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India's Pulse Sector: Results of Field Research

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Abstract

India is the world's largest producer of pulses, which are an important component of the Indian diet. Stagnant production in that country has contributed to declining per capita consumption over the past 20 years. During this period, domestic pulse prices have increased relative to other foods. Despite a liberal import regime, imports have generally remained a small share of supplies. Most Indian consumers are highly sensitive to prices when making food purchase decisions. Higher relative prices cause consumers to switch to lower priced pulse varieties and grades, and to other food items, such as cereals and vegetables. The recent rise in the popularity of low-priced imported dry peas demonstrates that consumers substitute nontraditional varieties into their diet based on relative prices. U.S. dry peas are not competitive in India because of the limited market for premium grades, as well as the higher costs associated with bagging and containerized shipping. U.S. chickpeas have also been limited to a small, premium-priced niche segment of the market.

Keywords: India, pulses, peas, lentils, chickpeas, pigeon peas, black matpe, mung beans.

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Introduction

India is the largest producer and consumer of pulses in the world, accounting for about 25 percent of global production, 27 percent of consumption, and 34 percent of food use (FAO). It also is the top importer, with an 11-percent share of world imports during 1995-2001, although imports have only accounted for about 6 percent of domestic consumption during the same period. Pulse production in India has fluctuated widely with no long-term trend, leading to a steady decline in per capita availability over the past 20 years. Imports have been unrestricted with relatively low tariffs during that period—virtually the only food item afforded such open access to the Indian market. Even with domestic pulse prices increasing faster relative to other foods, imports have remained a surprisingly small share of supplies. Although the United States exports some varieties of pulses to India, volumes are minor compared with many other pulse-exporting countries. Moreover, U.S. market share has declined over time.

This report describes the Indian pulse market and the United States' competitive position as a supplier to that sector. It identifies some of the factors that affect Indian pulse production and consumption as well as import demand. Challenges for U.S. competitiveness include the limited scope for quality-driven price premiums, high transportation costs, and the small volume of domestic production.

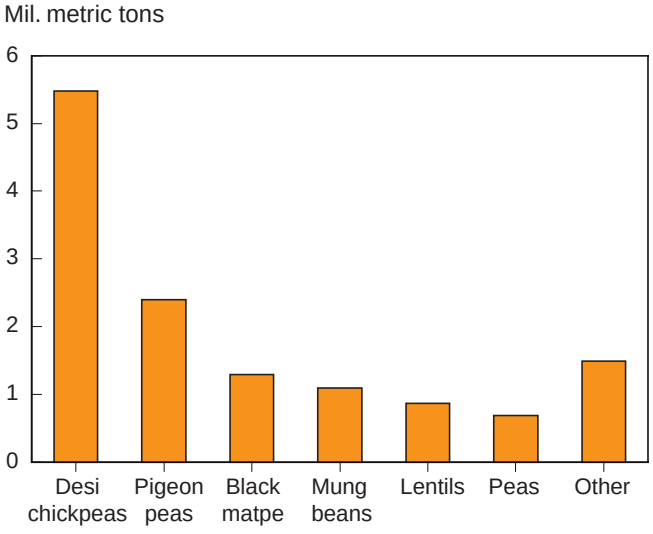
Much of the information presented here was gathered during a tour of India in June-July 2001. Researchers visited several cities—including Delhi, Ahmedabad, Mumbai, Chennai, and Kolkata—due to the wide range of pulses consumed in India, diverse regional preferences, and varying business practices. To gain a better understanding of the pulse sector, key players throughout the marketing chain—importers, wholesalers, millers, retailers, snack-food manufacturers, industry analysts, government officials, and academic researchers—were interviewed. Information on the U.S. dry pea, lentil, and chickpea industry was obtained from meetings with producers, processors, exporters, and industry associations in the Pacific Northwest and North Dakota.

Indian Pulse Production

Pulses are an important Indian crop, with an annual production of about 13.2 million tons from 22.5 million hectares between 1990 and 2000. (Government of India-b). Pulse is the common name for members of the *leguminosae* (pea) family (Lucier and Plummer). In India, the word "pulse" is used to describe the seeds of legumes that are dicotyledons and have no seed coats. As used in North American agriculture, the term "pulse crop" commonly refers to dry peas, lentils, beans, and chickpeas used as food or feed crops, but also includes cowpeas, fava beans, and lupines. A wide range of pulses is grown in India, primarily small chickpeas (desi variety), pigeon peas, black matpe, and mung beans (fig. 1). Between 1994 and 2000, desi chickpea and pigeon pea production averaged about 5.5 million tons and 2.4 million tons, respectively. Production of other pulse crops, including lentils, green/yellow peas, moth beans, horse gram, blackeye beans, and kidney beans, is relatively small.

The role of pulses in Indian crop area and production has declined since 1970/71 (fig. 2). Pulse area has declined relative to other crops, including wheat, rice, and oilseeds. Moreover, in contrast with other major crops, pulse production has remained relatively stagnant. Pulse yields have, on average, failed to show significant gains compared with other crops, a factor that has eroded the profitability and planting of pulses relative to other crops.

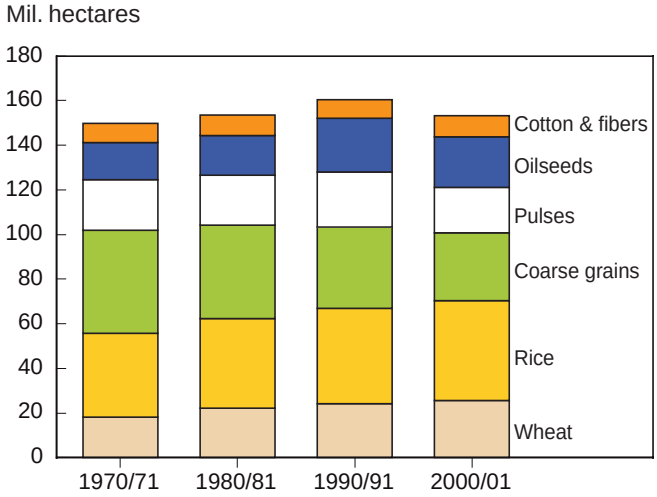
Figure 1
India: Average pulse production by variety[1]



[1]Production data for desi chickpeas and pigeon peas are for 1994/95-2000/01,1994/95-99/2000 for lentils, and 1994/95-97/98 for black matpe, mung beans, peas, and other pulses.

Sources: Government of India-b and c.

Figure 2
India: Area under major crops



Source: Government of India-f.

The state of Madhya Pradesh is the largest pulse producer, accounting for about 26 percent of total production from 1996/97 to 1999/00 (fig. 3) (Government of India-b). Other states with significant output include Uttar Pradesh (18 percent), Maharashtra (14 percent), Rajasthan (14 percent), Karnataka (5 percent), Andhra Pradesh (5 percent), and Bihar (5 percent). In general, pulses are grown in one of two seasons: the warm, rainy period (May-October) or the cool, dry season (November-April) (Meenakshi et al.). Chickpeas, lentils, and dry peas are grown in the cool season, while pigeon peas, black matpe, mung beans, horse gram, and moth beans are produced during the rainy period.[1]

Between 1980 and 2000, harvested area allocated to pulses ranged from 21.1-24.7 million hectares (Government of India-b). The shift to wheat and rice during the Green Revolution—the period between 1967 and 1978 in which farm acreage increased, double-cropping occurred, and improved seed varieties were planted—placed downward pressure on pulse acreage (Ganguly). Production fluctuated significantly between 1980 and 2000, ranging from 10.6 to 14.9 million tons, mainly due to variable yields that did not improve over

[1] Black matpe and mung beans are sometimes grown in the cool season as well.

Figure 3

Map of India



Source: Economic Research Service, USDA.

time (Government of India-b). Production has shown little growth since the 1970s, exhibiting only a slight upward trend over the past few years.

Few varietal improvements, combined with low resilience to moisture stress and pest infestation, have contributed to variable production. Only a small share (12 percent between 1990 and 1996) of pulse acreage is irrigated, reflecting both the rainfed conditions in traditional pulse-growing areas and the inability of relatively low-productivity pulses to compete with other crops, particularly wheat and rice, for irrigated land (Government of India-b). Pulse production is also hampered by minimum support prices that are generally below market prices. Thus, government assistance is rarely triggered. In contrast, the support prices and government procurement programs for wheat and rice are more attractive, encouraging farmers to grow those crops.

