threshing	manual, 15 manday/ha
	average yield	600-700 kg/ha
Mungbean	preparatory tillage	1 ploughing and 1 planking
	seed sowing	1 ploughing and 1 planking
	seed rate	18-20 kg/ha
	sowing period	21st June end of July
	hoeing and weeding	5-6 mandays/ha
	harvesting period	end of September-end of October
	harvesting and threshing	10-12 mandays/ha; manual labour
	average yield	350-400 kg/ha
Pigeonpea	land preparation	1 to 2 dry ploughing
	planting period	15th October-15th November
	planting method	broadcast
	seed rate	25-38 kg/ha
	hoeing	no weeding
	harvesting period	15th March to 15th April
	harvesting method	manual, 6-8 mandays/ha
	average yield	400-500 kg/ha

Table D. 2 Black gram, area and production, Myanmar, 1986/1996.

Year	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1986/87	236,844	217,976	13.98	3,047,383
1987/88	255,085	238,021	13.64	3,246,132
1988/89	226,954	180,765	9.81	1,772,431
1989/90	254,512	220,518	8.86	1,953,473
1990/91	362,078	336,668	9.12	3,070,067
1991/92	724,709	644,084	9.33	6,011,442
1992/93	803,365	763,834	9.05	6,910,971
1993/94	692,758	660,379	8.90	5,878,507
1994/95	895,783	893,788	9.77	8,735,879
1995/96	1,110,815	1,110,808	9.78	10,866,231

Table D. 3 Pigeonpea, area and production, Myanmar, 1986/1996.

Year	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1986/87	150,658	132,477	8.32	1,102,730
1987/88	164,884	142,833	8.90	1,271,149
1988/89	172,167	153,270	8.29	1,270,439
1989/90	154,763	141,006	8.06	1,136,178
1990/91	174,934	169,984	7.63	1,296,470
1991/92	280,169	256,752	7.52	1,931,456
1992/93	530,223	509,763	8.35	4,257,816
1993/94	571,004	553,740	7.89	4,369,009
1994/95	637,336	577,647	7.70	4,447,555
1995/96	614,484	592,484	7.80	4,622,942

Table D. 4 Chickpea, area and production, Myanmar, 1986/1996.

Year	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1986/87	497,925	432,448	11.32	4,895,757
1987/88	482,204	432,748	11.61	5,023,627
1988/89	341,529	233,082	9.67	2,253,179
1989/90	391,781	332,164	9.72	3,229,560
1990/91	442,225	390,363	8.48	3,310,388
1991/92	458,818	410,837	8.68	3,564,495
1992/93	415,854	367,334	8.74	3,211,492
1993/94	328,736	249,848	7.70	1,923,830
1994/95	321,698	300,834	8.20	2,466,286
1995/96	454,798	442,810	8.74	3,868,007

Table D. 5 Lentil, area and production, Myanmar, 1986/1996.

Year	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1986/87	8,273	6,764	4.5	30,442
1987/88	4,049	3,015	3.54	10,667
1988/89	2,551	1,559	3.3	5,142
1989/90	2,449	2,170	3.45	7,492
1990/91	3,061	2,851	3.68	10,478
1991/92	4,843	4,604	3.78	17,418
1992/93	8,800	8,727	3.68	32,121
1993/94	9,956	8,235	3.53	29,068
1994/95	6,644	6,574	4.10	26,948
1995/96	6,601	6,601	4.38	28,920

Table D. 6 Compound growth rates of area, production and yield (%) of pulses and other foodgrains in India.

Crop	1949/50 to 1992/93			1949/50 to 1964/65			1967/68 to 1992/93		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Chickpea	0.73	0.15	0.59	1.64	2.66	1	0.82	0.48	0.33
Pigeonpea	0.97	0.81	0.16	0.57	1.34	1.9	1.63	1.76	0.42
Other pulses	0.69	0.99	0.3	2.07	1.28	0.77	0.61	1.88	1.26
Total pulses	0.26	0.5	0.38	1.9	1.39	0.22	0.29	0.95	0.72
Rice	0.81	2.63	1.81	1.33	3.49	2.13	0.57	2.83	2.28
Wheat	2.38	5.69	3.23	2.68	3.99	1.27	1.66	4.88	3.16
Total cereals	0.60	3.00	2.04	1.30	3.24	1.68	0.09	2.98	2.46
Total foodgrain	0.53	2.7	2.03	1.41	2.93	1.43	0.14	2.79	2.73

Source: Lal and Prakash, March, 1996.

Table D. 7 Production potential of high yielding genotypes of pulses in Front Line Demonstrations (1992/93), India.

Pulse Crop	No. of Field Days Organized	Grain Yield (kg/ha) HYV	Local variety	% Increase in Yield
Chickpea	587	1,376	1,178	16.80
Field pea	180	1,610	1,307	23.20
Lentil	90	1,103	849	29.90
Pigeonpea (early)	206	1,187	907	30.80
Pigeonpea (late)	80	1,361	682	99.50
Mungbean (kharif)	230	880	703	25.20
Urdbean (kharif)	159	904	674	34.10
Mungbean (summar)	152	823	608	35.80
Urdbean (spring)	95	710	571	24.30
Urdbean (rabi)	20	1,217	1,047	16.20

Source: ISPRD 1994.

Table D. 8 Area of pigeonpea (’000 ha) by state in India.

Year	Gujarat	Karnataka	Madhya Pradesh	Uttar Pradesh
1981		374	534	
1982		369		
1983		388		
1984			493	520
1985			480	543
1986			437	496
1987			454	514
1988	337			488
1989	382		443	502
1990			442	468
1991			442	521
1992	408		407	534
1993	426			
1994			424	

Table D. 9 Area of gram (’000 ha) by state in India.

Year	Haryana	Madhya Pradesh	Rajasthan	Uttar Pradesh
1975	1,106	1,917	1,952	
1976		2,018	1,776	
1977			1,862	
1978	1,063	1,739		
1979	553	2,174		
1981	1,044	2,387	1,935	1,571
1982	508	2,387	1,756	1,506
1983	647	2,106	1,796	1,358
1984	622	2,076	1,533	1,374
1985	758	2,282	1,941	1,535
1986	610	2,218	1,412	1,492
1987	200	2,236	864	
1988	645	2,237	1,282	
1989	526	2,157	1,144	
1990	649	2,462		
1991	305	2,138		
1992	387	2,346	1,449	
1993	403			
1994	403	2,567	1,587	

Table D. 10 Area of mungbean ('000 ha) by state in India.

Year	Andhra Pradesh	Madhya Pradesh	Orissa	Rajasthan
1981	1,129	2,294	1,621	1,819
1982	1,158	2,246	1,489	1,755
1983	1,174	2,357	1,541	1,877
1984	1,045	2,266	1,485	1,803
1985	1,037	2,380	1,633	1,927
1986		2,115	1,784	1,779
1987	1,123	2,037		1,108
1988	1,084	1,933		
1989		1,936		
1990	1,198		1,747	
1991			1,939	
1992	1,215		664	

Table D. 11 Area of soybean ('000 ha) by state in India.

Year	Madhya Pradesh	Uttar Pradesh
1979	414	
1980	455	
1981	307	
1982	584	157
1983	614	182
1984	987	207
1985	1,097	192
1986	1,210	167
1987	1,329	18
1988	1,476	16
1991	2,649	
1993	3,415	

Table D. 12 Area of black gram ('000 ha) by state in India.

Year	Andhra Pradesh	Madhya Pradesh	Maharashtra	Orissa	Tamil Nadu	Uttar Pradesh	West Bengal
1979		2,237					
1980							
1981	1,129	2,246			455		
1982	1,158	2,246			480		
1983	1,174	2,357					
1984	1,045	2,266		1,485		959	304
1985	1,037	2,380		1,633		1,081	
1986	1,088	2,115	1,594	1,784		1,092	
1987	1,123	2,037				1,066	
1988	1,084	1,933				1,100	
1989		1,936				1,194	
1990	1,198	2,109	1,577				
1991		1,983		1,939		1,249	
1992	1,215	1,976	1,741	664		1,323	

Table D. 13 Production of pigeonpea (’000 tons) by state in India.

