Price and Profitability Analysis of Major Pulses in India

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ABSTRACT

This paper examines the causes of low growth in pulses production at the all-India level in terms of profitability of the farm business and the workings of the price policy. More precisely, it considers the effectiveness of price policy instruments in helping farmers gain sufficient income to promote investment, technology, and productivity. The analysis shows that the agricultural price policy, which aims to provide a remunerative and stable price environment to farmers, has been largely irrelevant in the case of pulses. It also suggests a review of the criteria for fixing the minimum support price of pulses and making it sensitive to prevailing market prices.

Keywords: agricultural prices, agricultural commodity, agriculture policy, pulses
JEL Classification: Q10, Q11, Q13, Q18

INTRODUCTION

The agricultural price policy implemented in the last four and a half decades has helped India overcome massive food shortages, emerge as a net food exporter, and achieve national food security. The policy has also been helpful in keeping the prices of basic food items relatively stable, which saved India from facing the sharp price spikes that many countries experienced during the global food crisis (Chand 2008). It has had a positive effect on farm income and led to economic transformation in well-endowed and mainly irrigated regions. The terms of reference of the Agricultural Prices Commission (GOI 1965), which is now the Commission for Agricultural Costs and Prices (CACP), requires that policy induced incentives should move in favor of crops where the domestic supply is less than the demand, relative to crops where it is more and rising; however, the implementation experience so far suggests that it has mainly benefitted a few crops, such as wheat and rice among food grains, and sugarcane and cotton among other crops (Chand 2003). This has resulted in a shift of land and other resources away from pulses, oilseeds, and coarse grains to wheat and paddy, which has created serious imbalances in the demand and supply of various agricultural commodities in the country.

This is evident in the fact that the production of pulses, which remained more or less normal between 1950–1951 and 1964–1965, encountered a sharp decline after 1967–1968 as the "green revolution" in cereals was experienced in some of the major pulse growing states (Kumar 1978). During this period, pulse crops were neglected, with the agricultural policy environment favoring the spread of green revolution technology in a few crops, such as paddy and wheat, for food security reasons in India. This input intensive technology further enhanced the existing yield gap between major cereals and pulses. The prolonged neglect for several decades resulted in stagnant yield levels. For instance, the yield in pulses increased by only 24 percent between triennium ending (TE) 1965–1966 and TE 2002–2003, while the yield in wheat increased by 227 percent. Production remained virtually stagnant at 11 million tons (MT) with an area of 22–23 million hectares (ha).

The per capita availability of pulses, which are main sources of protein in Indian diet, declined from 25.2 kilograms (kg) in 1961 to 18.7 kg in 1971 and further to 10.6 kg in 2003 (GOI 2014). This was caused by stagnant production and no shift in dietary preferences. The growing demand prompted by population increase, coupled with stagnant production, resulted in a steep increase in the prices of pulses. The prices of pulses surged at a higher rate than those of cereals. For instance, the real price of *arhar* and *gram* increased by 85.4 percent and 80.1 percent, respectively, compared to −19.6 percent for wheat, −9.6 percent for maize, and −2.3 percent for millets (Reddy, Bantilan, and Mohan 2013). As a result, huge imports of pulses became a regular feature in the country to bridge the gap between demand and supply. The import of pulses increased from 1,396.6 tons (T) in 1960–1965 to 765,150 T in 1995–2000. Interestingly, the rising prices of pulses did not encourage farmers to increase production. Poor production performance not only created an imbalance in the demand and supply of pulses but also led to soaring import bills, unpredictable price rises, and low net profit compared to competing crops (Joshi and Saxena 2002). In addition, factors such as unfavorable parity in prices, ineffective government procurement, lack of assured markets, and trade liberalization made the cultivation of pulses unremunerative and less

attractive than the cultivation of other crops (Byerlee and White 1997; Joshi et al. 2000; Chand 2000).

