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Making Pulses Affordable Again

Policy Options from the Farm to Retail in India

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Contents

Tables

Figures

ABSTRACT

Rising prices and declining consumption of pulses cause concern in terms of both nutrition and food inflation in India. This paper outlines policy strategies to increase the availability of pulses at affordable prices in India and also points out limitations of some of the most common recommendations for achieving these objectives. There seems to be no option but to increase domestic production of pulses in India. The global supply of pulses is limited compared with India's needs, and sizable imports by India are bound to increase world prices. Domestic production of pulses in India is most likely piecewise inelastic, meaning that small price increases do not translate into a significant supply response. Because farmers face both production and marketing risks, they increase pulse area and intensify production only when there is a large increase in expected prices that covers the risk premium. Droughts, too, are a major risk for pulses. Access to one or two protective irrigations during the growing season can possibly lead to sizable increases in pulse production and reduce the production risk. The *har khet ko paani* (assured irrigation) initiative under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) program should give priority to pulse-producing areas. The minimum support price (MSP) for pulses, without direct government procurement, helps traders more than farmers because it acts as a focal point for tacit collusion among traders. Farmers will benefit from the MSP only if it is raised substantially from its current levels. The increase in farmgate prices due to a higher MSP will not necessarily lead to an increase in the retail price of pulses because much of the wedge between farmgate prices and consumer prices is traders' margin. Including subsidized pulses in public distribution systems can save households some money, but it has only a small effect on total consumption of pulses and almost no effect on total protein intake. We suggest, as more potent solutions, investing in research and extension for pulses, aggregating pulse growers into farmer producer organizations, and paying pulse growers or pulse-growing areas for the ecosystem services offered by pulses.

Keywords: pulses, minimum support prices, risk premium, focal point

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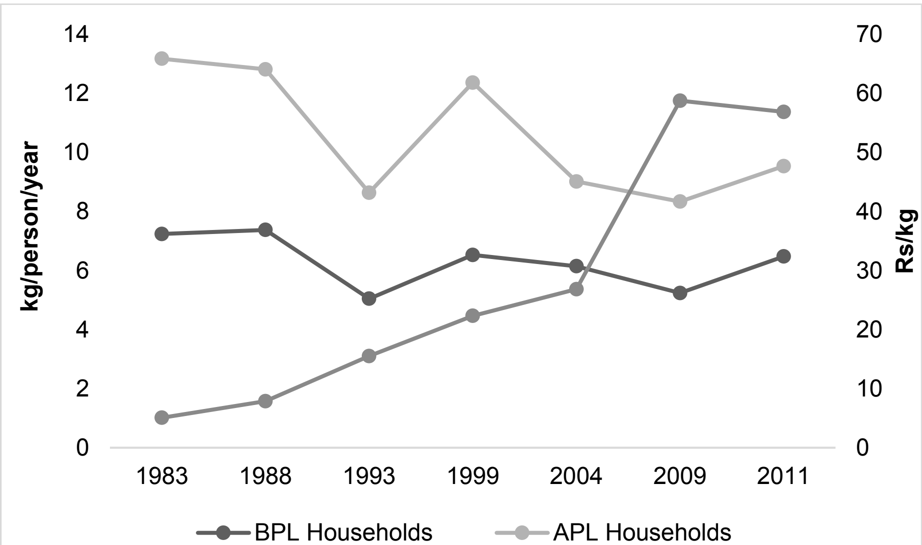
1. INTRODUCTION: RISING PRICES, DECLINING CONSUMPTION

Pulse prices have been rising again (only recently they have moderated), resulting in further decline in pulse consumption from an already low level. An average Indian consumed 60 grams of pulses per day in the 1950s. Today, the per capita consumption is down to 38 grams per day. Pulses have the highest price elasticity of demand (less than -1.00) among food grains (Kumar 2016), and data from consumption expenditure surveys conducted by the National Sample Survey Organization show that the rise in retail price is a major reason for their declining consumption (Figure 1.1).

Figure 1.1 Rising prices and declining consumption of pulses in India (1983 to 2011/2012)



Source: Consumption expenditure survey data, various rounds (NSSO various years).
Note: BPL = Below the Poverty line; Rs = Indian rupees.

Rapidly rising prices of pulses have also contributed disproportionately to the rise in the relative price of food. An average Indian household spends only 6–7 percent of its total food budget on pulses and pulse products, but pulses have accounted for more than 40 percent of the inflation in food prices in the last two years (Sekhar and Bhatt 2016a, 2016b). Pulses are an important source of protein and complex carbohydrates in the Indian diet. Expensive pulses make Indian diets less healthy (Reddy 2004) and less affordable, and their shrinking availability is a concern for nutrition as well as inflation.