Year	Gujarat	Karnataka	Madhya Pradesh	Uttar Pradesh
1981		183	482	
1982		157		
1983		183		
1984			401	942
1985			410	739
1986			414	684
1987			418	605
1988	251			661
1989	319		417	599
1990			437	578
1991			437	560
1992	341		315	552
1993	380			
1994			362	

Table D. 14 Production of gram (’000 tons) by state in India.

Year	Haryana	Madhya Pradesh	Rajasthan	Uttar Pradesh
1975	907	1,226	1,498	
1976		1,049	1,361	
1977			1,488	
1978	1,044	1,032		
1979	316	924		
1981	309	1,644	1,257	1,061
1982	282	1,644	1,318	1,395
1983	315	1,425	1,089	1,186
1984	319	1,302	969	1,272
1985	622	1,557	1,623	1,327
1986	413	1,480	834	1,233
1987	606	1,484	412	
1988	604	1,567	967	
1989	368	1,427	711	
1990	469	1,892		
1991	201	1,715		
1992	259	1,758	794	
1994	443	2,375	1,371	

Table D. 15 Production of mungbean ('000 tons) by state in India.

Year	Andhra Pradesh	Madhya Pradesh	Orissa	Rajasthan
1981	383	629	841	264
1982	515	629	810	244
1983	469	767	939	576
1984	429	640	792	391
1985	527	643	902	138
1986		600	930	119
1987	592	630		61
1988	597	659		
1989		662		
1990	565		923	
1991			980	
1992	636		227	

Table D. 16 Production of soybean ('000 tons) by state in India.

Year	Madhya Pradesh	Uttar Pradesh
1979	240	
1980	455	
1981	307	
1982	584	117
1983	514	127
1984	770	148
1985	829	154
1986	677	136
1987	767	19
1988	1,313	21
1990	3,599	
1991	2,093	
1993	3,599	

Table D. 17 Production of urad ('000 tons) by state in India.

Year	Andhra Pradesh	Madhya Pradesh	Maharashtra	Orissa	Tamil Nadu	Uttar Pradesh	West Bengal
1979		545					
1981	383	629			120		
1982	515	629			159		
1983	469	767					
1984	429	640		792		575	163
1985	527	643		902		746	
1986	522	600	473	930		710	
1987	592	630				701	
1988	597	659				829	
1989		662				845	
1990	565	775	665				
1991		762		981		1,020	
1992	636	778	941	227		1,024	

Table D. 18 Total cost of production (Rs/q) of pigeonpea by state in India.

Year	Gujarat	Karnataka	Madhya Pradesh	Uttar Pradesh
1981		173.2	117.9	
1982		199.5		
1983		180.1		
1984			168.0	120.3
1985			264.5	121.4
1986			295.9	108.7
1987			223.8	220.6
1988	379.6			226.7
1989	328.2		359.5	258.1
1990			413.1	247.5
1991			413.1	226.1
1992	503.9		617.3	260.3
1993	658.5			
1994			550.8	

Table D. 19 Total cost of production (Rs/q) of gram by state in India.

Year	Haryana	Madhya Pradesh	Rajasthan	Uttar Pradesh
1975	44.0	54.9	59.6	
1976		78.5	61.0	
1977			98.6	
1978	79.3	61.7		
1979	178.6	115.2		
1981	243.1	117.2	147.4	160.3
1982	191.6	112.7	140.0	144.3
1983	226.3	146.3	159.7	145.6
1984	199.8	183.2	195.0	173.4
1985	138.5	181.8	132.3	165.1
1986	188.4	171.4	149.2	185.1
1987	300.3	197.7	196.5	
1988	157.1	287.3	282.8	
1989	209.7	308.0	230.5	
1990	264.1	315.6		
1991	295.3	327.7		
1992	427.1	398.1	812.9	
1994	382.9	466.9	356.7	

Table D. 20 Total cost of production (Rs/q) of mungbean by state in India.

Year	Andhra Pradesh	Madhya Pradesh	Orissa	Rajasthan
1981	219.1	183.3	192.4	261.6
1982	235.7	196.6	230.9	231.9
1983	258.0	192.2	244.4	239.3
1984	241.4	213.0	262.6	373.9
1985	237.4	329.8	235.0	483.4
1986		248.0	233.5	271.1
1987	307.0	315.3		341.9
1988	476.3	490.7		
1989		529.9		
1990	528.1		534.2	
1991			502.3	
1992	763.3		550.5	

Table D. 21 Total cost of production (Rs/q) of soybean by state in India.

Year	Madhya Pradesh	Uttar Pradesh
1979	112.1	
1980	110.5	
1981	95.0	
1982	99.0	95.8
1983	154.1	107.7
1984	150.1	242.5
1985	169.3	208.2
1986	212.2	244.6
1987	290.0	163.4
1988	235.2	132.0
1991	316.8	
1993	301.7	

Table D. 22 Total cost of production (Rs/q) of urad by state in India.

Year	Andhra Pradesh	Madhya Pradesh	Maharashtra	Orissa	Tamil Nadu	Uttar Pradesh	West Bengal
1979		184.6					
1981	201.7	184.4			152.1		
1982	154.6	208.9			153.1		
1983	190.8	154.1					
1984	189.4	242.7		158.3		270.4	210.0
1985	221.6	282.1		153.2		374.0	
1986	212.3	291.6	390.2	203.6		330.6	
1987	259.0	380.5				413.3	
1988	231.0	374.9				416.9	
1989		452.0				582.7	
1990	333.7	488.1	619.6				
1991		757.4		341.5		413.3	
1992	405.2	542.5	467.2	381.3		451.7	

Table D. 23 Variable cost of production (Rs/q) of gram by state in India.

Year	Haryana	Madhya Pradesh	Rajasthan	Uttar Pradesh
1975	21.6	34.5	29.2	
1976		46.0	28.7	
1977			62.2	
1978	46.3	40.5		
1979	108.5	75.2		
1981	141.5	96.2	89.6	104.9
1982	110.6	85.1	89.5	100.0
1983	136.1	97.6	94.6	96.0
1984	126.8	127.4	120.3	110.6
1985	86.7	137.6	78.8	119.9
1986	116.6	130.2	90.5	121.5
1987	174.3	146.6	121.1	
1988	99.8	223.7	193.3	
1989	141.3	242.9	148.2	
1990	170.1	233.1		
1991	194.7	244.2		
1992	248.6	297.9	186.0	
1994	194.7	352.4	199.9	

Table D. 24 Variable cost of production (Rs/q) of pigeonpea by state in India.

Year	Gujarat	Karnataka	Madhya Pradesh	Uttar Pradesh
1981		127.7	77.4	
1982		147.8		
1983		139.0		
1984			100.0	62.7
1985			140.9	75.2
1986			180.4	61.8
1987			143.2	134.5
1988	300.8			107.9
1989	260.6		226.5	152.2
1990			270.5	136.4
1991			270.5	130.2
1992	380.6		432.5	160.9
1993	513.0			
1994			438.7	

Table D. 25 Variable cost of production (Rs/q) of mungbean by state in India.

Year	Andhra Pradesh	Madhya Pradesh	Orissa	Rajasthan
1981	167.7	90.0	126.9	121.6
1982	191.0	132.3	145.7	115.3
1983	208.9	125.4	169.6	91.3
1984	192.8	106.9	182.3	168
1985	184.5	223.3	154.8	246
1986		170.9	149.6	127.9
1987	234.6	185.9		181.1
1988	363.8	307.1		
1989		394.2		
1990	382.3		313.0	
1991			280.9	
1992	587.9		354.6	

Table D. 26 Variable cost of production (Rs/q) of soybean by state in India.

Year	Madhya Pradesh	Uttar Pradesh
1979	75.6	
1980	77.9	
1981	66.1	
1982	61.4	67.2
1983	123.2	78.9
1984	106.6	115.3
1985	107.4	128.5
1986	162.1	154.2
1987	227.0	126.9
1988	194.6	98.3
1991	316.8	
1993	301.7	

Table D. 27 Variable cost of production (Rs/q) of urad by state in India.