Some states in India levy taxes on certain pulses in order to protect their farmers. For example, Tamil Nadu imposes a 4-percent tax on yellow/green peas and chickpeas that are shipped across state lines. This surcharge, which is paid by commission agents, is intended to support local pulse production by limiting the amount of pulses that are imported or transported through the state.

Indian Pulse Consumption

India is a low-income country, and many consumers rely on cereals and pulses as primary sources of protein and calories. Although consumption of dairy products is common, many consumers exclude meat from their diets due to its high cost or for religious reasons. Stagnant production, a rising population, and small imports have caused the per capita availability of pulses to fall over time (fig. 4).

Virtually all Indians, rich and poor as well as vegetarian and nonvegetarian, consume pulses.[2] However, regional preferences exist with respect to pulse consumption (table 1). Pulses are served at home and in all types of establishments ranging from roadside eateries to fancy restaurants. Most pulses are consumed in shelled and split form. Some exceptions include green peas and kabuli chickpeas (known as garbanzo beans in the United States), which do not have hard hulls and may be consumed whole.

Pulses are used to make dal, a thick, gravy-like dish. Pulses are also used in curries and snack foods, such as samosa (a deep-fried pastry stuffed with green peas and potatoes), pakora (deep-fried vegetables coated with chickpea flour), and pappad (fried or toasted wafers).

[2] In general, pulses are not fed to animals, although the hulls and other milling byproducts are sold as cattle feed. Only pulses with major postharvest damage (e.g., that caused by moisture) are used as feed.

According to traders, Indian consumers tend to prefer local pulses to imported varieties because of their perceived superior taste. However, few consumers appear willing to pay high premiums for local varieties.

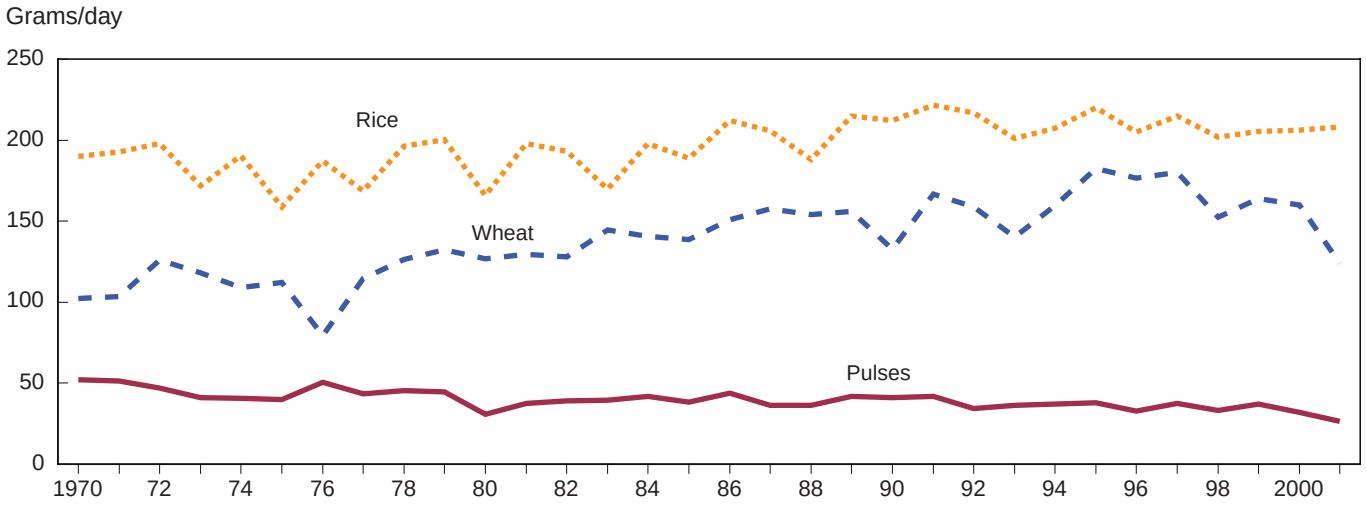
Role of Income in Pulse Demand

Pulse demand is positively correlated with income (Kumar). This finding is true for all income classes—particularly for the poorest individuals—and both urban and rural areas. For very poor consumers, pulse consumption increases by more than 0.6 percent for a 1-percent rise in income (table 2). Pulse demand remains significantly more responsive to changes in income than the demand for other food grains (e.g., wheat and rice), but less so than other foods, such as milk, vegetables, edible oil, and meat. This relationship contradicts recent trends in per capita consumption and income in India. While per capita pulse consumption has declined during the last 20 years, per capita income grew about 3.7 percent per year in the 1990s (Government of India-f). This suggests that other factors, particularly limited supplies and changes in relative prices, may have accounted for the decline in per capita consumption of pulses.

Role of Price in Pulse Demand

Index data on wholesale price movements in India indicate that prices for pulses rose significantly in real terms—as well as relative to those for other important food groups—from 1980 to 2000 (table 3 and fig. 5). Rising real pulse prices provide at least a partial expla-

Figure 4
India: Per capita availability of rice, wheat, and pulses, 1970-2001



Source: Government of India-b.

Table 1—India: Regional consumption preferences by pulse variety

Desi chickpeas	Universally accepted in India. Prepared as dal to accompany meals. Used in snack foods. About 50-60 percent is ground into flour (besan), which is used for coating fried dishes and snack foods. Of the remaining 40-50 percent, about 25 percent is left whole and 15-25 percent is split.
Pigeon peas	Second major pulse crop in India. Popular in central and southern India, with some difference in preference for color. Consumers in the south prefer the medium-sized, red variety, while those in more northern areas like the yellow type. Pigeon peas are primarily prepared as dal. Nearly all pigeon peas are decorticated and split. Castor oil is sometimes used as a preservative.
Black matpe	Third major pulse indigenous to India and Burma. Liked throughout the country, especially in the south. Used in various forms (whole, shelled and split, split only, and milled). Consumed in all regions in the form of pappad and is the major ingredient in several foods that are popular in the south, including idli and vada (rice cakes) and dosa (fermented crepes).
Mung beans	Popular in eastern India and Maharashtra. Typically used in split form to prepare dal.
Lentils	Consumed primarily in northern and eastern India. Least preferred in the south.
Green peas	Minor pulse in India. Consumed in most parts of the country due to their low price. Used in dal, snack foods, and restaurants. U.S. imports are confined to niche markets due to their higher price.
Yellow peas	Indigenous output is small, but domestic and imported peas are consumed in most regions of the country. Popular in Uttar Pradesh, eastern India (West Bengal, Bihar, Orissa, and Assam), and southern India. Imported peas serve as a low-cost substitute for desi chickpeas and pigeon peas when making besan (illegal, but commonly done) and dal, respectively.
Dun peas	Imported pulses that are the cheapest available in the market. Imported from Australia and consumed in the lowest income areas of eastern India. Typically "farmer-dressed"—bagged directly from the field without processing. Quality is low with many broken pieces, foreign matter, mottled appearance, and non-uniform shape.
Kabuli chickpeas	Largest size commands the highest price. Reserved for niche markets and special occasions. Smaller sizes may be substituted for desi chickpeas. Demand is localized in the north, but is expanding to the south.
Kidney beans	Consumption confined to northern India, where they are a favored dish.
Blackeye beans	Consumed in most parts of the country, but demand is limited.

Source: Economic Research Service, USDA.