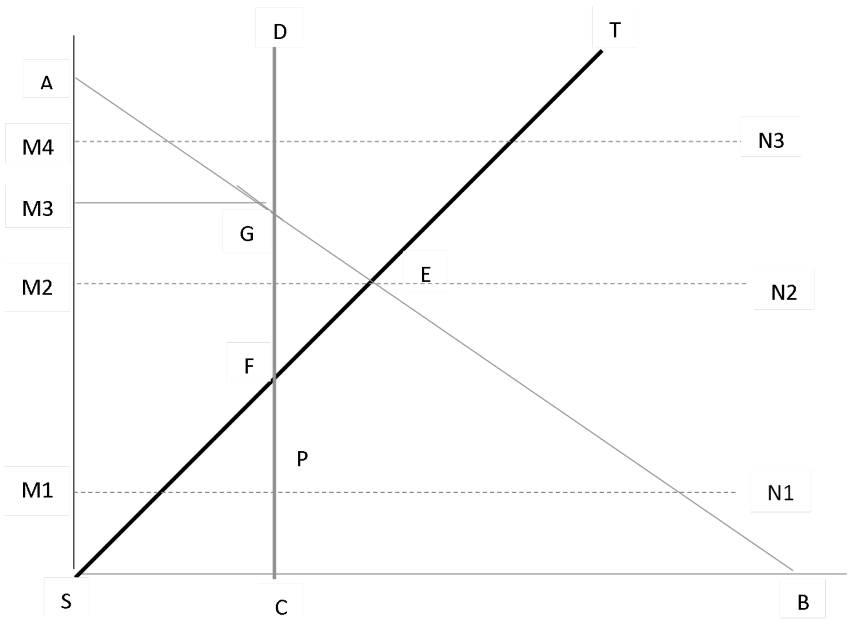
Pulses have a positive income elasticity (0.7), and their elasticity is highest for the poorest households (Kumar 2016). Consumption of pulse-based snacks is also rapidly rising with urbanization and the rise in disposable incomes. The direct and indirect demand for pulses as dal (primary processing) and processed items involving secondary processing should therefore increase as India becomes richer and more income accrues to poor households. If so, we can expect further increases in pulse prices in the years to come, unless availability increases.

This paper outlines policy strategies that can help increase the availability of pulses at affordable prices in India. Section 2 discusses reasons for the persistent deficit in pulse availability in India, and Section 3 outlines various policy strategies that can help address this problem. Section 4 concludes.

2. STAGNANT PRODUCTION AND PRODUCTIVITY OF PULSES

Unlike those of rice and wheat, the production and productivity of pulses have registered very slow growth in India over the last five decades. Pulse production remained stagnant at around 14 million tons annually for decades, from the 1950s to the early years of this century, before it increased to 17–18 million tons in 2013/2014, where it has hovered ever since (Figure 2.1). The increase in production has been slow in other parts of the world too (Rao and Joshi 2016). Thus, the availability of pulses in India as well as in the global markets has not kept pace with the rising demand. Moreover, the recent increases in pulse production have often been reversed by repeated droughts in large parts of India in the last two years.

Figure 2.1 Supply, demand, minimum support price, and farmgate prices in case of deficit crops such as pulses



Source: Authors.

Weak Supply Response to Rise in Prices

The effect of prices on supply is a function of the level of increase in prices and its transmission to farmers. It also is a function of whether or not the price change is large enough to cover the associated production and marketing risks. Our research shows that the production of pulses in India has not been very responsive to rises in minimum support prices (MSPs) or even in farm harvest prices. Farmers increase the area under pulses and intensify its production only when they expect a big rise in prices. Small price increases get ignored because of high relative risks in pulse production.

On the other hand, nonprice factors, such as droughts, have a big impact on pulse production. Of the area under pulses, 88 percent is rainfed, and a large part is drought prone (Reddy 2004). Dependence on the monsoon makes pulses riskier than cereals even in irrigated areas. Paradoxically, provision of irrigation has not helped increase the production of pulses. Once farmers have access to assured irrigation, they switch from pulses to other crops. Over time, as irrigated area has increased, cultivation of pulses has been shifting to rainfed areas (Tables 2.1a and 2.1b).

Table 2.1a Changes in chickpea area over time across zones and states (in percentages)

State	1960–1970	1971–1990	1991–2000	2001–2010
		Northern zone		
Haryana	-34.1	-54.5	-40.7	-61.3
Himachal Pradesh	-47.7	-59.3	-64.92	-56.7
Punjab	-53.1	-85.4	-83	-73.4
Uttar Pradesh	-15.2	-40.6	-35.5	-35.2
		Southern zone		
Andhra Pradesh	-24.2	-33.5	189.7	313.1
Karnataka	34.2	4.4	54.5	127.5
Tamil Nadu	37.5	64.5	33.1	-12.4
		Eastern zone		
Assam	—	73.3	-23.08	-31.2
Bihar	-50.06	-38.02	-34.31	-42.9
Odisha	19.3	98.09	-26.8	23.3
West Bengal	-14.5	-74.4	-41.05	-9.02
		Western zone		
Gujarat	-65.7	95.6	42.7	54.5
Maharashtra	-13.1	60.6	37.5	48.4
Rajasthan	-20.7	-13.6	93.1	-43.7
		Central zone		
Madhya Pradesh	3.1	34.4	21.6	6.9
All India	-21.6	-18.4	17.6	6.4

Source: India, Directorate of Economics and Statistics, 1950–2010 (2012).
Note: — = data not available.

Table 2.1b Changes in pigeon pea area over time across zones and states (in percentages)

State	1960–1970	1971–1990	1991–2000	2001–2010
		Northern Zone		
Haryana	—	411.6	-30.18	-5.9
Punjab	—	—	-60.58	-41.7
Uttar Pradesh	-5.25	-17.55	-13.07	-24.4
		Southern Zone		
Andhra Pradesh	12.1	93.4	12.1	19.5
Karnataka	-1.9	70.2	-2.5	33.9
Tamil Nadu	-6.5	187.7	-48.8	-63.05
		Eastern Zone		
Assam	83.3	119.09	-11.6	-17.3
Bihar	-7.8	-59.9	-7.4	-54.2
Odisha	163.4	307.3	-4.09	-3.1
West Bengal	26.8	-83.5	-45.6	-73.1
		Western Zone		
Gujarat	15.9	276.9	6.6	-28.4
Maharashtra	11.9	41.9	16.1	7.3
Rajasthan	11.2	4.4	33.7	-42.6
		Central Zone		
Madhya Pradesh	30.6	-9.6	-19.8	-6.7
All India	8.2	32.5	-1.8	3.3

Source: India, Directorate of Economics and Statistics, 1950–2010 (2012).
Note: — = data not available.