A significant improvement in output growth was witnessed from 2003–2004 to 2013–2014 (Table 1). The growth rate of pulses production was significantly high. For example, the annual growth rate of gram, arhar, and total pulses was 5.38 percent, 2.64 percent, and 3.43 percent, respectively, which was greater than the population growth rate but less than the demand growth rate. Importantly, much of the growth in production was on account of substantive improvement in yield levels. The yield levels in total pulses increased from 597 kg/ha in TE 2003–2004 to 757 kg/ha in TE 2013–2014, registering an annual compound growth rate of 2.40 percent. Despite the negative growth in area, urad and moong production grew at an annual rate of approximately 1.90 percent, mainly on account of significantly high growth in yield levels. Consequently, India achieved a record output in pulses production (18.40 MT) in TE 2013–2014, with all-time high production figures achieved in gram (8.69 MT), arhar (2.95 MT), urad (1.79 MT), and moong (1.48 MT). This reflected an improvement in per capita availability of pulses, which increased from 10.6 kg in 2003 to 15.2 kg in 2012 (GOI 2014).

However, despite a significant improvement in pulses production, the country still faced shortages in meeting domestic requirements. For instance, in 2007–2009, pulses production was 14.4 MT and consumption was 17.1 MT, which left a deficit of 2.66 MT. India had to import an average of 3 MT of pulses, which constituted around 15 percent of its demand.

The recent increase in pulses production is attributed to the government's renewed policy to boost pulses production across the country through various development programs, such as the Integrated Scheme of Oilseeds, Pulses, Oil Palm, and Maize (ISOPAM) and the National Food Security Mission (NFSM)-Pulses and Accelerated Pulses Production Program (A3P), along with the announcement of higher minimum support prices (MSPs) and emphasis on improved seed production and distribution, increased area in non-traditional areas for crops like chickpea, and higher market prices. These policy efforts were directed towards curtailing the growing demand for imports, reducing protein malnutrition, and making pulses affordable to the common person (GOI 2009).

With this background, this paper examines the causes of low growth in pulses production at the all-India level in terms of profitability of the farm business and the workings of the price policy. More precisely, it looks into the effectiveness of price policy

Table 1. Growth rates of pulses area, production, and yield (TE 1990–1991 to TE 2013–2014)

Pulses	TE 1990–1991 to TE 2002–2003	TE 2003–2004 to TE 2013–2014	TE 1990–1991 to 2002–2003	TE 2003–2004 to TE 2013–2014	TE 1990–1991 to TE 2002–2003	TE 2003–2004 to TE 2013–2014
	Area		Production		Yield	
Total pulses	-1.04	1.01	-1.17	3.43	-0.13	2.40
Arhar	-0.29	1.46	-1.34	2.64	-1.06	1.17
Gram	-1.42	3.28	-0.67	5.38	0.76	2.04
Moong	-0.78	-0.14	-2.61	1.90	-1.84	2.03
Urad	-0.22	-0.81	-1.12	1.92	-0.91	2.75

instruments in helping farmers gain sufficient income to promote investment, technology, and productivity. It aims to determine the trends in the movements of costs, prices, and returns of major pulse crops to explain the impact of price policy on the profitability of pulses cultivation.

This paper examines these issues empirically by doing an in-depth analysis of costs and returns in the production of four major pulses: arhar, gram, moong, and urad. The data used in the analysis were taken from reports on the cost of cultivation by the Directorate of Economics and Statistics, Ministry of Agriculture. Costs and returns were calculated at the all-India level to determine emerging trends in profitability. Weights based on area and production of the respective crops were used to aggregate the data from different states. Area-based weights were used for all variables except cost of production and price realized/received by farmers. The states covered in the analysis of costs and returns were Gujarat, Madhya Pradesh, Maharashtra, and Uttar Pradesh for arhar; Haryana, Madhya Pradesh, Rajasthan, and Uttar Pradesh for gram; Andhra Pradesh, Maharashtra, and Orissa for moong; and Andhra Pradesh, Madhya Pradesh, Maharashtra, Orissa, and Uttar Pradesh for urad. The analysis covers a period of more than 20 years from 1990–1991 to 2011–2012. However, 2011–2012 is the latest period for which data on different aspects of costs and returns are available from CACP. The study is divided into two periods: (1) the period of sluggish growth from 1990–1991 to 2002–2003, and (2) the recovery phase from 2003–2004 to 2013–2014.

The paper is organized into five sections. The first section presents the costs of cultivation and production of arhar, gram, moong, and urad. The second section explains the movements of MSPs and prices realized by farmers. The third section investigates the relationship between costs, prices realized by farmers, and support prices. The fourth section considers the trends in profitability to assess the viability of pulses cultivation. The fifth section consolidates these findings to identify the causes of poor growth performance in pulses production and provides concluding observations.