Year	Andhra Pradesh	Madhya Pradesh	Maharashtra	Orissa	Tamil Nadu	Uttar Pradesh	West Bengal
1979		109.2					
1981	157.5	113.6			152.1		
1982	123.3	135.5			153.1		
1983	162.2	116.3					
1984	165.3	142.0		111.1	128.1	128.1	104.2
1985	196.7	184.6		95.3		224.2	
1986	187.7	191.9	306.0	135.8		221.2	
1987	214.8	207.5				249.6	
1988	203.0	223.4				205.4	
1989		288.6				326.0	
1990	290.5	331.5	433.1				
1991		513.5		197.7		241.1	
1992	311.8	314.4	348.9	213.8		253.7	

Table D. 28 Share of area and production of major pulses in the total pulses in Pakistan, 1994/95.

Pulse	Area ('000 ha)	Share (%)	Production ('000 tons)	Share (%)
Chickpea	1,045.0	70.6	410.7	66.9
Mungbean	167.9	11.3	69.3	11.3
Black gram	64.5	4.3	28.6	4.6
Lentil	51.5	3.5	25.1	4.1
Lathyrus	97.3	6.6	49.1	8.0
Other Pulses	54.7	3.7	31.2	5.1
Total	1,480.9	100.0	614.0	100.0

Source: Economic wing, Ministry of Food, Agriculture and Livestock.

Table D. 29 Area, production and yield of chickpea in Pakistan, 1980/81 to 1994/95.

Year	Area ('000 ha)	Production ('000 tons)	Yield (kg/ha)
1980/81	842.9	336.9	400
1981/82	901.6	293.7	326
1982/83	892.9	491.0	550
1983/84	919.6	521.9	568
1984/85	1013.7	523.7	517
5 Year Average	914.1	433.4	474
1985/86	1033.3	586.2	567
1986/87	1082.1	583.3	539
1987/88	820.6	571.5	453
1988/89	979.4	456.0	466
1989/90	1025.4	561.9	543
5 Year Average	990.2	511.8	517
1990/91	1091.5	531.0	486
1991/92	996.9	512.8	514
1992/93	1007.6	247.3	344
1993/94	1045.0	410.7	393
1994/95	1065.5	558.5	525
5 Year Average	1041.1	472.1	452

Source: Economic wing, Ministry of Food, Agriculture and Livestock.

Table D. 30 Average annual growth rates of area, production, and yield of chickpea in Pakistan.

Period	Growth Rate (%) Area	Production	Yield
1970/71 to 1980/81	(-) 0.81	(-) 3.75	(-) 3.03 -
1980/81 to 1994/95	(+) 1.68	(+) 3.68	(+) 1.96
1990/91 to 1994/95	(-) 0.64	(+) 1.27	(+) 1.95

Table D. 31 Area, production and yield of mungbean in Pakistan, 1980/81 to 1994/95.

Year	Area ('000 ha)	Production ('000 tons)	Yield (kg/ha)
1980/81	67.0	31.8	445
1981/82	65.6	31.6	482
1982/83	79.0	39.6	502
1983/84	91.0	41.8	459
1984/85	93.6	44.6	476
5 Year Average	79.2	37.3	471
1985/86	104.2	48.8	468
1986/87	114.2	55.3	484
1987/88	94.1	43.3	461
1988/89	96.6	41.1	426
1989/90	143.8	57.0	396
5 Year Average	110.6	49.1	444
1990/91	141.6	56.5	399
1991/92	125.8	50.9	405
1992/93	146.8	62.1	423
1993/94	167.9	69.3	413
1994/95	179.7	80.0	445
5 Year Average	152.4	63.8	417

Source: Economic wing, Ministry of Food, Agriculture and Livestock.

Table D. 32 Average annual growth rates of area, production, and yield of mungbean in Pakistan.

Period	Growth Rate (%) Area	Production	Yield
1970/71 to 1980/81	(-) 0.44	(-) 0.31	(+) 0.11
1980/81 to 1994/95	(+) 7.30	(+) 6.81	(-) 0.46
1990/91 to 1994/95	(+) 6.14	(+) 9.08	(+) 2.76

Table D. 33 Area, production and yield of lentil in Pakistan, 1980/81 to 1994/95.

Year	Area ('000 ha)	Production ('000 tons)	Yield (kg/ha)
1980/81	72.7	29.5	406
1981/82	74.0	31.4	424
1982/83	82.3	29.9	364
1983/84	48.8	21.7	445
1984/85	49.1	26.0	531
5 Year Average	65.4	27.7	424
1985/86	57.4	31.3	544
1986/87	80.8	32.5	402
1987/88	76.0	30.9	407
1988/89	75.5	32.8	434
1989/90	67.9	29.9	440
5 Year Average	71.5	31.5	440
1990/91	63.4	27.2	429
1991/92	58.7	26.1	445
1992/93	63.5	28.2	443
1993/94	51.5	25.1	487
1994/95	61.0	31.0	508
5 Year Average	59.6	27.5	462

Source: Economic wing, Ministry of Food, Agriculture and Livestock.

Table D. 34 Average annual growth rates of area, production, and yield of lentil in Pakistan.

Period	Growth Rate (%) Area	Production	Yield
1970/71 to 1980/81	(+) 1.77	(+) 3.41	(+) 1.49
1980/81 to 1994/95	(-) 1.24	(+) 0.35	(+) 1.61
1990/91 to 1994/95	(-) 0.96	(+) 3.32	(+) 4.32

Table D. 35 Area, production and yield of black gram in Pakistan, 1980/81 to 1994/95.

Year	Area ('000 ha)	Production ('000 tons)	Yield (kg/ha)
1980/81	68.2	33.9	497
1981/82	66.5	32.8	492
1982/83	73.8	36.3	492
1983/84	71.2	39.4	553
1984/85	83.8	47.3	564
5 Year Average	72.7	37.9	521
1985/86	88.8	48.8	549
1986/87	77.5	38.8	501
1987/88	74.8	35.0	468
1988/89	78.5	32.2	411
1989/90	85.6	39.4	460
5 Year Average	81.0	38.8	479
1990/91	79.1	36.8	465
1991/92	79.4	37.1	468
1992/93	76.6	30.3	396
1993/94	64.5	28.6	443
1994/95	54.7	26.9	492
5 Year Average	70.9	31.9	453

Source: Economic wing, Ministry of Food, Agriculture and Livestock.

Table D. 36 Average annual growth rates of area, production, and yield of black gram in Pakistan.

Period	Growth Rate (%) Area	Production	Yield
1970/71 to 1980/81	(+) 5.51	(+) 5.63	(+) 0.16
1980/81 to 1994/95	(-) 1.56	(-) 1.64	(-) 0.07
1990/91 to 1994/95	(-) 8.80	(-) 7.53	(+) 1.42

Table D. 37 Area, production and yield of lathyrus (mattri) crop in Pakistan, 1980/81 to 1994/95.

Year	Area ('000 ha)	Production ('000 tons)	Yield (kg/ha)
1980/81	118.2	53.1	449
1981/82	124.8	55.9	448
1982/83	125.8	56.9	452
1983/84	91.9	41.9	456
1984/85	94.5	43.1	456
5 Year Average	111.0	50.2	452
1985/86	94.3	43.2	458
1986/87	94.6	43.3	458
1987/88	93.3	42.6	457
1988/89	18.5	45.2	459
1989/90	96.6	44.4	460
5 Year Average	95.5	43.7	458
1990/91	96.8	44.9	464
1991/92	96.9	45.5	470
1992/93	97.2	45.9	472
1993/94	97.3	49.1	504
1994/95	94.4	46.3	490
5 Year Average	96.5	46.3	480

Source: Pakistan Agricultural Research Council, Islamabad.

Table D. 38 Annual average growth rates of lathyrus (mattri) in Pakistan.

Period	Growth Rate (%) Area	Production	Yield
1975/76 to 1979/80	(+) 1.62	(+) 2.64	(+) 0.38
1980/81 to 1989/90	(-) 2.2	(-) 1.96	(+) 0.27
1990/91 to 1994/95	(-) 0.6	(+) 0.78	(+) 1.37

Table D. 39 Production of mungbean by district in Sri Lanka (mt).