Tables 2.2a and 2.2b show the percentage change in area under chickpeas and pigeon peas, respectively, over time across different regions of India, while Tables 2.1b and 2.2b present data for the area under these two pulses, respectively, across different states in more recent years. Irrigation seems to discourage pulse crops because of cereal crops' higher responsiveness to irrigation and their low production and price risk. For example, in the irrigated northern zone (the principal area for chickpea consumption), the area devoted to chickpeas has declined continuously from before the Green Revolution to the present. In the southern zone, Andhra Pradesh has seen a significant expansion in chickpea area over the years. Over time, however, the number of states in which the area under pulses increased is far less than the number of states in which it decreased (Inbasekar, Roy, and Joshi 2015).

Table 2.2a Chickpea area allocation across states in recent years

	Area ('000 hectares)				
State/union territory	**2010/2011**	**2011/2012**	**2012/2013**	**2013/2014**	**2014/2015**
Andhra Pradesh	475.0	480.0	569.0	472.1	342.0
Assam	1.8	1.8	1.7	2.1	2.1
Bihar	50.8	59.3	61.5	61.3	60.0
Chattisgarh	251.9	241.6	266.8	276.5	280.6
Gujarat	176.0	240.0	172.0	247.0	161.0
Haryana	112.0	79.0	47.0	83.0	65.0
Himachal Pradesh	0.6	0.7	0.5	0.5	0.4
Jammu and Kashmir	0.2	0.1	0.2	—	—
Jharkhand	69.9	127.5	138.3	155.8	160.7
Karnataka	959.0	803.0	969.0	946.0	939.0
Madhya Pradesh	3,112.1	3,043.7	3,128.7	3,160.1	2,853.0
Maharashtra	1,438.0	1,051.0	1,120.0	1,820.0	1,427.0
Manipur	—	—	0.7	2.0	0.7
Meghalaya	0.6	0.6	0.5	1.8	1.8
Nagaland	0.7	0.8	0.8	0.7	0.8
Odisha	41.9	39.0	41.2	47.2	47.3
Punjab	2.1	2.0	2.0	1.9	1.8
Rajasthan	1,783.3	1,433.9	1,252.9	1,923.5	1,256.3
Tamil Nadu	7.3	8.6	7.0	8.9	6.8
Telangana	109.0	85.0	112.0	113.9	59.0
Tripura	0.3	0.2	0.2	0.1	0.2
Uttar Pradesh	570.0	577.0	604.0	577.0	558.0
Uttarakhand	0.5	1.0	0.5	0.8	0.7
West Bengal	22.1	23.3	25.1	24.9	26.2
Dadra and Nagar Haveli	0.4	0.1	0.2	0.2	0.2
Delhi	0.1	0.0	—	0.0	—
All India	9,185.6	8,299.1	8,521.8	9,927.4	8,251.1

Source: India, Ministry of Agriculture (2012).
Note: — = data not available.

Table 2.2b Pigeon pea area allocation in states in recent years

State/union territory	Area ('000 hectares)				
	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015
Andhra Pradesh	297.4	183.0	203.6	184.5	151.0
Arunachal Pradesh	0.6	0.7	0.5	0.5	0.6
Assam	7.1	5.7	6.0	6.1	6.1
Bihar	26.0	22.1	22.1	21.9	19.9
Chattisgarh	55.0	54.1	52.1	50.9	53.1
Gujarat	277.0	244.0	228.0	210.0	214.0
Haryana	25.0	18.0	15.1	9.4	6.1
Himachal Pradesh	0.0	0.0	0.0	—	0.0
Jharkhand	103.8	113.9	195.7	196.8	195.9
Karnataka	891.0	767.0	660.0	824.0	728.0
Kerala	2.0	1.5	1.2	0.9	0.3
Madhya Pradesh	487.5	534.9	530.5	464.0	521.0
Maharashtra	1,302.0	1,233.0	1,180.0	1,141.0	1,210.0
Meghalaya	0.8	0.8	0.8	1.1	1.2
Manipur	—	—	—	—	0.5
Nagaland	2.5	2.5	2.9	3.0	3.0
Odisha	135.4	142.1	140.9	138.9	137.9
Punjab	4.2	3.0	3.1	2.9	2.6
Rajasthan	21.3	19.1	16.8	14.5	13.2
Tamil Nadu	35.8	36.0	39.6	59.6	72.4
Telangana	341.4	299.0	275.4	263.5	220.0
Tripura	1.2	1.6	1.5	3.9	2.5
Uttar Pradesh	344.0	320.0	311.0	301.0	287.0
Uttarakhand	1.7	2.0	3.0	3.4	3.6
West Bengal	1.6	1.3	1.4	1.5	2.1
A & N Islands	0.0	0.2	0.1	0.0	0.0
D & N Haveli	2.0	1.5	1.3	1.6	1.6
Delhi	0.4	0.3	0.3	—	—
All India	4,366.7	4,007.4	3,892.9	3,904.4	3,853.5

Source: India, Directorate of Economics and Statistics (2015).
Note: — = data not available.

For both chickpeas and pigeon peas, Andhra Pradesh, Karnataka, Madhya Pradesh, and Maharashtra are the only states where cultivated area has increased. Importantly, states from the heavily irrigated northern zone of India are not on this list. The area under pulses has steadily declined in both northern and eastern India—areas with better access to irrigation. The area under pulse cultivation has remained stagnant in Gujarat, Rajasthan, and Tamil Nadu.