Table 2—India: Expenditure elasticities of demand

Commodity	Rural				Urban			
	I	II	III	IV	I	II	III	IV
Rice	0.183	0.106	0.035	-0.018	0.148	0.078	0.010	-0.029
Wheat	-0.026	-0.055	-0.072	-0.057	0.005	-0.078	-0.125	-0.101
Coarse cereals	-0.173	-0.170	-0.153	-0.097	-0.135	-0.213	-0.207	-0.119
Pulses	0.611	0.454	0.310	0.121	0.612	0.442	0.275	0.095
Milk	0.895	0.740	0.573	0.299	0.878	0.681	0.525	0.272
Edible oil	0.768	0.578	0.399	0.178	0.675	0.488	0.320	0.122
Vegetables	0.742	0.568	0.408	0.194	0.669	0.487	0.337	0.152
Fruit	0.826	0.661	0.524	0.293	0.782	0.610	0.499	0.293
Meat	1.136	1.007	0.887	0.600	1.076	0.880	0.755	0.489
Sugar	0.369	0.234	0.125	0.025	0.350	0.199	0.088	-0.013
Other food	1.241	1.107	0.996	0.739	1.198	0.979	0.868	0.585
Nonfood	2.547	2.634	2.505	1.998	2.488	2.338	2.160	1.757

I: Very poor, II: Moderately poor, III: Non-poor lower, IV: Non-poor higher.

Note: Budget shares allocated to pulses by rural (urban) consumers in 1987-88 were 5% (5.1%), group I; 4.9% (4.7%), group II; 4.5% (4.3%), group III; 3.7% (2.8%), group IV.

Source: Kumar.

nation for the decline in per capita pulse consumption despite rising incomes.

Most Indian consumers have relatively low incomes, and tend to be very price-sensitive buyers of most items, including pulses. Estimates of price elasticities of demand for rural and urban consumers confirm this price sensitivty (table 4). For example, pulse consumption by very poor households in rural areas falls by 0.775 percent when pulse prices rise by 1 percent. Pulse consumption is significantly more sensitive to price changes than cereal consumption and nearly as price sensitive as many higher value foods, including milk, vegetables, and edible oil. Field interviews with traders, processors, and importers uniformly support the primary importance of prices in purchase decisions.

Market behavior with regard to quality premiums is another indicator of consumer price response. Although wholesalers often carry a range of qualities for each pulse variety, they report that purchases are heavily (roughly 80 percent) weighted toward lower cost varieties of average to lower quality.

Pulse Substitution in the Indian Diet

Rising prices for pulses relative to substitute foods likely contributed to the decline in per capita pulse consumption since 1980. Substitution is not typically between pulses and other protein-rich foods, such as meat, dairy products, or fish. Instead, substitution appears to be mostly between pulses and cereals, vegetables, fruit, and, to some extent, dairy products. In the case of middle- and low-income consumers, relatively high pulse prices appear to shift consumption toward lower cost cereals and vegetables. Among higher income consumers, a shift away from pulses may be due to preferences for vegetables, fruit, dairy products, and meat, as opposed to price.

To some extent, households also substitute among pulse varieties and qualities when price relationships change. Indian consumers routinely make purchases based on relative prices (given minimal levels of acceptable quality) even when the varieties are not a

Table 3—India: Annual growth rates of pulse demand variables, 1980-2000

Per capita		Deflated wholesale prices							
Pulse consumption	Real GDP	Pulses	Wheat	Rice	Milk	Edible oil	Eggs	Vegetables	Fruit
Annual growth rate, 1980-2000 (%)									
-0.9	3.5	2.1	0.4	0.5	0.6	-1.0	-1.0	0.4	0.5

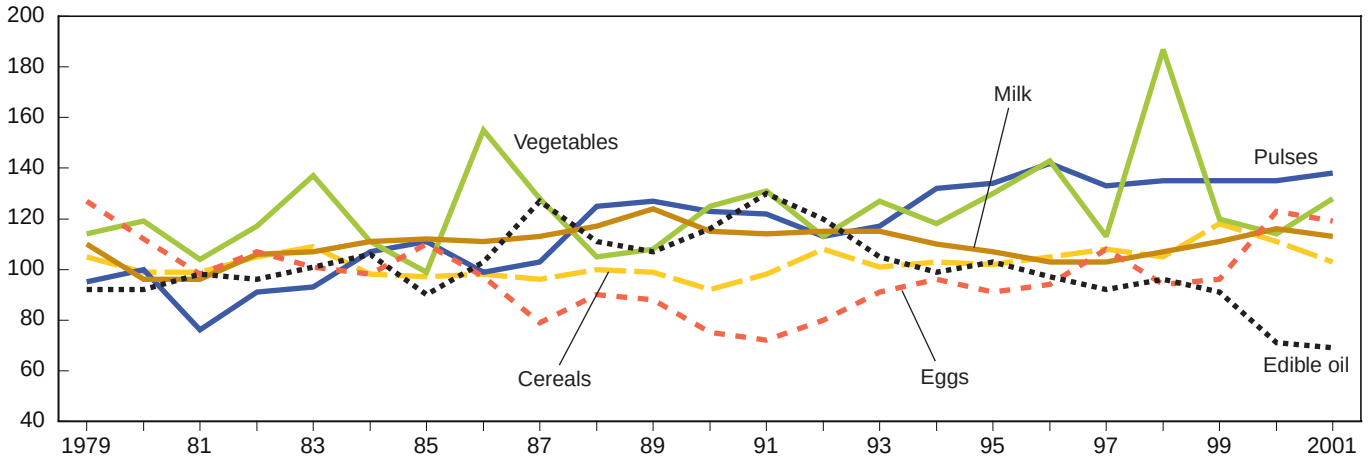
Note: Annual growth rates are calculated based on 3-year averages centered on 1980 and 2000.

Sources: Government of India-a and Government of India-f.

Figure 5

India: Deflated wholesale price indices for food groups, 1979-2001

1981/82=100



Source: For 1979-1998, Government of India-a; for 1999-2001, Government of India-e.

Table 4—India: Uncompensated own-price elasticities of demand

Commodity	Rural				Urban			
	I	II	III	IV	I	II	III	IV
Rice	-0.472	-0.360	-0.245	-0.133	-0.464	-0.402	-0.302	-0.205
Wheat	-0.400	-0.317	-0.227	-0.140	-0.319	-0.312	-0.216	-0.143
Coarse cereals	-0.389	-0.308	-0.214	-0.111	-0.451	-0.392	-0.281	-0.166
Pulses	-0.775	-0.686	-0.545	-0.334	-0.784	-0.738	-0.597	-0.406
Milk	-0.897	-0.838	-0.727	-0.510	-0.894	-0.870	-0.777	-0.605
Edible oil	-0.832	-0.740	-0.600	-0.386	-0.798	-0.757	-0.622	-0.422
Vegetables	-0.826	-0.747	-0.618	-0.415	-0.803	-0.762	-0.640	-0.475
Fruit	-0.872	-0.805	-0.703	-0.520	-0.856	-0.845	-0.767	-0.640
Meat	-0.962	-0.945	-0.912	-0.806	-0.950	-0.950	-0.917	-0.854
Sugar	-0.686	-0.572	-0.424	-0.237	-0.681	-0.622	-0.477	-0.288
Other food	-0.995	-0.990	-0.975	-0.942	-0.993	-0.990	-0.985	-0.957
Nonfood	-1.320	-1.350	-1.300	-1.180	-1.310	-1.350	-1.310	-1.210

I: Very poor, II: Moderately poor, III: Non-poor lower, IV: Non-poor higher.

Note: Budget shares allocated to pulses by rural (urban) consumers in 1987-88 were 5% (5.1%), group I; 4.9% (4.7%), group II; 4.5% (4.3%), group III; 3.7% (2.8%), group IV.

Source: Kumar.

traditional part of the Indian diet. If there is a significant increase in the relative price of one pulse variety, some or all of a household's purchases may shift to lower cost varieties. Such substitution is more likely to occur in low-income households where pulses may even be substituted out of the diet completely when prices rise.

The most obvious demonstration of substitution is the rising consumption of imported yellow peas (from Canada and Australia) and dun peas (from Australia). Yellow peas are traditionally produced in small amounts in some areas of India, while dun peas are not grown at all in India. Both are generally imported at prices that make them the lowest cost pulses in the Indian market, and they are quickly being integrated into food preparations. Both varieties are particularly popular in the low-income regions of eastern India, including West Bengal, Orissa, Bihar, and Assam. Although the varieties are not traditionally consumed in those areas, consumers have readily accepted them because of their low price. In particular, the popularity of dun peas, which are supplied in “farmer-dressed” condition (see table 1), show that consumers are willing to accept quality levels that are well below those of domestic or other imported pulses.