District	Average 86-90	% of Total	Average 91-95	% of Total
Colombo	1.33	0.01	--	--
Gampaha	3.80	0.02	1.33	0.01
Kalutara	1.67	0.01	--	--
Galle	3.00	0.01	--	--
Matara	9.60	0.05	10.00	0.05
Puttalam	944.80	4.58	1,480.60	7.02
Kurunegala	6,359.60	30.82	4,188.00	19.85
Kegalle	54.00	0.26	25.60	0.12
Ratnapura	1859.80	9.01	1,262.80	5.99
Kandy	71.00	0.34	29.80	0.14
Matale	636.00	3.08	411.00	1.95
Nuwaraeliya	10.80	0.05	14.80	0.07
Badulla	725.40	3.52	655.40	3.11
Moneragala	4,243.80	20.56	4,865.80	23.07
Jaffna	262.00	1.27	415.20	1.97
Vavuniya	198.00	0.96	128.50	0.61
Mullativu	64.40	0.31	85.25	0.40
Mannar	23.40	0.11	36.33	0.17
Anuradhapura	854.40	4.14	1,029.40	4.88
Polonnaruwa	732.40	3.55	657.00	3.11
Trincomalee	85.00	0.41	74.50	0.35
Batticaloa	108.40	0.53	112.40	0.53
Ampara	697.20	3.38	720.40	3.42
Hambantota	2,043.60	9.90	4,507.80	21.37
Kilinochchi	107.80	0.52	160.60	0.76
Mahaweili-H	538.40	2.61	367.75	1.74
Sri Lanka	20637	100	210.94	100

Source: Department of Census & Statistics.

Table D. 40 Production of cowpea by district in Sri Lanka (mt).

Districts	Average 86-90	% of Total	Average 91-95	% of Total
Colombo	1.25	0.01	--	--
Gampaha	10.00	0.05	2.50	0.01
Kalutara	2.20	0.01	1.00	0.01
Galle	--	--	--	--
Matara	3.00	0.01	3.33	0.02
Puttalam	1,938.20	8.92	1,800.40	9.58
Kurunegala	6,439.20	29.63	3,960.00	21.07
Kegalle	42.00	0.19	14.20	0.08
Ratnapura	574.60	2.64	505.60	2.69
Kandy	161.00	0.74	81.20	0.43
Matale	606.80	2.79	489.80	2.61
Nuwaraeliya	113.20	0.52	123.40	0.66
Badulla	533.20	2.45	620.00	3.30
Moneragala	2,697.00	12.41	2,373.60	12.63
Jaffna	21.40	0.10	260.60	1.39
Vavuniya	529.40	2.44	429.75	2.29
Mullativu	77.00	0.35	179.25	0.95
Mannar	40.60	0.19	39.00	0.21
Anuradhapura	2,938.00	13.52	2,255.80	12.00
Polonnaruwa	416.40	1.92	430.20	2.29
Trincomalee	136.60	0.63	116.50	0.62
Batticaloa	165.60	0.76	111.60	0.59
Ampara	1,715.40	7.89	2,536.40	13.50
Hambantota	1,315.80	6.05	1,853.80	9.86
Kilinochchi	97.00	0.45	84.75	0.45
Mahaweili-H	1157.00	5.32	701.00	3.73
Sri Lanka	21,732	100.00	18,792	100.00

Source: Department of Census & Statistics.

Table D. 41 Production of black gram by district in Sri Lanka (mt).

Districts	Average 86-90	% of Total	Average 91-95	% of Total
Colombo	--	--	--	--
Gampaha	--	--	--	--
Kalutara	--	--	--	--
Galle	--	--	--	--
Matara	--	--	19.00	0.30
Puttalam	382.80	5.19	283.20	4.42
Kurunegala	639.40	8.67	160.80	2.51
Kegalle	--	--	--	--
Ratnapura	1.00	0.01	--	--
Kandy	3.20	0.04	5.40	0.08
Matale	26.20	0.36	13.00	0.20
Nuwaraeliya	4.40	0.06	4.75	0.07
Badulla	15.00	0.20	6.60	0.10
Moneragala	5.80	0.08	4.00	0.06
Jaffna	30.20	0.41	96.80	1.51
Vavuniya	1,711.20	23.20	1,696.50	26.47
Mullativu	403.60	5.47	591.00	9.22
Mannar	156.80	2.13	201.33	3.14
Anuradhapura	2,717.00	36.83	3,456.60	53.94
Polonnaruwa	6.40	0.09	2.50	0.04
Trincomalee	13.20	0.18	44.25	0.69
Batticaloa	96.20	1.30	101.80	1.59
Ampara	13.60	0.18	7.80	0.12
Hambantota	1.00	0.01	--	--
Kilinochchi	97.60	1.32	231.75	3.62
Mahaweili-H	1,053.20	14.28	97.60	1.52
Sri Lanka	7,376.20	100.00	6,408.00	100.00

Source: Department of Census & Statistics.

Table D. 42 Area under mungbean by district in Sri Lanka (ha).

District	Average 86-90	% of Total	Average 91-95	% of Total
Colombo	1.33	0.01	--	--
Gampaha	5.80	0.02	1.67	0.01
Kalutara	1.67	0.01	--	--
Galle	2.0.0	0.01	--	--
Matara	21.00	0.08	22.80	0.09
Puttalam	2,599.40	9.32	2277.80	9.10
Kurunegala	10,876.00	39.02	6,740.20	26.93
Kegalle	82.40	0.30	29.60	0.12
Ratnapura	1,981.40	7.11	1,474.80	5.89
Kandy	85.00	0.30	62.80	0.25
Matale	694.40	2.49	477.80	1.91
Nuwaraeliya	11.20	0.04	17.00	0.07
Badulla	904.80	3.25	941.00	3.76
Moneragala	4,748.60	17.03	4,924.00	19.68
Jaffna	349.60	1.25	581.00	2.32
Vavuniya	154.00	0.55	122.00	0.49
Mullativu	96.80	0.35	110.00	0.44
Mannar	27.00	0.10	32.00	0.13
Anuradhapura	965.20	3.46	1,093.60	4.37
Polonnaruwa	824.40	2.96	714.20	2.85
Trincomalee	113.60	0.41	77.00	0.31
Batticaloa	179.20	0.64	167.40	0.67
Ampara	623.00	2.23	748.00	2.99
Hambantota	1,913.60	6.86	4,031.40	16.11
Kilinochchi	108.20	0.39	171.00	0.68
Mahaweili-H	508.40	1.82	309.00	1.23
Sri Lanka	27876	100	25025	100

Source: Department of Census & Statistics.

Table D. 43 Area under cowpea by district in Sri Lanka (ha).

District	Average 86-90	% of Total	Average 91-95	% of Total
Colombo	1.50	0.01	--	--
Gampaha	10.20	0.04	3.50	0.02
Kalutara	4.80	0.02	2.00	0.01
Galle	--	--	--	--
Matara	6.40	0.02	6.33	0.03
Puttalam	3,563.40	13.85	2,799.00	12.93
Kurunegala	8,900.40	34.60	5,358.40	24.76
Kegalle	66.20	0.26	12.40	0.06
Ratnapura	530.20	2.06	511.40	2.36
Kandy	167.80	0.65	99.40	0.46
Matale	573.20	2.23	526.20	2.43
Nuwaraeliya	110.40	0.43	107.80	0.50
Badulla	577.60	2.25	696.00	3.22
Moneragala	3,029.80	11.78	2,244.80	10.37
Jaffna	50.20	0.20	401.40	1.85
Vavuniya	415.40	1.61	447.25	2.07
Mullativu	128.60	0.50	112.50	0.52
Mannar	36.80	0.14	34.67	0.16
Anuradhapura	2,710.80	10.54	2,521.80	11.65
Polonnaruwa	398.00	1.55	423.20	1.96
Trincomalee	165.00	0.64	136.75	0.63
Batticaloa	241.60	0.94	161.60	0.75
Ampara	1,742.80	6.78	3,030.20	14.00
Hambantota	1,214.20	4.72	1,603.60	7.41
Kilinochchi	102.80	0.40	89.50	0.41
Mahaweili-H	1,035.00	4.02	487.20	2.25
Sri Lanka	25724	100	21640	100

Source: Department of Census & Statistics.