Improvement in the quality or yield potential of pulse seeds has also lagged behind that of cereals, and private-sector companies are conspicuous by their absence in the pulse seed sector. On the other hand, the private sector is very active in crops like maize, sorghum, and pearl millet. Private companies also provide extension services to farmers to boost their sales. The role of private sources of extension has become important in India as public extension has declined in its reach and impact. Pulses, unfortunately, do not benefit from private-sector participation, especially in seed production and extension efforts.

3. THE NEED FOR CONCERTED POLICY EFFORTS FOR PULSES

Pulses are an important source of complex carbohydrates and the main source of noncereal protein for poor Indian families. They are also the cheapest source of noncereal protein in India (Table 3.1). Thus an increase in pulse prices raises concerns for both nutrition and food price inflation. But the increasing price itself has not triggered any major increase in production due to technological and market constraints. Therefore we need special policy efforts to increase the production and availability of pulses in India and make them more affordable to consumers. The remainder of this section outlines some of the policy initiatives on this front.

Table 3.1 Protein contribution and its cost across food (rural and urban), in Indian rupees per kg of protein

	NSS 66th round (July 2009–June 2010) Rs. per kg of protein		NSS 68th round (July 2011–June 2012) Rs. per kg of protein		Protein per unit in grams
Food item	**Rural**	**Urban**	**Rural**	**Urban**	
Pulses					
Pigeon peas	317	341	260	290	223
Gram, split	182	197	217	232	208
Gram, whole	173	203	200	237	208
Green gram	272	288	259	284	245
Lentils	244	254	208	223	251
Black gram	236	263	235	259	240
Peas	134	166	154	192	197
Gram flour	185	194	217	226	220
Animal-source foods					
Milk (liters)	462	558	613	731	40
Eggs (number)	387	382	447	437	8
Fish/prawns	499	622	611	758	140
Goat/meat/mutton	823	907	1094	1220	226
Beef/buffalo/meat	392	405	490	478	214
Chicken	397	412	447	463	259
Cereals					
Rice—PDS	47	41	61	79	75
Rice—market	223	301	247	320	75
Wheat—PDS	41	53	40	52	121
Wheat—other sources	102	125	102	132	121
Maize	—	—	105.3	225.2	111
Coarse cereals					
Pearl millet	109	64	115	144	97
Sorghum	113	264	214	254	104
Finger millet	148	180	182	201	73
Other millets	137	515	227	515	97
Other cereals	258	747	280	427	97

Source: National Sample Survey 66th and 68th rounds (NSSO various years).
Note: — = data not available; NSS = National Sample Survey; PDS = public distribution system; Rs. = Indian rupees.

Imports: A Limited Option

Pulse prices have been high and volatile in recent years. As discussed earlier, the production of pulses shows only limited response to a rise in prices due to the absence of any technology breakthrough and the riskiness of the crop (grown in rainfed conditions with high incidence of pests) that requires large increases in prices to foster a significant supply response. This supply rigidity in pulses makes it more challenging to stabilize prices. Could trade help? India imports nearly 5 million tons[1] of pulses annually from other parts of the world, making it the world's largest importer. Our analysis, however, shows that importing pulses does not cool down their prices (Negi and Roy 2015). At best, it helps arrest the rate of price rise. There is only a limited supply of pulses globally, and markets are not able to supply them in large quantities quickly given the size of India's demand. Moreover, prices rise quickly in the world markets whenever there is a scarcity in India, the largest consumer and importer of pulses in the world.

India's imports of pulses have increased rapidly over the last few years—in quantity and in value. Our results show that expansion in imports has mostly been on the intensive margin, where, to a large extent, higher prices have been a factor in the increased value of imports in real terms. Given the global situation, India continues to rely on only a few countries for imports. Therefore, while trade helps and should be encouraged, there seem to be limited international markets that can meet India's demand, especially if one or more of the large exporters experiences a shock. Diversification across exporters is surely needed for India's pulse imports. Recent policy moves to grow pulses elsewhere, such as Mozambique and Myanmar, are welcome, but obtaining pulses at reasonable prices and protecting against idiosyncratic shocks in a few countries would require a much larger set of exporters.

Consumer Subsidies: Not Likely to Mitigate the Problem of Limited Availability and Low Intake of Pulses

States like Andhra Pradesh, Himachal Pradesh, Telangana, and Tamil Nadu have added pulses to the basket of subsidized goods sold through the public distribution system (PDS). There is an increasing demand to diversify the cereals-only PDS basket to make it more nutrition sensitive. Our research, however, shows that adding subsidized pulses to the PDS basket leads to only a small increase in household consumption and an almost negligible net nutritional impact (Chakrabarti, Kishore. and Roy 2016). Table 3.2 shows that when households in the Mehboobnagar district of Telangana received 10 kg of subsidized pigeon peas from PDS shops over the 2008 calendar year, their total consumption of pulses increased by only 2.9 kg per family per year. They responded to the PDS provision of pigeon peas by reducing their market purchases of this and other pulses by 3.8 kg and 2.4 kg, respectively.

Table 3.2 Impact of inclusion of pigeon peas in public distribution system in Telangana and Maharashtra on household consumption of pulses, 2008

Variable	Total consumption of pigeon peas in kg (market + PDS)	Kg pigeon peas from market	Total pulses other than pigeon peas	Total pulse consumption
Impact of 10kg subsidized pigeon peas in PDS	**6.222*** **	**-3.841*** **	**-2.370*** **	**2.904*** **
Constant	11.72***	11.73***	10.61***	33.94***
Observations	1,266	1,266	1,266	1,266
R-squared	0.150	0.087	0.391	0.289
Number of households	685	685	685	685

Source: Authors' own calculation using "Village Dynamics in South Asia" data from Telangana and Maharashtra.
Note: PDS = public distribution system. ***- significant at 1 percent level.