Costs of Cultivation and Production: The General Trend

This section analyzes the trends in paid-out cost of cultivation (A2 CoC) and total cost of cultivation and production (C2 CoC and CoP) in real terms for arhar, gram, moong, and urad from 1990–1991 to 2011–2012.

The C2 CoC for the four pulses were high during the recovery phase (Tables 2 and 3). On average, in real terms, the recovery phase witnessed an increase of 45–55 percent in total CoC over the previous period. The CoC increased at a higher rate in the recent period, which indicates that the high profitability might have encouraged farmers to invest in more inputs and technology. This can be observed in the robust gain in yields per hectare in the recovery phase. However, despite robust growth in yield levels, the growth in real CoP was higher in the recovery phase for the four pulses (Table 3). A careful analysis of growth in yield levels vis-à-vis total CoC further reveals that annual yield growth in the recovery phase was lower compared to real total CoC growth, which enabled the cost per quintal (qtl) to rise.

As the cost per unit area (C2 CoC) turned out to be higher than the cost per unit of output (C2 CoP) for the four pulses, the rate of return became more attractive than the level of return. This necessitated a shift from CoP to CoC in (support) price policy with respect to pulses. A comparison of trends in the costs of these crops shows that the cost of production per unit was lowest for gram, followed by arhar, urad,

Table 2. Different costs in the production (real terms) of arhar, gram, moong, and urad at all-India level (1990–1991 to 2011–2012)

Period	Arhar			Gram			Moong			Urad		
	C2 CoP	C2 CoC	A2 CoC	C2 CoP	C2 CoC	A2 CoC	C2 CoP	C2 CoC	A2 CoC	C2 CoP	C2 CoC	A2 CoC
	INR/ qtl	INR/ ha	INR/ ha	INR/ qtl	INR/ ha	INR/ ha	INR/ qtl	INR/ ha	INR/ ha	INR/ qtl	INR/ ha	INR/ ha
1990–1991	59	508	177	54	555	267	89	251	123	75	323	170
1991–1992	50	445	183	47	482	247	74	254	102	63	279	134
1992–1993	52	478	232	50	437	219	88	282	159	57	302	151
1993–1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994–1995	75	530	245	48	483	237	68	220	137	74	348	170
1995–1996	66	558	234	53	432	208	80	259	157	75	393	179
1996–1997	54	486	199	54	501	233	77	338	181	77	367	182
1997–1998	74	491	221	50	469	225	102	333	196	79	342	177
1998–1999	52	464	199	46	405	205	78	344	191	75	312	135
1999–2000	53	535	216	55	478	211	85	443	240	84	394	213
2000–2001	62	493	211	61	625	282	99	436	248	85	405	198
2001–2002	59	608	277	60	630	301	97	526	337	77	484	259
2002–2003	72	622	309	69	602	290	103	426	253	77	419	222
2003–2004	69	685	339	56	537	250	87	397	249	95	352	201
2004–2005	63	683	330	52	511	241	116	407	270	90	365	197
2005–2006	69	736	378	64	647	294	120	497	294	100	442	222
2006–2007	77	700	365	66	658	311	128	506	304	90	539	247
2007–2008	71	745	374	70	619	288	88	495	287	74	468	244
2008–2009	83	781	386	60	596	283	85	478	242	84	470	229
2009–2010	89	983	477	52	570	269	113	474	244	109	546	279
2010–2011	92	943	525	50	532	241	105	532	307	90	547	278
2011–2012	81	948	462	68	757	332	113	581	297	109	621	326

Table 3. Annual compound growth rates of different costs (real terms) for arhar, gram, moong, and urad at all-India level (1990–1991 to 2011–2012)

Pulses	Different Costs	1990–1991 to 2002–2003	2003–2004 to 2011–2012
Arhar	C2 CoP	1.71	1.98
	C2 CoC	1.69	4.14
	A2 CoC	4.76	3.95
Gram	C2 CoP	2.04	2.4
	C2 CoC	0.67	4.37
	A2 CoC	0.71	3.64
Moong	C2 CoP	1.24	3.29
	C2 CoC	4.49	4.89
	A2 CoC	6.2	2.22
Urad	C2 CoP	0.25	1.74
	C2 CoC	2.19	7.37
	A2 CoC	2.27	6.19