Table D. 44 Area under black gram by district in Sri Lanka (ha).

District	Average 86-90	% of Total	Average 91-95	% of Total
Colombo	--	--	--	--
Gampaha	--	--	--	--
Kalutara	--	--	--	--
Galle	--	--	--	--
Matara	--	--	--	--
Puttalam	671.60	7.91	387.80	4.30
Kurunegala	941.80	11.10	252.20	2.80
Kegalle	--	--	--	--
Ratnapura	1.00	0.01	--	--
Kandy	4.80	0.06	3.25	0.04
Matale	31.60	0.37	20.80	0.23
Nuwaraeliya	13.20	0.16	7.40	0.08
Badulla	16.40	0.19	8.20	0.09
Moneragala	9.00	0.11	6.00	0.07
Jaffna	48.00	0.57	115.20	1.28
Vavuniya	2451.20	28.88	2,167.75	24.05
Mullativu	589.80	6.95	706.75	7.84
Mannar	185.40	2.18	211.67	2.35
Anuradhapura	2493.60	29.38	5,273.60	58.51
Polonnaruwa	17.20	0.20	4.40	0.05
Trincomalee	19.40	0.23	38.50	0.43
Batticaloa	110.80	1.31	149.80	1.66
Ampara	16.40	0.19	8.80	0.10
Hambantota	1.00	0.01	--	--
Kilinochchi	87.40	1.03	214.50	2.38
Mahaweili-H	778.20	9.17	89.40	0.99
Sri Lanka	8,486.20	100.00	9,012.80	100.00

Source: Department of Census & Statistics.

Table D. 45 Area under mungbean Sri Lanka by season (ha).

Year	Maha	% of Total	Yala	% of Total	Total
1986	15,026	60.12	9967	39.88	24,993
1987	16,106	62.97	9471	37.03	25,577
1988	18,746	65.90	9701	34.10	28,447
1989	15,591	57.48	11532	42.52	27,123
1990	22,107	66.50	11138	33.50	33,245
Average	17,515	62.59	10362	37.41	27,877
1991	24,210	73.29	8822	26.71	33,032
1992	20,759	78.49	5689	21.51	26,448
1993	17,877	71.20	7231	28.80	25,108
1994	16,038	71.45	6407	28.55	22,445
1995	12,405	68.55	5692	31.45	18,097
Average	18,258	72.60	6768	27.40	25,026

Table D. 46 Production of mungbean Sri Lanka by season (mt).

Year	Maha	% of Total	Yala	% of Total	Total
1986	11,040	58.96	7685	41.04	18,725
1987	10,644	60.54	6939	39.46	17,583
1988	12,990	45.66	6454	22.69	19,444
1989	12,150	59.33	8330	40.67	20,480
1990	18,997	70.49	7954	29.51	26,951
Average	13,164	58.99	7472	34.68	20,637
1991	19,729	74.21	6855	25.79	26,584
1992	18,408	79.55	4761	20.45	23,139
1993	15,540	73.73	5536	26.27	21,076
1994	13,837	72.71	5193	27.29	19,030
1995	11,353	70.90	4660	29.10	16,013
Average	15,773	74.22	5395	25.78	21,168

Source: Department of Census & Statistics.

Table D. 47 Area under cowpea Sri Lanka by season (ha).

Year	Maha	% of Total	Yala	% of Total	Total
1986	18,194	65.67	9511	34.33	27,705
1987	19,352	70.12	8245	29.88	27,598
1988	16,272	67.23	7933	32.77	24,205
1989	14,471	63.45	8337	36.55	22,808
1990	18,756	71.30	7548	28.70	26,304
Average	17,409	67.55	8315	32.45	25,724
1991	18,323	71.22	7404	28.78	25,727
1992	15,423	72.83	5755	27.17	21,178
1993	16,790	75.59	5423	24.41	22,213
1994	15,598	74.36	5379	25.64	20,977
1995	13,224	73.04	4881	26.96	18,105
Average	15,872	73.41	5768	26.59	21,640

Table D. 48 Production of cowpea Sri Lanka by season (mt).

Year	Maha	% of Total	Yala	% of Total	Total
1986	16,425	66.75	8182	33.25	24,607
1987	15,617	70.45	6552	29.55	22,169
1988	13,626	68.32	6318	31.68	19,944
1989	11,948	62.64	7126	37.36	19,074
1990	16,760	73.30	6104	26.70	22,864
Average	14,875	68.29	6856	31.71	21,732
1991	16,208	72.33	6199	27.67	22,407
1992	12,496	71.60	4957	28.40	17,453
1993	14,693	75.79	4694	24.21	19,387
1994	13,800	74.21	4796	25.79	18,596
1995	11,742	72.89	4368	27.11	16,110
Average	13,788	73.36	5003	26.64	18,791

Source: Department of Census & Statistics.

Table D. 49 Area under black gram Sri Lanka by season (ha).

Year	Maha	% of Total	Yala	% of Total	Total
1986	6,895	88.14	928	11.86	7,823
1987	7,929	79.67	2023	20.33	9,952
1988	8,524	80.58	2054	19.42	10,578
1989	5,795	79.44	1500	20.56	7,295
1990	6,180	91.08	605	8.92	6,785
Average	7,065	83.78	1422	16.22	8,487
1991	2,655	88.35	350	11.65	3,005
1992	6,891	96.74	232	3.26	7,123
1993	11,646	96.69	399	3.31	12,045
1994	11,053	96.63	385	3.37	11,438
1995	10,997	96.02	456	3.98	11,453
Average	8,648	94.89	364.4	5.11	9,013

Table D. 50 Production of black gram Sri Lanka by season (mt).

Year	Maha	% of Total	Yala	% of Total	Total
1986	6,639	87.49	949	12.51	7,588
1987	6,932	74.47	2376	25.53	9,308
1988	7,115	75.42	2319	24.58	9,434
1989	3,936	69.70	1711	30.30	5,647
1990	4,436	90.55	463	9.45	4,899
Average	5,812	79.53	1564	20.47	7,375
1991	2,205	86.95	331	13.05	2,536
1992	4,976	96.42	185	3.58	5,161
1993	8,071	96.08	329	3.92	8,400
1994	7,687	96.03	318	3.97	8,005
1995	7,541	94.95	401	5.05	7,942
Average	6,096	94.09	313	5.91	6,409

Source: Department of Census & Statistics

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Table D. 51 Area under pigeonpea Sri Lanka by season (ha).

Year	Maha	% of Total	Yala	% of Total	Total
1986	13	54.17	11	45.83	24
1987	14	28.57	35	71.43	49
1988	150	82.42	32	17.58	182
1989	3	11.11	24	88.89	27
1990	1	4.00	24	96.00	25
Average	36	36.05	25	63.95	61
1991	8	18.60	35	81.40	43
1992	8	33.33	16	66.67	24
1993	40	80.00	10	20.00	50
1994	51	82.26	11	17.74	62
1995	19	63.33	11	36.37	30
Average	25	55.51	17	44.49	42

Table D. 52 Production of pigeonpea Sri Lanka by Season (mt).

Year	Maha	% of Total	Yala	% of Total	Total
1986	18	56.25	14	43.75	32
1987	19	33.93	37	66.07	56
1988	202	85.96	33	14.04	235
1989	4	13.33	26	86.67	30
1990	1	3.70	26	96.30	27
Average	49	38.63	27	61.37	76
1991	5	13.16	33	86.84	38
1992					
1993	45	88.24	6	11.76	51
1994	64	90.14	7	9.86	71
1995	19	70.37	8	29.63	27
Average	33	65.48	14	34.52	46.75

Source: Department of Census & Statictics.9.86.

Table D. 53 Area under pulses in Sri Lanka (ha).