States that have added pulses to the PDS provide only 1–2 kg of subsidized pulses per month per family. The quantity of pulses provided will have to increase manyfold to have any substantial impact on total consumption and nutrition. There are not enough pulses available in India or in the world to support such a policy. Unlike rice and wheat, we face a scarcity of pulses. So subsidizing pulses on a large scale does not seem to be a feasible option to increase their consumption. Pulse consumption will increase

[1] Throughout the text, *tons* refers to metric tons.

sustainably only if availability increases. When it comes to pulses, there is no option, it seems, but to increase total production in India and in the world.

Low Substitution among Pulses: The Need to Increase Production of All the Main Pulses

An interesting aspect of the pulse consumption pattern in India is that there is very little substitution among different types of pulses. Nutritionally, pulses are similar to each other, but Indian consumers show strong preferences. For example, households in southern India would not switch from white lentils and pigeon peas to chickpeas even if the latter were available at a comparatively low price. The elasticity of substitution among different pulses is near 0 (Table 3.3). This implies that increasing the overall availability of pulses is not sufficient. We need research and policy support to increase the production and availability of all the main pulses together.

Table 3.3 Elasticity of substitution among major pulses

	Chickpeas	Pigeon peas	Mung beans	Black gram	Lentils
Chickpeas	-0.92	0.07	0.02	0.02	-0.19
Pigeon peas	0.06	-0.86	0.05	0.04	-0.28
Mung beans	-0.08	-0.097	-1.05	-0.03	-0.04
Black gram	-0.06	-0.08	-0.04	-1.02	0.19
Lentils	0.025	0.05	0.01	0.02	-1.10

Source: Kumar and Joshi (2016).

Minimum Support Prices: Ineffective and Possibly Counterproductive without Procurement

The government of India has tried to incentivize an increase in pulse production and productivity by raising its minimum support price (MSP). On a couple of occasions, the MSP was increased very substantially. For example, the MSP of pulses has increased by more than 50 percent in the last five years. For the 2015/2016 crop year (July–June), the agriculture ministry announced up to a 6 percent increase in MSP, including a bonus of 200 Indian rupees (Rs) per quintal. With the increase, the MSP of urad touched Rs 4,625 per quintal for 2015/2016, compared with Rs 4,350 per quintal the previous year. Still, we have not seen a commensurate supply response to increases in the MSP.

Based on the recommendations of the Commission for Agricultural Costs and Prices (CACP), India's Department of Agriculture and Cooperation declares MSPs for 22 crops before their sowing seasons each year. The MSP is aimed at giving farmers a guaranteed price and an assured market to protect them from price fluctuations. The guaranteed price and assured market are expected to encourage higher investment in and adoption of modern farming practices. With this motivation, MSPs for rice and wheat were started with the introduction of high-yielding varieties, amid fears that a glut on the market would adversely affect farmers. These two commodities are now in surplus, and MSPs are also set for several deficit crops, such as pulses.

With MSPs announced based on the recommendations of CACP, we argue that it makes a difference whether the crop is in surplus (supply greater than demand at MSP) or is in deficit (demand greater than supply at the announced MSP). For crops such as pulses, the demand is usually greater than the supply at the announced MSP—that is, there is a deficit, as shown in Figure 2.1. There are three possible cases of supply: (1) perfectly inelastic supply, shown as line CD in the figure; (2) elastic supply, shown as ST; and (3) piecewise elastic supply, shown as CFT. The piece-wise inelasticity in supply can come from several factors such as lack of substitutes in production or lack of inputs. Depending on the season and area, there are competing crops for pulses, for example soybean in Maharashtra, wheat in several states, cotton in some states, and some other commercial crops such as chilies. In the case of pulses, the channel that we believe is salient is the riskiness where unless price rise covers for risk premium, the supply response may not be there. Only when the size of price rise is substantive, can one expect a supply response.

The reality of the market is that trade takes place between farmers and traders at or around the MSP, with or without procurement by the government. The easiest way to understand the situation of a deficit crop is by considering a perfectly inelastic supply. Referring back to Figure 2.1, if MSP = M1, farmers receive much less than the potential price given by the demand curve equal to M3. Under all MSPs up to M3, for the quantity given by SC, the farmer should be receiving prices higher than the MSP. For example, at an MSP of M1, the farmer gets less per unit by the amount represented by line PG. Above M3, the crop will be not a deficit commodity but a surplus one. If the MSP is announced prior to sowing and brings in a supply response, then the curve will shift to the right, but farmers will still get a lower price than without the MSP unless the MSP is raised significantly, to the level of M3 or a corresponding level in relation to the new supply curve.

Even if the supply curve is inelastic domestically, imports could compensate. In this case, there are two possibilities: (1) global markets can bridge the deficit, or (2) global markets are thin and cannot meet the requirements. If the deficit is bridged with imports, then there may not be a gap between the MSP and the potential price. If global markets are insufficient, the wedge between the actual and potential farmgate price will be sustained. With a piecewise elastic supply or an inelastic supply, an MSP higher than M1 and lower than M2 or M3 (depending on the case) should not transmit to market prices. It will do so only if traders' margins are unchecked. With an elastic supply (ST in Figure 2.1), a higher MSP can affect the level of excess demand more than in the inelastic case, and also can affect market price.