While price is the overriding factor in purchase decisions, some consumers (mostly those with high incomes) are concerned about quality attributes, including size, color, cooking time, shape, and taste. Based on rough weights assigned by wholesale traders, this segment of the market comprises about 20 percent of consumption. While these individuals are willing to pay more for higher quality, a limited survey of market prices suggests that the price premiums are generally small, ranging from 5 to 10 percent.

Low demand and small premiums for higher quality pulses are derived from the use of household labor for sorting. It is common for Indians to clean and sort pulses (as well as rice, wheat, and other foods) prior to cooking. Lower income households prefer to perform this operation in order to avoid paying the premiums associated with presorted varieties.

Wholesale Marketing

Wholesale markets exist throughout India and channel domestic and imported pulses to retailers. Delhi's Naya Bazaar is the largest wholesale pulse market in India. Other major wholesale markets are located in Mumbai (Vashi), Kolkata (Postha), and Chennai (Govindappa Naiken Street). The major wholesale markets comprise numerous sellers—about 150 and 200 wholesale pulse traders in Naya Bazaar and Vashi, respectively. Wholesale trade is fragmented because each seller operates independently. The markets do not maintain formal sales records, but sellers typically keep tallies of their own sales. Moreover, there is no official price reporting or regulation at any of the markets. Unlike at the retail level (particularly in urban areas), pulses are generally not branded. However, wholesalers pass origin information on to buyers.

Numerous layers exist in the marketing chain between farmers and consumers—as many as 6 to 7 levels, including brokers, wholesalers, millers, and retailers. However, the frequency of transactions is highest at the wholesale level, since commodities change hands several times with the assistance of brokers.

Vertical integration, whether between importers and wholesalers, producers and wholesalers, or wholesalers and retailers, is not evident. However, some importers suggested that reducing the number of players in the marketing chain could be profitable. There seems to be interest in integrating the import and wholesale levels. Key factors preventing integration within the wholesale level include historical fragmentation in business transactions due to multiple layers of agents, the prevalence of multigenerational, family-owned businesses, and a lack of regional or national firms. Efforts to vertically integrate would threaten many wholesale businesses and replace longstanding business practices based on experience and trust. Another factor that may inhibit vertical integration is the small-scale nature of pulse processing.

Quality Standards

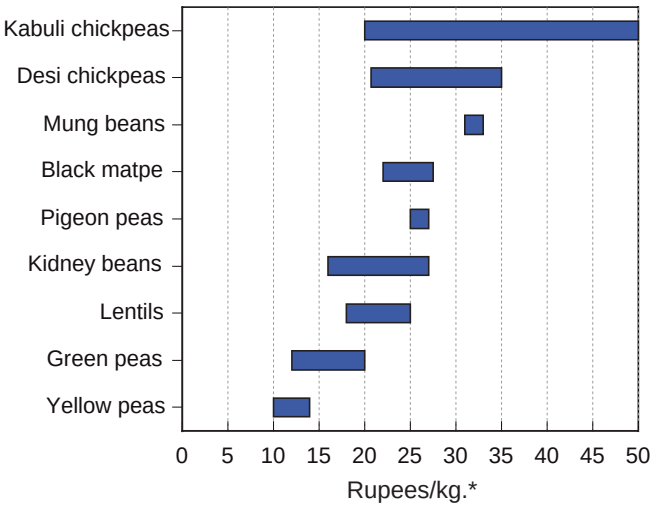
Approximately 80 percent of traded pulses are classified as “fair to average quality” (FAQ), which is the only universal grade in the Indian marketing system. However, this grade is not fully standardized since grading is done by visual inspection. The absence of more stringent quality standards reflects the relatively low incomes and high price sensitivity of most consumers. Some foreign suppliers and domestic wholesalers have created a “special quality” (SQ) category to serve certain niches in the market. However, this distinction is informal, subjective, and based on local trading practices.

Wholesale Prices

Domestic pulse prices often vary on a daily basis, with most fluctuations attributable to market supply conditions rather than quality differences. Domestic prices can also fluctuate widely on an annual or seasonal basis due to changes in production. Despite the fragmented market structure, regional markets in India appear to be well integrated with respect to price. Pulse traders have close ties to those in other areas, keeping abreast of relative prices and opportunities for arbitrage.

Among the domestic and imported pulses, kabuli chickpeas, desi chickpeas, and mung beans tend to be the costliest while dry peas (including yellow and green) are the cheapest (fig. 6). Green peas previously held a premium over yellow peas, but the latter are now sometimes more expensive because of their substitutability for desi chickpeas and pigeon peas. Domestic pulses typically fetch premiums over imported pulses of the same variety because of their pre-

Figure 6
India: Wholesale price ranges for pulses, June-July 2001



*As of July 2, 2001, the exchange rate was 47.18 rupees for 1 U.S. dollar. Board of Governors of the Federal Reserve System, Foreign Exchange Rates.

Source: Economic Research Service, USDA.

ferred taste, but the premiums appear to be small. Price premiums associated with high quality and the bagging and containerization of U.S. peas have made them more expensive than peas from competing countries (such as Canada), reducing the demand for U.S. peas.

Wholesale Marketing Margins

The revenues accruing to commission agents, brokers, and wholesalers are based on a percentage of sales value. Each agent typically charges a margin of 1-1.5 percent above transportation, handling, storage, and processing costs. Although the reported margins are small, significant revenue can be earned since inventories usually turn over 18-24 times annually. With many actors in the marketing chain, there may be potential to increase efficiency by integrating marketing (import, wholesale, and retail) and processing activities. If the potential efficiency gains are large, future changes in market structure could significantly affect domestic producer and consumer prices, as well as the competitiveness of imports with local varieties.

Milling

Many pulses in India are decorticated (hulls are removed) and split. Mills process the pulses using a multi-step procedure. First, they are cleaned to remove foreign matter, such as stones. Second, the surfaces are scratched so that they readily absorb moisture. Third, the pulses are soaked in a water-vegetable oil mixture to soften the outer layer. Fourth, decorticating machines remove the hulls, and the pulses may be split. Lastly, some millers polish the pulses to improve their appearance. If the end product is flour, the decorticated pulses (such as desi chickpeas and black matpe) are ground. The milling extraction rate is about 85 percent, but varies by variety.

Operating machinery, bagging, and hauling are labor-intensive activities in most plants. However, some newer, more automated facilities do exist. Wholesale price differences imply milling costs and margins of about 3-4 rupees/kg. (or $62-83/ton). Milling charges are levied on the amount delivered to the plant. Millers discount their fees if they retain the byproducts, which can be sold as feed.

The milling sector in India consists almost entirely of small-scale enterprises, with plant machinery often custom designed and built by the owners or local mechanics. With a few exceptions, the mills are old. However, they are reported to be technically and economically efficient at producing high-quality products. Hence, there is no incentive from either a quality or cost standpoint to import milled pulses. While a surplus of milling capacity was reported by millers, it is not clear whether it exists throughout the year or occurs only in off-peak periods (e.g., just prior to harvest).

Mills are typically independently operated. In addition, vertical integration is not evident in the milling industry. In part, industry structure stems from regulations that historically limited pulse processing (and most other agricultural processing activities) to small-scale firms. This industry structure may also be due to frequent weather-induced fluctuations in production, which increase the cost and uncertainty of sourcing raw materials.

Retail Marketing

Most consumers purchase pulses from small, independent retail establishments where they are sold loose directly from gunnysacks supplied by wholesalers. The amount purchased depends on a person's income. Those who are poor may buy small amounts daily, with the frequency of purchase declining as income rises.[3] In some cases, pulses are sorted and cleaned by the retailer, thus commanding a premium.

Prepackaged pulses in bags of 0.5-5 kilograms (kg.) are typically available in urban areas at government stores as well as middle- and high-end retail shops. Prepackaged pulses are a small portion of total consumption—about 10-20 percent of urban consumption and a negligible share of rural consumption. Prepackaged pulses are cheapest at government-owned stores and the most expensive at high-end supermarkets. Compared with other segments of the marketing chain, retail-level margins are large, ranging from 30 percent at government-owned stores to 50 percent in upscale supermarkets.