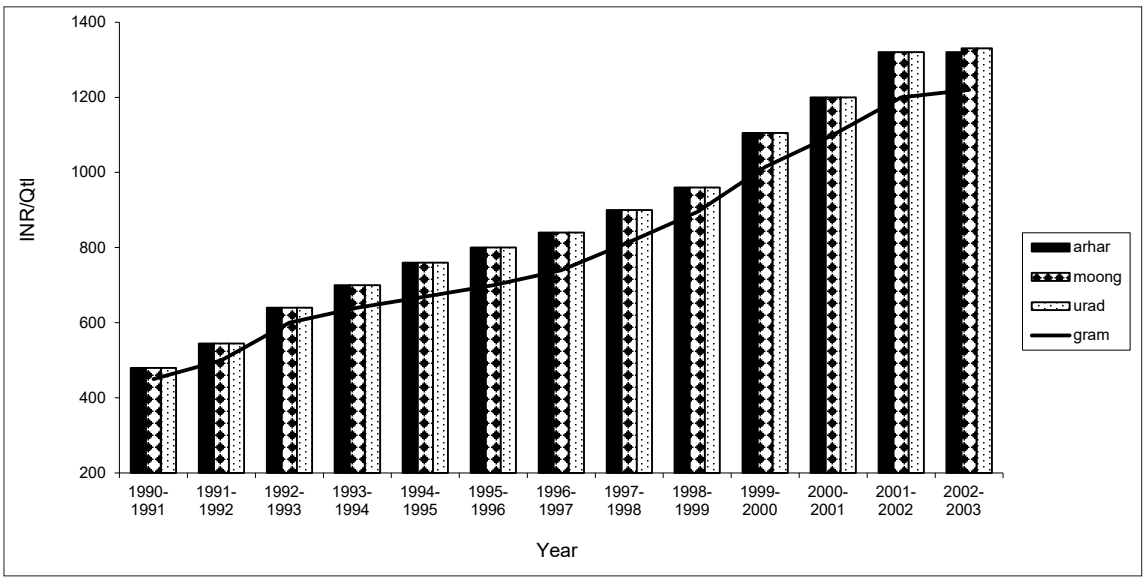
and moong. The total cost of cultivation was highest for arhar, followed by gram, and almost equal for urad and moong. This is because of higher yields in gram, followed by arhar, urad, and moong. In a study on the relationship between real cost of production and yield levels, an inverse relationship between them was found in arhar, gram, moong, and urad. The analysis shows that real costs (CoP) of arhar, gram, moong, and urad can be reduced by 4–5 percent if their respective yield levels increase by 10 percent (GOI 2015a, 2015b). Despite the total cost of cultivation being almost equal for moong and urad, the paid-out cost of cultivation was higher for moong, which indicates lower imputed values of land, labor, and capital for this crop.

Trends in the MSPs and Prices Realized by Farmers

This section analyzes the trends in MSPs and prices realized by farmers. The MSP serves as an incentive to farmers and stimulates higher production by encouraging the use of modern inputs and inducing investment in cost-reducing technology. However, the mere announcement of higher MSPs will not raise the level of prices received by producers without proper procurement arrangements. Therefore, it is more important to see the prices received by farmers than the MSPs per se. The prices realized by farmers are best represented by the implicit prices received by farmers, which is the ratio of the value of the main product to the average yield.

The changes in MSPs show that from 1990–1991 to 2002–2003, the government maintained a uniform price structure for arhar, moong, and urad (Figure 1). The support prices of these three crops increased from INR 480 to INR 1,330, registering an annual growth rate of 8.86 percent. The prices of these crops increased by more than 13 percent for three consecutive years: 1990–1991, 1991–1992, and 1992–1993. Similarly, the procurement price of gram increased by 7–20 percent from 1990–1991 to 1992–1993. However, the rate of increase in the MSP of gram was lower than

Figure 1. Trends in the MSPs (INR/qtl) of arhar, gram, moong, and urad (1990–1991 to 2002–2003)