Until now we have assumed that the seller's price is at the MSP. Given the production deficit at the MSP, shouldn't the price at which farmers sell to traders rise higher? Given the nature of the market, we argue that it does not because the MSP works as a focal point of tacit collusion among traders, who offer farmers a price that is near the MSP. CACP data show that farmgate prices for commodities like pulses are heavily centered around the MSP (the variable is MSP–farmgate price). This is true for all pulses and is positively skewed when larger farmers' realized prices are considered, representing the effects of bargaining power.

In this situation, increasing the MSP would raise the farmer's price, and because there is no procurement, the fiscal costs are nil. Moreover, this channel is independent of what the market price is. If there is pass-through to the consumer price, the government could mitigate the price rise by holding credible stocks to calm the markets. It is also likely that the market (retail) price is determined by supply and demand and is not a function of the farmgate prices in the same period, given short-run inelasticity. In addition, many times farmers find out the MSP after sowing, which also leads to inelasticity.

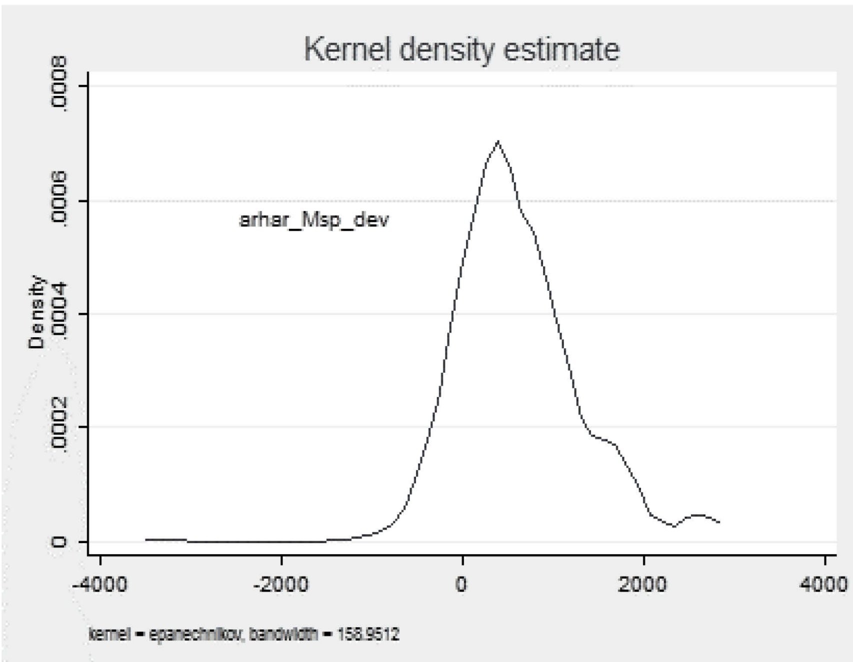
In the recent past, very few years have witnessed average farmgate prices going below the MSP. Over the last 17 years, the farm harvest price (FHP) of chickpeas has been around the MSP or just little lower only once: in 2013/2014. For pigeon peas, the two prices have been similar only three times in the last 17 years: the FHP was marginally below the MSP in 2011/2012 and 2012/2013, and almost same in 2004/2005. These are the years with significant increases in the MSP as well as spikes in imports. Hence, it is not unreasonable to suggest that without the announcement of MSPs for pulses, the farmgate prices can effectively rise because the tacit collusion among traders (see Rahman 2015) at the MSP is broken.

Hence, price supports work differently for pulses than for rice, wheat, or oilseeds:

- Unlike that of rice and wheat, pulse production is less than the annual demand and there is no procurement at the MSP. Further, unlike oilseeds, there is not much availability of pulses in the international markets either, certainly not at much cheaper prices.
- Even when the MSP for pulses has been raised significantly, it has stayed below the market price of pulses in every single year since 2000.

We contend that when the support price of pulses is near or below the market price and the opportunities to import them cheaply from other countries are limited, the MSP helps traders more than producers. It acts as a focal point, or a Schelling point,[2] for pulse traders to facilitate implicit collusion at prices below what the market price otherwise would be. Our results show clustering of farmgate prices around the MSP (Figure 3.1) that is unlikely without this sort of tacit collusion. It is possible that farmers may receive higher prices if the MSP were not announced and hence there were no anchors for traders to collude around.

Figure 3.1 Distribution of farmgate prices



Source: CACP data (2012).

Aggregation through Farmer Producer Organizations: Increasing Farmers' Price Realization

Behind the possibility of tacit collusion among pulse traders lies also the asymmetry of bargaining power stemming from low marketable surplus and inability to reap economies of scale. Apart from technical constraints on raising pulse production, we see small supply responses to rises in pulse prices also because farmers receive only a small fraction (less than 50 percent) of what consumers pay in the market even when there is very little processing or value addition as pulses travel from farms to plates. Small landholdings and low productivity of pulses mean that each farmer has a very small marketable surplus—a few bags. He or she faces high transaction costs and has very little bargaining power in the market.

Aggregation of the small surpluses through producer companies would help. For example, a recent case study in Tamil Nadu shows that farmers' realization increased from 47 percent to 63 percent of the retail price of white lentils once the growers organized themselves into a producer company (Angles and Karunakaran 2016). A number of farmer producer organizations (FPOs) have been organized for pulse growers across different parts of India, but there is a large variation in their performance. We need more research to understand how to promote successful and viable FPOs that bring more benefits to their members. Successful FPOs will not only help in the marketing of pulses but may also act as

[2] Named after Nobel laureate Thomas Schelling, who propounded the concept (see Schelling 1960).

effective channels of extension to promote the use of better seeds, lifesaving irrigation, and best practices in pulse production.