Consumer packages are generally branded with retail outlets' names. Unlike at the import and wholesale levels, origin information is not passed on to consumers. There is currently no national or regional retail branding of pulses, although some companies reportedly are investigating its potential.

[3]Some consumers in Ahmedabad preserve unused pulses, particularly pigeon peas, by soaking them in castor oil.

Pulse Imports

With stagnant production and the recognition that pulses are an important source of protein, India has permitted unrestricted imports of pulses with low duties for about 20 years—virtually the only food item given such open access. Despite unrestricted imports and low tariffs, imports have remained a relatively small share of supply and consumption. In fact, except for 2001 when imports increased sharply, India's pulse imports have fluctuated without a strong upward trend between 1985 and 2000 (fig. 7). Annual fluctuations in imports (mostly average to lower quality) have not been correlated with variations in domestic production (usually FAQ), suggesting that international supplies and prices may be as important as domestic market conditions in affecting import levels.

Dry peas comprise the largest share of imports, with the dry pea share rising sharply in 2001.[4] Kabuli chickpeas and pigeon peas also account for significant shares of pulse imports. Imports of lentils, black matpe, and desi chickpeas are relatively small, reflecting sizable domestic production of these varieties and limited availability in the world market.

Data on trends in import prices are consistent with the level and composition of India's imports (fig. 8). Import prices for green peas and dry peas as a whole have been lower and more stable than for other varieties since the early 1990s, and particularly since 1998. Import prices for chickpeas, lentils, and dry beans have, by contrast, been higher and more volatile than those of dry peas, especially green peas. These price trends likely reflect the emergence of growing and more stable supplies of dry peas (including green peas) in the world market, particularly from Canadian and Australian exporters.

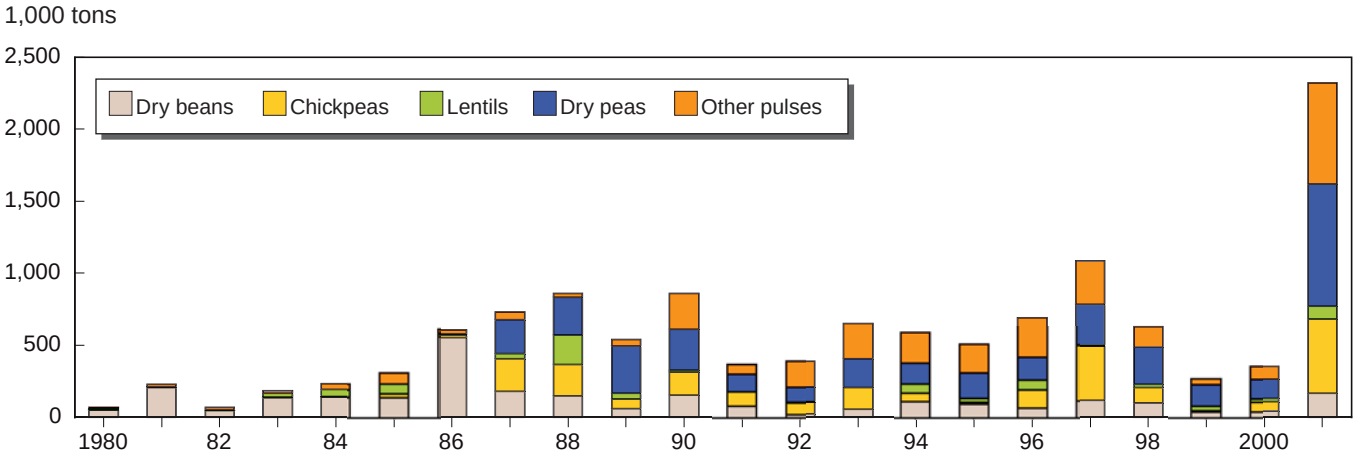
Supply Sources

India was the world's largest pulse importer during 1995-2001 (table 5). For many pulses, large shares of imports—including desi chickpeas, pigeon peas, mung beans, black matpe, and kidney beans—come from Burma (fig. 9). Importers favor Burma because it offers many varieties with qualities similar to those produced in India as well as reasonable prices, low freight rates, and relatively fast delivery. However, erratic production and significant price fluctuations can make transactions with that country difficult.

Canada and Australia are major suppliers of dry peas and kabuli chickpeas to the Indian market, each supplying about one-third of India's pea imports during the period 1995/96-1999/2000 (April/March years). Historically, Canada has shipped green and yellow peas, with the latter accounting for much of the increase in Indian imports in 2001 (fig. 10). Australia is a supplier of chickpeas and low-priced dun peas, which are marketed primarily in Kolkata and eastern India. In contrast, the U.S. share of pea imports is

[4] Data on dry pea imports are available since 1987/88. The dry bean category from 1980/81-1986/87 includes dry peas.

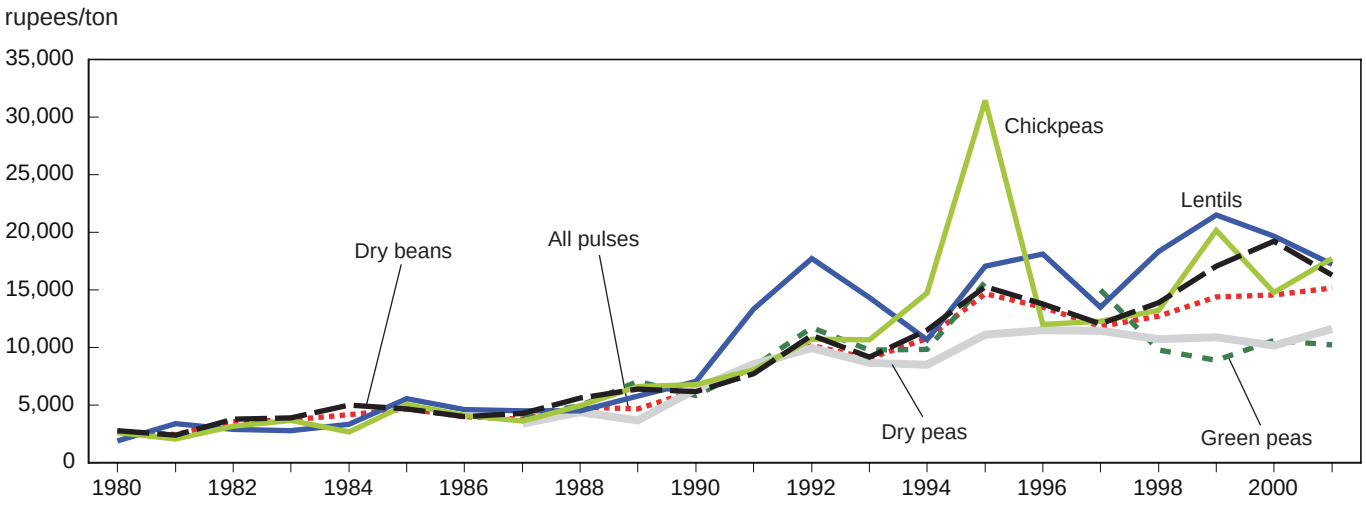
Figure 7
India: Pulse imports by type



Years begin April 1.
Source: FAO.

Figure 8

India: Pulse import unit values



Note: Prices are in 1981/82 rupees.

Sources: FAO and Government of India-f.