Year	Mungbean	Cowpea	Black Gram	Lentils	Total
1986	24,993	27,705	7,823	24	60,545
1987	25,577	27,597	9,952	49	63,175
1988	28,447	24,205	10,578	182	63,412
1989	27,123	22,808	7,295	27	57,253
1990	33,245	26,304	6,785	25	66,359
1991	33,032	25,727	3,005	43	61,807
1992	26,448	21,178	7,123	24	54,773
1993	25,108	22,213	12,045	50	59,416
1994	22,445	20,977	11,439	62	54,922
1995	18,097	18,105	11,453	30	47,685

Source: Department of Census & Statistics.

Table D. 54 Production of selected pulses in Sri Lanka (mt).

Year	Mungbean	Cowpea	Black Gram	Lentils	Total
1986	18,725	24,607	7,588	32	50,952
1987	17,583	22,169	9,308	56	49,116
1988	19,444	19,944	9,434	235	49,057
1989	20,480	19,074	5,647	30	45,231
1990	26,951	22,864	4,899	27	54,741
1991	26,584	22,407	2,536	38	51,565
1992	23,139	17,453	5,161	0	45,753
1993	21,076	19,387	8,400	51	48,914
1994	19,030	18,596	8,005	71	45,702
1995	16,013	16,110	7,942	27	40,092

Source: Department of Census & Statistics.

Table D. 55 Average yield of pulses in Sri Lanka (mt/ha).

Year	Mungbean	Cowpea	Black Gram	Lentils
1986	0.75	0.89	0.97	1.33
1987	0.69	0.80	0.94	1.14
1988	0.68	0.82	0.89	1.29
1989	0.76	0.84	0.77	1.11
1990	0.81	0.87	0.72	1.08
1991	0.80	0.87	0.84	0.88
1992	0.87	0.82	0.72	0.00
1993	0.84	0.87	0.70	1.02
1994	0.85	0.89	0.70	1.15
1995	0.88	0.89	0.69	0.90

Source: Department of Census & Statistics.

Table D. 56 Average yield of selected pulses in Sri Lanka (mt/ha).

Year	Mungbean			Cowpea			Black Gram			Lentils		
	Maha	Yala	Total	Maha	Yala	Total	Maha	Yala	Total	Maha	Yala	Total
1986	0.73	0.77	0.75	0.90	0.86	0.89	0.96	1.02	0.97	1.38	1.27	1.33
1987	0.66	0.73	0.69	0.81	0.79	0.80	0.87	1.17	0.94	1.36	1.06	1.14
1988	0.69	0.67	0.68	0.84	0.80	0.82	0.83	1.13	0.89	1.35	1.03	1.29
1989	0.78	0.72	0.76	0.83	0.85	0.84	0.68	1.14	0.77	1.33	1.08	1.11
1990	0.86	0.71	0.81	0.89	0.81	0.87	0.72	0.77	0.72	1.00	1.08	1.08
1991	0.81	0.78	0.80	0.88	0.84	0..87	0.83	0.95	0.84	0.63	0.94	0..88
1992	0.89	0.83	0.87	0.81	0.86	0.82	0.72	0.80	0.72	0.00	0.00	0.00
1993	0.87	0.77	0.84	0.88	0.87	0.87	0.69	0.82	0.70	1.13	0.60	1.02
1994	0.86	0.81	0.85	0.88	0.89	0.89	0.70	0.83	0.70	1.25	0.64	1.15
1995	0.92	0.82	0.88	0.89	0.89	0.89	0.69	0.88	0.69	1.00	0.73	0.90

Source: Department of Census & Statistics.

Table D. 57 Total sown area, productivity and production of different crops in Myanmar (1995/96 prov.).

No.	Crop	Unit	Sown area (acre)	Yield	Production
1	Rice	basket	15,308,555	61.77	937,848,880
2	Wheat	"	286,592	11.65	3,336,343
3	Maize	"	415,380	21.36	8,481,323
4	Sorghum	"	557,002	9.20	4,939,220
5	Black gram	"	1,110,815	9.78	10,866,231
6	Green gram	"	1,177,600	9.00	10,542,764
7	Butter bean	"	89,382	10.52	932,914
8	Sultapya	"	106,885	8.42	896,171
9	Soybean	"	191,196	10.21	1,951,363
10	Chickpea	"	454,798	8.74	3,868,007
11	Cowpea (Pelun)	"	210,975	8.00	1,687,596
12	Pigeonpea	"	614,484	7.80	4,622,942
13	Garden pea	"	96,266	8.50	818,091
14	Groundnut	"	1,295,522	39.22	50,132,704
15	Sesamum	"	3,405,933	5.85	14,317,993
16	Sunflower	"	550,999	20.30	11,097,973
17	Cotton	viss	954,203	164.81	131,288,180
	- Wagyi	"	123,709	115.65	14,088,356
	- Mahlaing	"	174,966	77.56	11,333,027
	- Long staple	"	655,528	200.26	105,866,797
18	Jute	"	123,510	226.40	26480059
19	Rubber	lbs	253,099	478.04	62,158,463
20	Sugarcane	ton	164,658	19.63	3,012,284
21	Virginia	viss	8,449	1267.35	10,707,854
22	Potato	"	46,620	2503.89	116,731,467
23	Coffee	"	13,262	98.27	67,165
24	Others		4,822,321		
	Total		32,258,506		

Source: Myanmar Agriculture Service.

Table D. 58 Total crop production ('000 metric ton) by crop group.

No.	Crop Group	1991/92	1992/93	1993/94	1994/95
1	Cereal crops				
	- Paddy	13,199	14,835	16,757	18,192
	- Others	463	484	475	514
2	Oil seed crops	642	781	768	963
3	Pulses	768	939	922	1,154
4	Culinery crops	429	427	437	438
5	Plantation crops	377	384	394	433
6	Industrial crops	2534	3,539	2,940	2,451
7	Miscellaneous	68	62	63	50
	Total	18,480	21,451	22,756	24,195

Source: Review of the Financial, Economic and Social Conditions for 1995/96, Ministry of National Planning and Economic Development, 1996.

Table D. 59 Total sown area, yield and production of pulses in Myanmar (1995/96).

No.	Crop	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1	Black Gram	1,110,815	1,110,808	9.78	10,866,231
2	Green Gram	1,177,600	1,170,986	9	10,542,764
3	Butter bean	89,382	88,680	10.52	932,914
4	Bocate	195,519	195,389	9.18	1,793,671
5	Sultani	18,278	18,247	10.52	191,983
6	Sultapya	106,885	106,437	8.42	896,171
7	Soybean	191,196	191,111	10.21	1,951,363
8	Chickpea	454,798	442,810	8.74	3,868,007
9	Cowpea	210,975	210,820	8	1,687,596
10	Pigeonpea	614,484	592,484	7.8	4,622,942
11	Pe-Yin	37,147	35,518	8.09	287,401
12	Pebyugalay	8,178	8,178	8	65,451
13	Lablab bean	175,821	173,855	7.26	1,262,143
14	Lima bean	35,439	34,227	7.74	264,984
15	Garden pea	96,266	96,246	8.5	818,091
16	Lentil	6,601	6,601	4.38	28,920
17	Pe-Nauk	302,788	288,152	5.75	1,656,867
18	Other pulses	203,015	202,082	9.35	1,890,046
	Total	5,035,187	4,972,631		

Table D. 60 Regional distribution of pigeonpea sown area, yield and production (1995/96), Myanmar.

No.	Crop	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1	Sagaing	124,655	120,448	6.98	840,727
2	Mandalay	238,380	220,831	7.30	1612,931
3	Magway	182,510	182,510	8.49	1548,722
4	Bago	2,073	2,073	7.04	14,594
5	Yangon	645	645	6.62	4,270
6	Ayeyarwady	20,506	20,506	9.11	186,862
7	Tanintharyi	382	190	4.13	784
8	Kachin	144	144	5.56	801
9	Chin	1,402	1,402	16.44	23,048
10	Shan	31,618	31,618	10.00	316,180
11	Kayah	9,354	9,347	5.61	52,465
12	Kayin	436	436	6.84	2,981
13	Mon	996	951	7.90	7,513
14	Rakhine	1,383	1,383	8.00	11,064
15	Union	614,484	592,484	7.80	4,622,942

Table D. 61 Regional distribution of chickpea sown area, yield and production (1995/96), Myanmar.