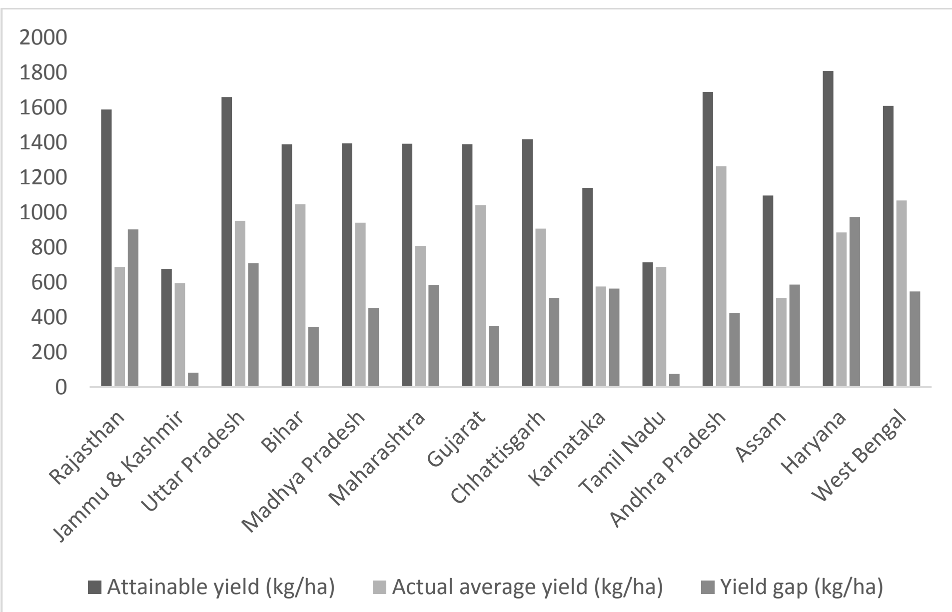
One other change related to marketing that can bring benefits is to free pulses from agricultural produce market committee (APMC) taxes. Under the APMC act, all transactions are regulated to take place in government licensed wholesale markets called *mandis*. The state governments then impose tax on all transactions that take place. The buyers have to pay these taxes and they can build it in their bids, which result in price markups.

Mandis in different states have different taxes. Some states, like Haryana and Uttar Pradesh, have very high taxes (15 percent and 19 percent, respectively). In the major pulse-producing state of Madhya Pradesh, the taxes are as high as 9 percent. These taxes add to increases in consumer prices and reduced farmer prices in pulses, and they should therefore be done away with.

Extension: To Bridge the Yield Gap and to Increase Area under Pulses

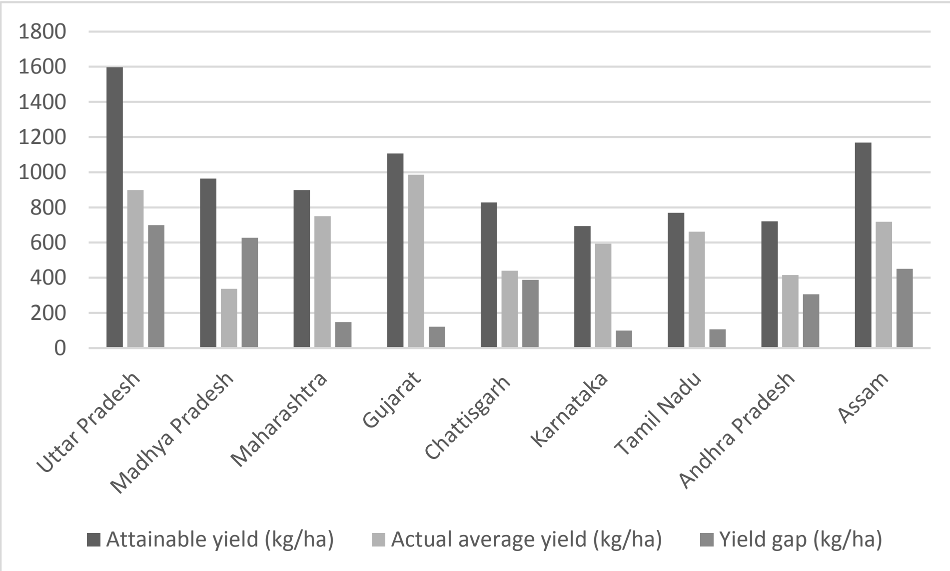
There is a large yield gap in pulses. The realized yield is 40–100 percent less than the potential yield (Figures 3.2 and 3.3). Please see Singh and Saxena (2016) for details. Production of pulses can therefore increase by 4–5 million tons even with the existing technologies if farmers follow the best practices. Low seed replacement rates in pulses (about 30 percent) are another reason for low productivity. We should target an average seed replacement rate of 40 percent by 2020. Pulse seed value chains are almost lacking, and the few existing ones are notoriously inefficient. The seed markets are fragmented, dominated by numerous small players. Rather than selling certified or truthfully labeled seed, local traders sell grains as seed.

Figure 3.1 Yield gap in chickpeas, in kg/ha, by state



Source: India, Ministry of Agriculture (2012).

Figure 3.3 Yield gap in pigeon peas, in kg/ha, by state



Source: India, Ministry of Agriculture (2012).

Famers and even extension agencies struggle to get improved seeds in adequate quantities when they need them. The pulse seed sector is an understudied area of research and policy. We need more research to identify bottlenecks and find ways to ensure easy availability of good-quality seeds to farmers.