Source: Computed from CACP data

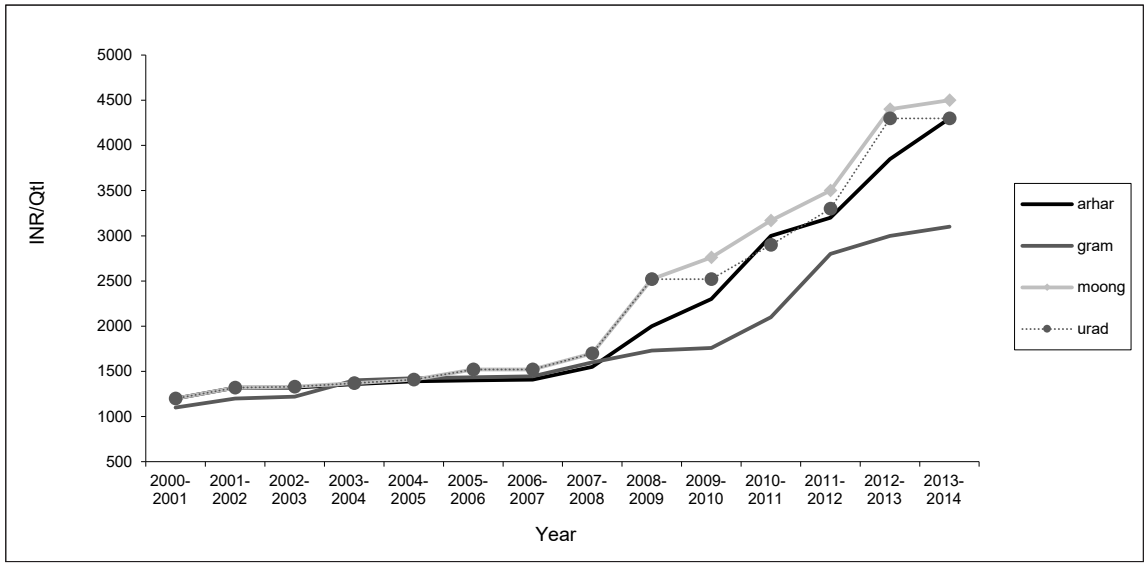
that of arhar, moong, and urad. The intercrop price parity between gram and the three other crops shows that the ratio of gram to these crops declined from 0.94 percent in 1990–1991 to 0.88 percent in 1996–1997. The ratio declined significantly during this period because of a sharp rise in the MSPs of arhar, moong, and urad. It ranged between 0.91 and 0.93 from 1997–1998 to 2002–2003.

To stimulate pulses production, the government included pulses in the NFSM. The MSPs of most pulses have increased significantly since the NSFM was launched in October 2007. Compared to the period of sluggish growth, the changes in MSPs from 2003–2004 to 2011–2012 show that the prices of arhar, moong, and urad increased the most (Figure 2). The moong prices increased from INR 1,370 to INR 3,500, while the urad prices increased from INR 1,370 to INR 3,300 during this period, registering an annual growth rate of 12.44 percent and 11.62 percent, respectively.[1]

The prices of gram doubled from INR 1,400 to INR 2,800 during 2003–2004 to 2011–2012, while arhar witnessed more than twice an increase in its support price during the same period. The biggest increase ever made in support prices of arhar, moong, and urad were observed in the last four years covered in this study, which was from 2008–2009 to 2011–2012. For instance, prices of moong and urad increased by more than 48 percent in 2008–2009 compared to the previous year, whereas the procurement price of arhar rose by about 30 percent in 2008–2009 and 2010–2011.

The intercrop price parity between gram and the three other crops shows that the ratio of gram to arhar ranged from 1.02 to 1.03 during 2003–2004 and 2007–2008. The ratio of gram to moong and urad ranged from 0.94 to 0.95, indicating a higher increase in the MSPs of these two crops. However, from 2008–2009 onwards, the ratio declined

Figure 2. Trends in the MSPs (INR/qtl) of arhar, gram, moong, and urad (1990–1991 to 2002–2003)