Table 5—Major pulse[1] importers, 1995-2001[2]

Country	1995	1996	1997	1998	1999	2000	2001	Average
				1,000 tons				
Algeria	130	250	135	146	143	160	175	163
Belgium	675	661	538	601	591	572	451	584
Brazil	206	123	196	255	135	121	170	172
China	72	264	187	168	127	190	235	177
Cuba	139	124	181	155	219	120	151	156
Egypt	174	187	123	164	328	263	371	230
France	235	167	114	113	110	161	145	149
Germany	470	278	203	184	210	138	108	227
India	502	692	1,084	629	269	353	2,424	850
Italy	553	387	380	407	418	437	421	429
Japan	186	163	173	158	171	170	163	169
Mexico	46	173	130	245	168	133	177	153
Netherlands	776	613	451	594	585	330	228	511
Pakistan	235	285	112	188	194	372	371	251
Spain	830	589	636	784	777	850	768	748
United Kingdom	154	174	176	167	176	160	166	168
United States	111	111	130	121	202	211	213	157
World	7,559	7,012	7,087	7,091	7,105	7,216	9,399	7,496

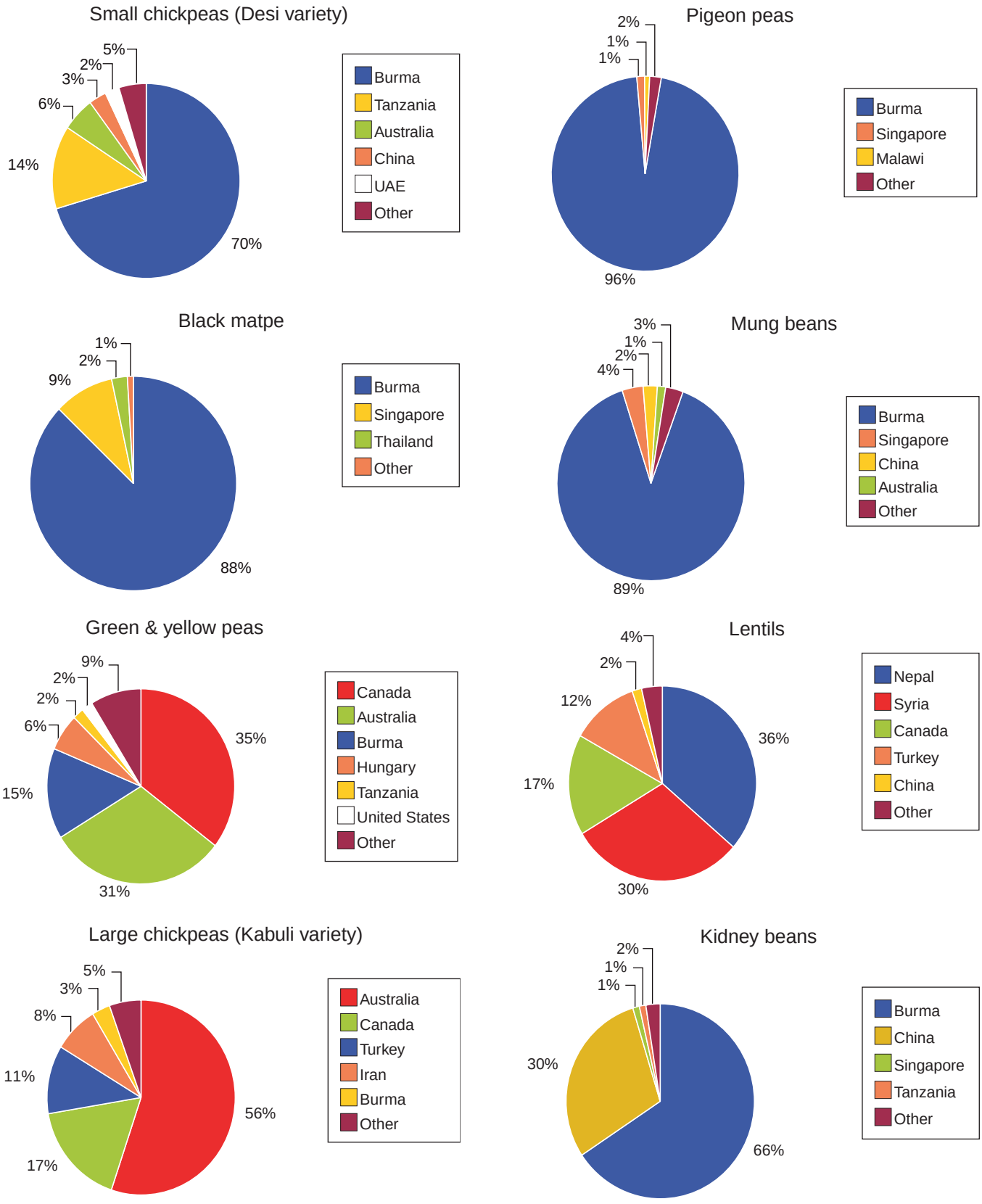
[1] Includes all types of dried (including split) leguminous vegetables, with the exception of vetches and lupins classified under SITC 081 (feedstuffs for animals).

[2] Years beginning April 1.

Source: FAO.

Figure 9

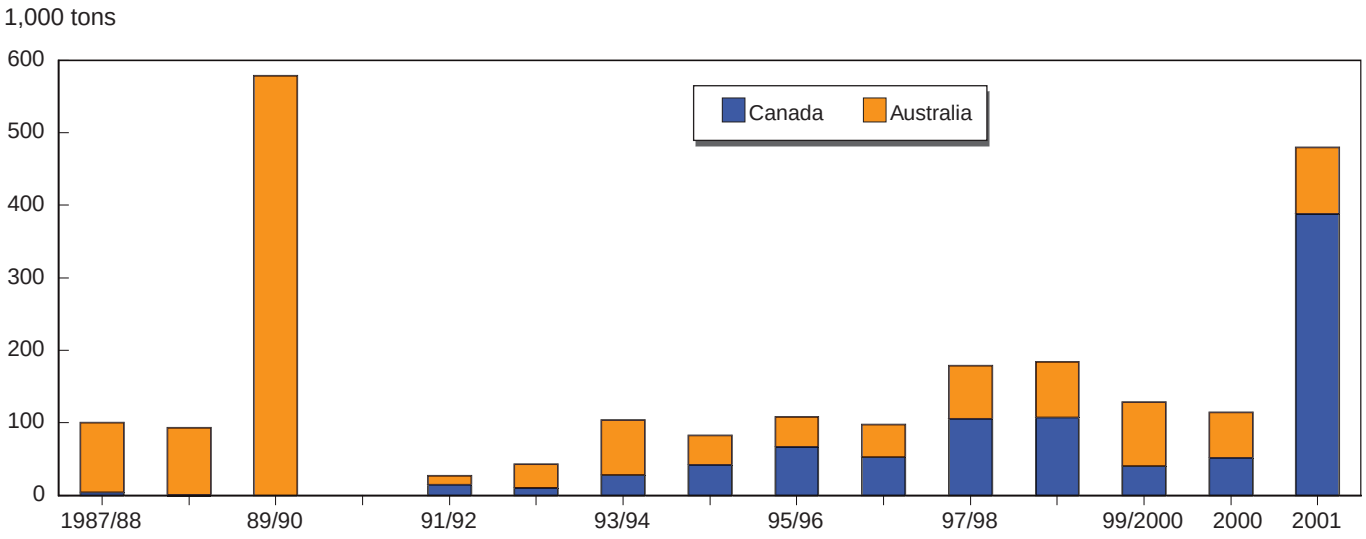
India: Pulse imports by variety and origin, 1995/96-1999/2000 averge



Source: Government of India-d.

Figure 10

India: Imports of peas from Australia and Canada



Note: Data for 1990/91 not available.

Sources: For 1987/88 through 1999/00 (April-March marketing years), Government of India-d; For 2000- 2001 (calendar years), Global Trade Information Service, Inc.

small, due mainly to the additional $100-per-ton premium over Canadian product. This difference is caused by quality-induced premiums as well as high shipping costs resulting from bagging and containerization. While Indian importers are willing to spend an additional 2-3 percent for the higher quality of U.S. peas, they typically will not pay significantly more than that amount.

Most kabuli chickpeas come from Mexico, Australia, Canada, Turkey, and Iran. The largest size—12 millimeters in diameter—are imported from Mexico. However, because the larger sizes are more costly, they are reserved for special occasions. As a result, U.S. exports of kabuli chickpeas to India are limited. As for desi chickpeas, importers indicated that, historically, there have been some problems with Canadian product, including high moisture content and inferior milling quality. As a result, Australia's Tyson chickpea variety is preferred because its uniform size is well-suited for milling.

Nepal and Syria account for the largest shares of Indian lentil imports, followed by Canada and Turkey. Imports from Canada have shown significant growth in recent years. Even though Canada has only been exporting lentils to India since 1995/96, it has achieved a 17-percent share of the import market. The United States, on the other hand, has sporadically shipped lentils to India since 1981, but has yet to gain significant market share.