The Indian Council of Agricultural Research and state agricultural universities have developed new short-duration varieties of pulse seeds without compromising the yields. With shorter duration, pulses can be competitive with cereals and a pulse crop can be successfully introduced even in the rice-wheat and rice-rice cropping systems. Reduced duration also reduces the vulnerability of the crop to terminal droughts. We need to promote wider adoption of these varieties through effective extension and efficient seed value chains. Participation of the private sector also needs to be improved. One possible policy option is to use a pull system of research, whereby large prizes are set up in both the public and private sectors for developing technology with the desired attributes.

Given the limited interest shown by the private sector and the lack of adequate progress in pulse technology, it might be well to try a policy that Michael Kremer and colleagues suggested: an advance marketing commitment (see Kremer et al. 2007). The idea is to create a level playing field and let the private and public sectors compete to develop technology that meets predetermined attributes. The winner takes away a big prize but gives up intellectual property rights so that the government can distribute the technology to farmers at affordable prices.

Har Khet Ko Paani: Protective Irrigation for More Pulses

We have seen that intensive irrigation leads farmers to switch from pulses to other crops. However, provision of protective irrigation can be a game changer in pulse production. The *protective irrigation* systems are designed and operate on the principle that the available water has to be spread thinly over a large area, in an equitable manner. The objective is to reach as many farmers as possible, and to protect against crop failure and famine. The amount of water a farmer would receive under protective irrigation would be insufficient to cover full crop water requirements on all of his land for an average rainfall year. The primary objective of protective irrigation thus has an explicit social dimension (Jurriens et al 1996).

The *har khet ko paani* (water to every farm) initiative under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) program should accord top priority to the provision of lifesaving irrigation in pulse-growing areas. A similar provision in the central Indian tribal region (extending from eastern Gujarat in the west to Jharkhand and West Bengal in the east) can help bring a part of the 11 million hectares of rice fallows under pulses. Growing a second crop of pulses in the rice-fallow areas will increase farmers' income, reduce poverty in the tribal areas, and help increase the availability of pulses in the country.

We recommend that given the rising demand and prices of pulses in India and the importance of pulses to human and soil health, PMKSY should prioritize pulse-growing areas for investment. Access to even one or two lifesaving irrigations over the life of the crop can give a quantum boost to pulse production and productivity, and reduce production risks significantly. Thus, investment in lifesaving irrigation in pulse-growing and rice-fallow areas of India will likely offer a high return on investment under PMKSY. The uptake of irrigation of pulses would depend on the conditionality built in irrigation programs. Otherwise farmers might migrate to other crops if irrigation were to become available.

Paying Pulse Growers and Pulse-Growing Areas for Ecosystem Services

Among protein-rich foods, pulses have the lowest carbon and water footprint. In addition, pulses improve soil health by naturally fixing atmospheric nitrogen in the soil; growing pulses reduces the need for application of nitrogenous fertilizer, especially urea, in the subsequent crop. Thus, pulses provide valuable environmental services (Dudeja and Duhan 2005). Owing to the country's diverse agroclimatic conditions, pulses are grown in India throughout the year. There are several benefits from pulses that are particularly important, such as their role in crop rotation and in intercropping, because they help improve soil fertility by reducing soil pathogens and fixing nitrogen. Studies show that because of these factors, the yield of a crop that follows pulses can increase by up to 20–40 percent (Pande and Joshi 1995).

Changes in soil fertility have been assessed for different crops, for example maize (Dwivedi et al. 2015; Kumar et al. 2015). Lower usage of fertilizer, pesticide, and irrigation further makes pulses an environmentally sustainable crop group. Saddled with a huge fertilizer subsidy burden and food safety issues from excessive chemical use in farming, India can benefit greatly from these roles of pulses.

We need to assess the value of the environmental services provided by pulse cultivation and devise mechanisms to reward farmers or pulse-growing areas for these ecosystem services. Paying individual farmers may be logistically difficult, but we can formulate ways to pay pulse-growing areas by offering them additional resources for investment in agriculture, irrigation, or extension in the same way that the 14th finance commission of India has offered states incentives to maintain and increase area under forests.

4. CONCLUSIONS

Pulses are important for the health and nutrition of Indian households. Rising prices of pulses have led to high food price inflation and nutritional concerns. Since India is by far the largest producer, consumer, and importer of pulses, increasing domestic production is essential. Imports can help, but unlike edible oil, options to import pulses at cheaper prices are limited. Therefore, in the long run, there is no option but to increase home production of pulses. Provision of lifesaving irrigation with water-harvesting structures may help increase pulse production in India significantly. Therefore, we recommend that pulse-growing areas and rice-fallow areas with high potential to produce pulses should get priority under the Pradhan Mantri Krishi Sinchayee Yojana program.

Promoting adoption of shorter-duration pulse varieties and varieties that are disease and pest resistant through intensive extension efforts can help increase pulse production by 5–6 million tons by 2020. Given the rising consumption of pulses and their increasing contribution to food price inflation, we need to allocate more resources to research on pulses to increase their potential yields and resilience to weather fluctuations.

We also need to create incentives for greater participation of an organized private sector in the pulse value chain, especially in development of better pulse varieties. The technology and resource push should be accompanied by policies and institutions that may help to increase price realization for farmers. Promoting aggregation through farmer producer organizations (FPOs) will help increase price realization for growers. The government should make it easier for FPOs to operate in the interest of farmers. Insurance to reduce risk can incentivize farmers to grow more pulses and also make them more responsive to even small increases in pulse prices. Assessing the ecosystem services provided by pulses and finding ways to reward pulse growers—directly or indirectly—may also help increase pulse production.

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