No.	Crop	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1	Sagaing	131,303	131,303	7.50	984,773
2	Mandalay	131,876	119,888	8.46	1,014,493
3	Magway	124,202	124,202	9.40	1,167,499
4	Bago	46,022	46,022	11.54	531,094
5	Yangon				
6	Ayeyarwady	14,750	14,750	8.06	118,895
7	Tanintharyi				
8	Kachin	22	22	10.18	224
9	Chin				
10	Shan	2,380	2,380	9.20	21,896
11	Kayah	3,515	3,515	7.00	24,620
12	Kayin				
13	Mon				
14	Rakhine	728	728	6.20	4513
15	Union	454,798	442,810	8.74	3,868,007

Table D. 62 Regional distribution of black gram, yield and production (1995/96), Myanmar.

No.	Crop	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1	Sagaing	26,663	26,663	7.70	205,367
2	Mandalay	13,767	13,669	11.19	152,992
3	Magway	3,884	3,884	8.74	33,946
4	Bago	418,796	418,796	10.44	4,374,050
5	Yangon	57,000	57,000	10.36	590,520
6	Ayeyarwady	572,810	572,810	9.32	5,339,032
7	Tanintharyi	2,215	2,215	6.13	13,583
8	Kachin	60	60	9.00	540
9	Chin				
10	Shan	10	10	9.20	92
11	Kayah				
12	Kayin				
13	Mon	12,000	12,000	10.23	122,800
14	Rakhine	3,701	3,701	9.00	33,309
15	Union	1,110,815	1,110,808	9.78	10,866,231

Table D. 63 Regional distribution of green gram sown area, yield and production (1995/96), Myanmar.

No.	Crop	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1	Sagaing	264,040	262,926	7.13	1,875,410
2	Mandalay	106,077	101,294	8.60	870,736
3	Magway	222,994	222,277	7.11	1,580,645
4	Bago	250,286	250,286	11.30	2,827,171
5	Yangon	135,000	135,000	10.50	1,417,700
6	Ayeyarwady	171,207	171,207	10.11	1,731,284
7	Tanintharyi	525	525	6.67	3,503
8	Kachin	60	60	8.90	534
9	Chin				
10	Shan	984	984	6.44	6,341
11	Kayah	421	421	6.17	2,597
12	Kayin	9235	9,235	9.10	84,048
13	Mon	14,736	14,736	8.65	127,410
14	Rakhine	2035	2035	7.56	115,385
15	Union	1,177,600	1,170,986	9.00	10,542,764

Table D. 64 Regional distribution of lentil sown area, yield and production (1995/96), Myanmar.

No.	Crop	Sown Area (acre)	Harvested Area (acre)	Yield (basket/acre)	Production (basket)
1	Sagaing	5,885	5,885	4.34	25,562
2	Mandalay	295	295	3.53	1,042
3	Magway				
4	Bago				
5	Yangon				
6	Ayeyarwady				
7	Tanintharyi				
8	Kachin				
9	Chin				
10	Shan	421	421	5.50	2,316
11	Kayah				
12	Kayin				
13	Mon				
14	Rakhine				
15	Union	6,601	6,601	4.38	28,920

Table D. 65 The average per acre cost of production (kyat/acre) for selected crops in Myanmar.

No.	Crop	Average Yield (basket)	1984/85	1991/92	1992/93	1994/95
1	Paddy	70	515	2,005	4,635	6,425
2	Maize	25	517	1,526	3,342	4,408
3	Groundnut					
	- Rain	25	955	2,353	4,764	6,203
	- Winter	40	1109	2,734	5,968	7,555
4	Sesamun					
	- Early	4	340	898	1,640	3,128
	- Late	5	355	923	1,656	3,118
5	Sunflower	20	503	1,605	3,468	4,650
6	Cotton (long staple)	200 viss	677	1,835	3,524	5,073
7	Black gram	10	275	884	1,705	2,538
8	Green gram	10	311	957	1,787	2,738
9	Chickpea	10	277	936	1,846	2,520
10	Pigeonpea	7	197	718	1,560	2,185
11	Lentil	6	227	n.a.	n.a.	n.a.

Source: Myanmar Agriculture Service.

Table D. 66 Farm gate prices, cost of production and net return of major crops and pulses in Myanmar (1994/95).

No.	Crop	Farmgate Price (kyat/mt)	Yield (basket/acre)	Cost of Production (kyat/acre)	Net Return (kyat/acre)
1.	Black gram	28,272	10	2,538	6,693
2.	Green gram	32,125	10	2,738	7,751
3.	Chickpea	32,457	10	2,522	8,076
4.	Pigeonpea	28,807	7	2,185	4,399
5.	Summer paddy	10,,518	70	7,717	7,643
6.	Wheat	21,737	15	5,783	4,863
7.	Maize	16,610	25	4,408	5,949
8.	Groundnut	29,571	40	7,555	5,855
9.	Sunflower	31,008	20	4,650	4,352
10.	Cotton (long staple)	36,742	200 viss	5,073	6,927

Source: Myanmar Agriculture Service.

Table D. 67 Production, consumption and export situation of pulses in Myanmar.

Year	Production (mt)	Seed & Waste (mt)	Export (mt)	Population (million)	Annual Consumption per Head (kg/yr)
1985/86	620,842	63,205	92,747	37.07	12.5
1986/87	611,757	61,780	92,314	37.80	12.1
1987/88	565,572	55,485	75,326	38.54	11.3
1988/89	370,692	51,849	17,477	39.29	7.7
1989/90	453,002	69,589	59,867	40.03	8.1
1990/91	552,393	87,645	226,051	40.79	5.8
1991/92	720,492	105,062	203,589	41.55	9.9
1992/93	888,499	109,729	525,576	42.33	6.0
1993/94	869,788	123,101	514,291	43.12	5.4
1994/95	1,109,769	145,561	424,880	43.92	13.0
1995/96	1,352,906	154,462	577,505	44.74	13.9

Source: Myanmar Agriculture Service.

Table D. 68 Average farmers' cost of production of chickpea during 1995/96, Pakistan.

No.	Operation/Input	Unit	Physical Unit	Costs/Returns (Rs/ha)
1.	Ploughings	no.	1	185.30
2.	Ploughings & plankings	no.	2	594.20
3.	Sowing	no.	1	247.10
4.	Seed	kg	7	259.35
5.	Hoeing & weeding	man-days	4	691.88
6.	Harvesting	man-days	4	691.88
7.	Threshing	man-days	2	370.65
8.	Winnowing charges	man-days	2	370.65
9.	Interest @ 14% per annum (for 6-months on items 1-4)			90.00
10.	Labour (additional)	man-hours	2.5	46.33
11.	Land rent			1235.00
12.	Total costs			4782.34
13.	*Yield			-
14.	Main product (grains)	40 kg	5	7721.88
15.	By-product (straw)	40 kg	12	593.04
16.	Gross output	Rs		8314.92
17.	Net income without rent	Rs		4767.58
18.	Net income with rent	Rs		3532.58
19.	Cost of production per 40kg	Rs		387.23

* average yield is 495 kg/ha.

Source: National Coordinated Research Programme on Food Legumes, NARC, Islamabad.

Table D. 69 Average farmers' cost of production of lentil during 1995/96, Pakistan.

No.	Operation/Input	Unit	Physical Unit	Costs/Returns (Rs/ha)
1.	Ploughings	no.	1	185.30
2.	Ploughings & plankings	no.	2	594.20
3.	Sowing	no.	1	247.10
4.	Seed	kg	7	259.35
5.	Hoeing & weeding	man-days	4	691.88
6.	Harvesting	man-days	4	670.65
7.	Threshing	man-days	2	370.65
8.	Winnowing charges	man-days	2	370.65
9.	Interest @ 14% per annum (for 6-months on items 1-4)			102.31
10.	Labour (additional)	man-hours	3.5	55.60
11.	Land rent			1,235.00
12.	Total costs			4,779.47
13.	*Yield			-
14.	Main product (grains)	40 kg	5	9,562.78
15.	By-product (straw)	40 kg	12	543.62
16.	Gross output	Rs		10,106.40
17.	Net income without rent	Rs		6,561.93
18.	Net income with rent	Rs		5,326.93
19.	Cost of production per 40 kg	Rs		386.85

* average yield is 495 kg/ha.