Import Destinations

The major import centers are Mumbai (60-70 percent of total volume), Chennai (15-20 percent) and Kolkata (15-20 percent). Trading and pricing activities occur in Delhi and Mumbai. Mumbai and Kolkata are destinations for bulk shipments, while Delhi and Chennai are container markets. Large importers prefer to ship commodities in bulk because of the lower per unit cost compared with containerized shipments. The remaining importers transport pulses in containers. Bulk shipments can have as many as 10 buyers, with only the largest importers individually contracting for an entire vessel. Containerized shipping costs typically average $15-$20 per ton higher than for bulk shipments. At the time that the interviews were conducted, the differential was relatively high at $25 per ton.

India does not have bulk handling facilities at ports and inland markets, so bulk imports must be bagged upon arrival. Bagging costs in India ($4-$5 per ton) are far lower than the charges associated with containerized shipments. While containerized cargoes tend to arrive in better condition than bulk shipments, importers indicate that the gain in quality is not sufficient to justify the higher shipping costs.

Structure and Conduct in Pulse Importing

India has about 12-15 major pulse importers, with the largest concentration located in Mumbai, followed by Kolkata and Delhi. These players reportedly account for 60-70 percent of total pulse imports. Importers rely primarily on personal networks and contacts with brokers in supplying countries for market information, obtaining price quotes, and making purchases. Many traders remain with a given exporter when they are able to obtain good market information, a guaranteed supply, and first choice of quality.

Due to the limited incomes and price sensitivity of most Indian consumers, a large percentage (about 80 percent) of imported pulses are rated as FAQ. While quality is a consideration, importers are only willing to pay small premiums for better quality. Traders look for the lowest prices at acceptable qualities. The most important quality attributes are cleanliness, uniform size, color, and shape (important for milling). Lower quality levels receive price discounts.

Traders use foreign grading systems if they are importing from countries that utilize such standards. Purchases of U.S. and Canadian pulses are usually graded No. 2 or better and imports from Burma are primarily FAQ. Indian importers prefer to have pulses sorted, graded, and milled in India because the cost of such activities is significantly lower in India than in the exporting countries. Another reason for not importing decorticated and split pulses is that moisture from soaking (prior to milling) may affect quality during shipping. Since pulses are generally consumed quickly in India, moisture is not a concern when pulses are milled domestically.

Many importers use short-term credit, which is readily available from Indian institutions at attractive interest rates, to facilitate imports. Indian parastatal trading companies, including the State Trading Corporation and the Minerals and Metals Trading Corporation, are competitive sources of financing for Indian importers. The U.S. Department of Agriculture's export credit guarantee programs, GSM-102 and GSM-103, are not attractive options for Indian importers. Interest rates on U.S. credit are not significantly lower than those available from domestic options. Moreover, use of U.S. credit potentially exposes importers to exchange rate risk.

Importers in Delhi, Mumbai, and Chennai offer short-term credit to their domestic buyers. This credit is usually for a short period (such as 10 days), but is not always repaid by the deadline. Unlike in the other cities, Kolkata importers do not offer credit and require immediate cash payment.

Importers are not involved in domestic marketing. They sell their product to wholesalers, either directly or, more commonly, through brokers. Mumbai importers report that there may be as many as 500 wholesale customers for a 5,000-ton shipment. Pulses are typically marketed to wholesalers by quality attributes and origin. Wholesalers exhibit little loyalty toward importers, and significant price competition exists among importers when selling product to domestic wholesalers.

Import Risks

Pulse importers face a number of risks that threaten the profitability of their transactions. Many importers forward sell their products before taking physical possession of them. Falling domestic prices prior to delivery provide incentive for buyers to renege on contracts. Domestic market conditions, particularly variability in domestic production and import activities, also affect pulse prices. The volume of business and the prices contracted by other importers serving the same market are key factors affecting an importer's profitability. Multiple impending shipments can flood the market and lead to lower prices, increasing the probability of default by domestic clients. Thus, traders closely monitor competitors' transactions but appear to operate independently, with not much communication between them except through their brokers. Indian importers also face foreign exchange risk because transactions with every country are conducted in U.S. dollars.

Costs and Profitability of Imports

There are many costs associated with importing pulses into India. Considering Canadian green peas in June-July 2001, commodity costs were about $120/ton at the foreign port (including inland transportation costs) for No. 2 grade or better. Ocean freight rates ranged from $50-$60/ton for bulk shipments to $80/ton for loose peas in containers (there is typically only a $15/ton difference between the two shipping methods). Importers pay fees equal to 0.5 percent of the shipment value for insurance and export guarantees, which insure payment to the exporting countries.

Traders face numerous charges once the pulses reach Indian ports (table 6). There are also incidental costs, such as “speed money” to facilitate service at the port. Moreover, penalty charges arise when containers are

Table 6—India: Selected charges paid by importers at the Indian port, 2001

Selected charges	Amount	
	Percent of shipment value	
Import duty	10	
Theft	0.5	
	Rupees/ton	*$/ton*
Phytosanitary fee	300-400	6.25-8.33
Unloading of bulk shipment	500	10.41
Bagging	120-200	2.50-4.16
Warehouse storage (monthly)	50	1.04

Source: Economic Research Service, USDA.

kept for more than 14 days, or when a ship is docked for more than 7 days. Importers try to sell product off the boat in order to minimize handling, transportation, and storage costs, but may choose to store pulses for 2-3 months if current market prices are unfavorable.

Although importers sometimes realize large margins on cheap and well-timed purchases, average margins are reported to be thin, with profits being made on volume. Interviews with several major importers suggest margins of about 1 percent of total shipment value.

Pulse Import Policy

India has had a liberal policy toward pulse imports during the past two decades. Pulse imports were placed under Open General License in 1979, allowing anyone to import pulses into India without approval or restriction. According to Kelley, import duties steadily declined during the late 1980s and 1990s. From 1988 to 1989, the tariff rate was 35 percent. The duty fell to 10 percent in 1989 and remained at that level through 1994. In 1995, the tariff was reduced to 5 percent and was eventually eliminated in March 2000. A 5-percent duty was reinstated in April 2001 and then raised to 10 percent in March 2002.

No other major food item in India has had such a consistently open import regime over this period. In contrast, cereal imports were subject to quantitative restrictions until the mid-1990s and, since then, have been assigned high tariffs that prohibit trade. Imports of vegetable oil, now India's largest agricultural import, were restricted because of state trading until 1994, but since then have been freely traded subject to tariffs that now range from 45-75 percent. India’s World Trade Organization bound tariff rates are 50 percent for dry peas and 100 percent for all other pulse varieties. Hence, there is considerable leeway for India to legally raise tariffs on pulse imports.

One reason why pulse import policies have remained relatively open may be the importance of pulses in the Indian diet. Due to limited incomes, many consumers rely on pulses as a source of protein. Given consumers' price sensitivities, the government is concerned that high tariffs would increase pulse prices and contribute to declining consumption. Another reason for relatively unrestricted access is that pulse imports have never reached levels that may threaten the livelihood of domestic producers. It is unclear if the Indian government would raise tariff rates if imports surged.

U.S. Competitiveness in the Indian Pulse Market

The United States is not a major player in India's pulse import market for several reasons. Most importantly, U.S. pulses are relatively expensive compared with those from other exporting countries. These high prices are caused primarily by four factors. First, U.S. pulses are positioned as high-quality commodities, thus commanding price premiums (Price). India's price-sensitive consumers are unwilling to pay significant premiums for U.S. quality, especially when lower cost (and lower quality) pulses from other countries are available. As a result, U.S. exports are limited to a small, top-end segment of the Indian market. Second, U.S. exporters bag and containerize shipments in order to maintain high product quality. This process is more costly than bulk shipping. Third, compared with Canada, transportation costs are relatively high in the United States. Canadian law caps the maximum revenues that railroads may earn on grain shipments, giving a transportation cost advantage to Canadian shippers. In the United States, long shipping distances cause high trucking costs, particularly in the Northern Great Plains. Rail rates to ports are also high (Price). Fourth, from the mid-1990s through 2001, the high valuation of the U.S. dollar relative to other currencies helped make U.S. exports more expensive than those from other countries.