Source: National Coordinated Research Programme on Food Legumes, NARC, Islamabad.

Table D. 70 Average farmers' cost of production of black gram during 1995/96, Pakistan.

No.	Operation/Input	Unit	Physical Unit	Costs/Returns
				(Rs/ha)
1.	Ploughings	no.	1	185.30
2.	Ploughings & plankings	no.	2	594.20
3.	Sowing	no.	1	247.10
4.	Seed	kg	7	266.35
5.	Hoeing & weeding	man-days	4	691.88
6.	Harvesting	man-days	4	691.88
7.	Threshing	man-days	2	370.65
8.	Winnowing charges	man-days	2	370.65
9.	Interest @ 14% per annum (for 6-months on items 1-4)			90.00
10.	Labour (additional)	man-hours	2.5	64.86
11.	Land rent			1,235.00
12.	Total costs			4,808.41
13.	*Yield			-
14.	Main product (grains)	40 kg	5	8,648.50
15.	By-product (straw)	40 kg	12	462.08
16.	Gross output	Rs		9,110.58
17.	Net income without rent	Rs		5,537.08
18.	Net income with rent	Rs		4,302.08
19.	Cost of production per 40 kg	Rs		389.19

* average yield is 495 kg/ha.
Source: National Coordinated Research Programme on Food Legumes, NARC, Islamabad.

Table D. 71 Average farmers' cost of production of mungbean during 1995/96, Pakistan.

No.	Operation/Input	Unit	Physical Unit	Costs/Returns
				(Rs/ha)
1.	Ploughings	no.	1	185.30
2.	Ploughings & plankings	no.	2	594.20
3.	Sowing	no.	1	247.10
4.	Seed	kg	7	296.52
5.	Hoeing & weeding	man-days	4	691.88
6.	Harvesting	man-days	4	691.88
7.	Threshing	man-days	2	370.65
8.	Winnowing charges	man-days	2	370.65
9.	Interest @ 14% per annum (for 6-months on items 1-4)			92.18
10.	Labour (additional)	man-hours	2.5	46.33
11.	Land rent			1,235.00
12.	Total costs			4,821.69
13.	*Yield			-
14.	Main product (grains)	40 kg	5	7,215.32
15.	By-product (straw)	40 kg	12	444.78
16.	Gross output	Rs		7,660.10
17.	Net income without rent	Rs		4,073.41
18.	Net income with rent	Rs		2,838.41
19.	Cost of production per 40kg	Rs		487.82

* average yield is 495 kg/ha.
Source: National Coordinated Research Programme on Food Legumes, NARC, Islamabad.

Annex E International news on trade in pulses

Table E. 1 Exchange rate in US $.

Year	India (Rs/US $)	Pakistan (Rs/US $)	Sri Lanka (Rs/US $)	Myanmar (kyat/US $)
1981		12	20	
1982		13	21	
1983		14	24	50
1984		15	25	
1985	12	16	27	
1986	13	17	28	
1987	13	18	29	
1988	14	19	32	
1989	17	21	36	55
1990	18	22	40	65
1991	24	25	41	100
1992	31	26	46	110
1993	31	30	48	125
1994	31	31	49	120
1995		32	51	123
1996			55	160
1997				160

Table E. 2 Exchange rate evolution in Myanmar from April 1983 - April 1997.

Month	Year	Market Rate (US $)
Apr	1983	50
Dec	1989	55
Dec	1990	65
Dec	1991	100
Dec	1992	110
Dec	1993	125
Jan	1994	125
Mar	1994	122
Aug	1994	120
Dec	1994	120
Jan	1995	115
Mar	1995	110
Aug	1995	116
Oct	1995	120
Dec	1995	123
Jan	1996	123
Feb	1996	123
Mar	1996	124
Apr	1996	124
May	1996	130
Jun	1996	135
Jul	1996	158
Aug	1996	168
Sep	1996	170
Oct	1996	169
Nov	1996	169
Dec	1996	170
Jan	1997	167
Feb	1997	165
Mar	1997	164
Apr	1997	165

Sydney, Friday, 31 May 1996 (Reuters)

Price increases of up to A$50 a ton for major Australian pulse crops are expected over the next three months making the grains a more attractive proposition for later sowings, chairman of the industry representative body Pulse Australia Ltd., Alan Hunter, said.

The near-perfect autumn rain break across much of eastern Australia meant earlier sowing was concentrated on the major winter cereals, he said in a statement.

But much of the southern grain regions and Western Australia had not yet received substantial autumn rain, he said.

While cereals would dominate when seeding does start, the Eastern Australian Department of Agriculture was advising growers that trials in the state showed late sown pulse corps could still achieve much of their potential yield, he said.

This applied equally for field peas, chickpeas and lentils, he said. Current prices for pulse crops rang from about A$250 a ton to about A$285 a ton for chickpeas.

The strengthening market outlook for pulses coupled with other benefits associated with grain legume production would see increased areas sown to pulse corps in coming weeks, he said.

Pulse prices were being driven by reports from India that farmers had cut back on pulse growing this year in favour of wheat, with a likely shortfall in the crop now being harvested of an additional one million tons, Hunter said.

Likewise in Australia, Europe and North America, field pea production this year was expected to be lower by up to a half million tons, he said,

"In these conditions market analysts expect volatile prices as the market reacts to new information about weather conditions, crop yields and market demand," he said.

Rome, Friday, 14 November 1996 (Reuters)

The Untied Nation's Food and Agriculture Organization said in a report released on Thursday it expected aggregate 1965 output of cereals and pulses in the Commonwealth of Independent States to be two percent above 1995 production.

The report, dated November 4 and based on data collected during a mission to the CIS in September, said it estimated output would be 133 million tons cleaned weight, compared with 130 million last year.

It forecast substantially better harvests in Russia and Kazakhstan but sharp falls of between 18-50 percent in Moldova, Turkmenistan and the Ukraine.

FAO estimated that CIS that production could rise in 1996 by 70 million tons, thanks both to higher yields and expanded area. The aggregate output of coarse grains is expected to decline five percent to 58 million tons, the report said.

Overall food supplies in the CIS remained adequate to meet demand during 1995-1996.

It said that following the poor harvest in 19955, aggregate imports of cereals in 1996-1995 are estimated to have risen nearly 12 million tons including intra-CIS trade, a rise of 1.2 million tons on the preceding year.

FAO estimated that cereal utilization would contract in 1996-1997 to an estimated 157 million tons compared with 172 million in the preceding year and 238 million in 1991-92.

CIS cereal import requirements for 1996-1997 are tentatively estimated at 9.2 million tons including intra-CIS trade, some 2.7 tons less than imports in 1995-1996, FAO added.

It projected Russian wheat imports of three million tons, of which 500,000 tons would be imported from outside the CIS. Coarse grain imports would be 800,000 tons including 200,000 tons form outside the former Soviet Union.

Melbourne, Tuesday, 23 July 1996

Pulse crops could play a key role in limiting trade barriers for Australian grain exports, the chairman of Pulse Australia Ltd., Alan Hunter said.

Addressing the Pluses of Pulse conference, Hunter said industries around the world were under notice they would need to comply with new World Trade Organization requirements for sustainable production.

"Countries such as Australia which export their produce would need to demonstrate compliance with sustainability requirements or face the threat of severe trade barriers," he said.

The WTO's sustainable production requirements relate to the rotation of crops to reduce fertilizer use and avoid a build-up of diseases in soils.

Use of pulses could help Australian growers avoid trade barriers for wheat, Hunter said.

This would provide further incentive for Australian farmers to include pulse production as an integral element of cropping and animal production, he said.

Pulses are increasingly recognized for their contribution to farming systems through assistance in disease control, in improved soil nitrogen levels and improvements in soil structure, he said.

The area sown to pulses in Australia has jumped five-fold since the mid-1980s, and now includes more than two million hectares producing almost 2.5 million tons of pulse products.

A target of four million tons has been set for the end of the next decade, with an increasing proportion of that in food grade and value-added products, Hunter said.

The main pulse crops are lupins, field peas, chickpeas and faba beans.

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