U.S. producers do not grow the pulses—including desi chickpeas, pigeon peas, mung beans, and black matpe—that are most common in India, which limits market penetration in that country. Instead, the United States grows and exports green peas, kabuli chickpeas, and lentils to India. Although there is demand for green peas in India because of their relatively low cost, U.S. shipments are not price competitive, thus limiting them to a niche market. In contrast, Canadian exporters have been successful in producing and exporting competitively priced, average quality yellow and green peas. Canadian breeders are also developing varieties of lentils, desi chickpeas, and other varieties suited for the Indian market.

In addition, relatively small pulse acreage and production have made it difficult for the United States to be a large, consistent supplier to India and a viable alternative to Canada, Australia, or other established suppliers. To some extent, the higher risks of planting non-program crops have limited U.S. acreage, both in the traditional production region of the Pacific Northwest and in the Northern Great Plains, a relatively new area.

Keys to improving the U.S. position in the Indian pulse market fall under two categories: expanding U.S. supplies (both of current and new varieties) and increasing price competitiveness. The 2002 Farm Act provides dry pea, lentil, and small chickpea (those that fall through a 20/64 grading screen) growers access to marketing loan benefits, which reduce price risk and help stabilize producer revenue when prices are low. (Pulses are not eligible for direct payments or counter-cyclical payments.) Supporters expected the marketing loan programs to provide incentives for production growth, an essential component for expanding existing markets and developing new ones.

For the 2002 crop year, national loan and repayment rates were established for dry peas, lentils, and small chickpeas (table 7). These rates reflected No. 1, food-grade quality and were discounted for lower quality pulses. Under this scenario, pulse acreage was not expected to greatly expand. The incentive to plant pulse crops would have been higher had the repayment rates been based on feed-grade quality.

The loan and repayment rates have changed for pulse crops grown in 2003. Regional loan rates have been established for feed-grade dry peas because season-average farm prices vary significantly across production regions. Pea producers in the West (Idaho, Oregon, Washington, Arizona, California, Nevada, New Mexico, and Utah) will receive a higher loan rate than those in other States (the average across all States is $6.33/cwt.). Nationwide loan rates will be applied to No. 3 grade lentils ($11.94/cwt.) and No. 3 grade small chickpeas ($7.56/cwt.) grown in the 2003 crop year.

Because the 2003 loan and repayment rates are based on No. 3 grade quality, the positive effect on acreage allocated to these crops is likely to be greater than previously expected when the loan and repayment rates were based on food-grade quality. The incentive to grow pulses will also continue to depend on the relative returns from competing crops as well as the availability of market outlets for pulse sales. Reduced price risk and the agronomic advantages of pulses in rotations will likely contribute to a rise in the acreage allocated to these crops. However, even with marketing loan provi-

Table 7—U.S. 2002 loan rates for selected pulse crops

	National loan rate	Discounted loan rates for qualities less than U.S. No. 1		
Grade	No. 1	No. 2	No. 3	Sample
		$/cwt		
Dry peas	6.33	5.83	5.33	3.83
Lentils	11.94	11.19	10.69	7.94
Small Chickpeas	7.56	6.56	5.31	4.06

Source: Farm Service Agency, USDA.

sions, planting flexibility restrictions are likely to limit acreage of small chickpeas. Under the 2002 Farm Act, planting flexibility provisions restrict the planting of fruits and vegetables on base acres. Because small chickpeas are classified as vegetables, little or no growth in small chickpea acreage is expected.

Processors, exporters, and industry representatives generally agree that if production of these commodities does expand, it will likely occur in the Northern Great Plains rather than in the Pacific Northwest, because of greater land availability, lower land costs, and flatter terrain (Price). Producers in the Pacific Northwest foresee the market for these pulse crops becoming segmented, with the Pacific Northwest supplying premium grades and the Northern Great Plains producing feed-quality and lower quality food-grade pulses. Lower quality pulses would be comparable with exports from other countries and more widely accepted by Indian consumers. A dedicated supply of lower grade pulses may also increase the price competitiveness of U.S. exports in the world market.

Domestic transportation infrastructure has been a constraint, particularly in the Northern Great Plains. Transportation costs may hinder market expansion in that region. Some U.S. pulses may be shipped through Canada, which can transport commodities at significantly lower cost. Increased acreage could make bulk shipping and the use of unit trains feasible, thus reducing shipping costs.

Factors other than the Farm Act provisions will come into play when considering the future of the industry and the potential for the United States to be a large exporter. Given relatively small domestic food use, other markets need to be developed and/or expanded in order to accommodate increases in supply. The development of pulse-based food products and the use of peas in feed rations may encourage greater production, which could, in turn, increase the United States' competitive position in the export market.

Yellow peas may potentially be a profitable crop to export given their low price and substitutability for desi chickpeas in the Indian pulse market. Desi chickpeas are another potential crop for producers in the Northern Great Plains. Although a major component of Indian pulse consumption, other suppliers have not yet been successful in supplying significant volumes of desi chickpeas to the Indian market.

The Pardina lentil, a variety exclusive to the United States, also may have large potential in India. Its most attractive feature is that it is cheaper than most other pulses. Pardina lentils are also small, so they cook quickly. Production would have to increase in order to supply Indian demand, since nearly all of the current domestic production is exported to Spain. The one problem with the Pardina variety is that its inner flesh differs in color (pink or yellow), so the milled or split product is not uniform. Indian traders note that competitive pricing and the promotion of favorable characteristics may counteract this drawback.

Conclusions

India has the world's largest pulse sector, producing and consuming many varieties. Since most Indian consumers have low incomes, they rely on pulses as a key source of protein. Stagnant production and a growing population have led to rising pulse prices and declining per capita consumption despite a liberal policy regime towards pulse imports. Pulse production remains unattractive to Indian farmers because of the relatively low productivity of pulses, combined with more favorable government price supports and procurement policies for wheat and rice.

The explanation for why the Indian market has witnessed declining per capita consumption of pulses despite rising incomes and a liberal import policy likely hinges on several factors. First, domestic supplies have not risen significantly over time due the use of non-irrigated land, a lack of varietal improvements, and government policies that encourage wheat and rice production. Second, imports have remained a small share of supplies. This may be due to constraints in world supplies of low-priced pulses that could be exported to India. Also, pulse-exporting countries have tended to limit their response to opportunities in the Indian market, either because of resource constraints in expanding output or risks associated with producing and marketing relatively minor crops for new markets (as in the United States). Third, increases in pulse prices may have exceeded growth in incomes, leading to reduced demand for pulses.

Field research conducted in June-July 2001 reveals that Indian consumers are responsive to both income and price in pulse purchases. Income elasticities of demand for pulses are positive among high- and low-income and rural and urban groups, indicating a widespread preference to devote new income to pulse consumption. While quality attributes are evaluated when making purchase decisions, price is the dominant factor. Price premiums for higher quality tend to be small, with transactions heavily weighted toward average and lower quality product. Moreover, consumers switch among quality levels and varieties as well as between other foods (such as cereals and vegetables), based on changes in relative prices. While quality-based niche markets do exist, marketing strategies should focus on average or lower quality and competitive pricing in order to make significant inroads into the Indian market.

The marketing channel between producers and consumers comprises several different levels. These levels show little evidence of vertical integration. Importers, millers, and wholesalers operate on small margins, with earnings being made with high inventory turnover. In contrast, retail margins are significant, ranging from 30-50 percent. Most pulses are sold unbranded to consumers and in loose form, although store-branded consumer packages are becoming commonplace in urban areas. Origin information for imported pulses may be preserved at the import and wholesale level, but disappears at the retail level. There is no national or regional branding of pulses. Some firms are contemplating vertical integration and national branding—strategies that could effectively reduce marketing costs and retail prices as well as boost market share.

India imports pulses from many countries, including traditional varieties from Burma and relatively cheap, non-traditional varieties, such as green and yellow peas from Canada and dun peas from Australia. The United States is not a significant player in the Indian market because its exports are not price competitive with those from other countries. Quality-induced price premiums, combined with high shipping costs associated with bagging and containerization, make U.S. pulses relatively expensive. Other factors that limit U.S. market share in India are the small volume of pulses produced in the United States and, at least in the late 1990s, the strong value of the U.S. dollar relative to the rupee.

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