Source: Computed from CACP data

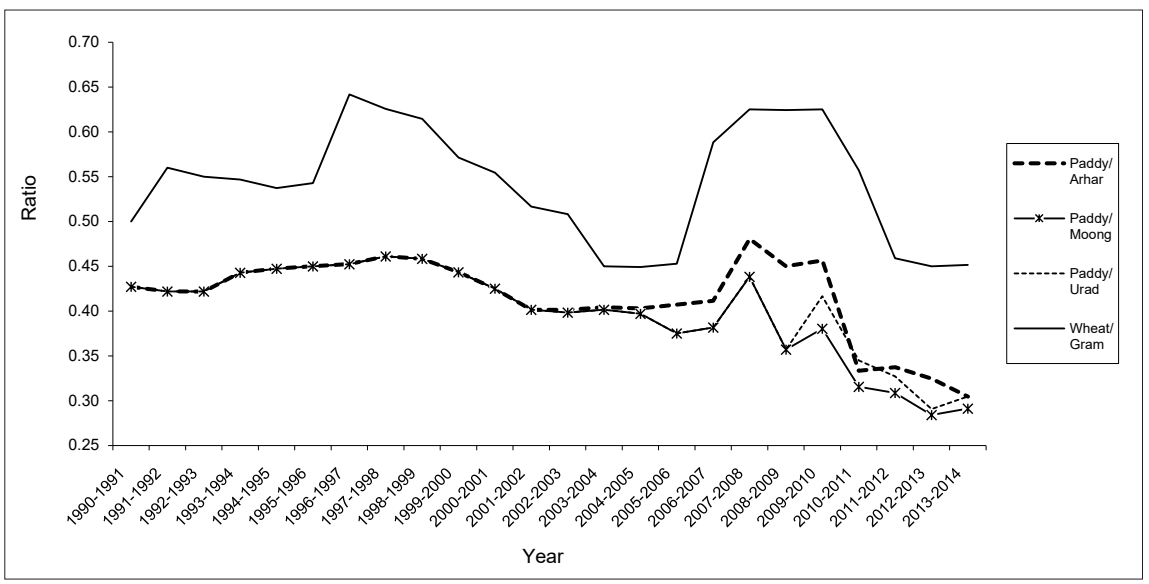
1 USD 1 = INR 53.44 (2012 estimates) https://www.cia.gov/library/publications/the-world-factbook/fields/2076.html

significantly because of the highest increment ever made in support prices of moong, urad, and arhar. This increase distorted the intercrop price parity. It ranged from 0.66 to 0.72 for moong, arhar, and urad in 2009–2010.

It has been argued that over the years, policy-induced incentives moved in favor of wheat and rice, which led to a shift of land and other resources away from pulses and created serious imbalances in demand and supply. In this context, one would expect the price policy to influence a price parity in favor of pulses vis-à-vis rice and wheat. However, the actual experience was different. The ratio of the MSP of wheat relative to gram declined for almost a decade beginning 1995–1996, and increased sharply after that (Figure 3). Between 2007–2008 and 2009–2010, the price of wheat relative to gram remained at almost the same level as in the mid-1990s. The price of paddy relative to arhar, moong, and urad followed a similar pattern, i.e., declined for almost seven years beginning 1998–1999 and increased slightly after that before it started declining again in 2008–2009. The analysis shows that from the second half of the 1990s, support prices moved in favor of pulses than wheat and paddy. However, because of a sharp rise in the MSP of wheat compared to gram from the mid-2000s onwards, the price ratio increased, which became favorable again to gram only after 2009–2010.

The findings of the analysis do not support the argument that support prices induced changes in production patterns. The favorable price regime did not trigger an increase in area under cultivation. This raises an important question regarding the effectiveness of MSPs for pulses. In this context, it would be interesting to see the relationship between the prices realized by farmers and the MSPs, as farmers are more concerned with the former than the latter per se. The ratio of price realized to MSP was higher than 1 for the four pulses almost during the entire period, indicating that the prices realized by farmers for these crops were higher than the MSPs (Table 4). However, the ratio of price realized fell continuously for nearly a decade beginning in the mid-1990s

Figure 3. Price parity between the MSPs of cereals and pulses



Source: Computed from CACP data

Table 4. Price realized by farmers in relation to MSP for arhar, gram, moong, and urad (1990–1991 to 2011–2012)

Period	Price Realized (INR/qtl)				Ratio of Price Realized to MSP			
	Arhar	Gram	Moong	Urad	Arhar	Gram	Moong	Urad
1990–1991	791	609	854	718	1.6	1.4	1.8	1.5
1991–1992	874	609	947	715	1.6	1.2	1.7	1.3
1992–1993	920	714	797	665	1.4	1.2	1.2	1.0
1993–1994	NA	NA	NA	NA	NA	NA	NA	NA
1994–1995	1,292	821	997	1,313	1.7	1.2	1.3	1.7
1995–1996	1,744	894	1,459	1,595	2.2	1.3	1.8	2.0
1996–1997	1,442	1,182	1,395	1,278	1.7	1.6	1.7	1.5
1997–1998	1,568	1,084	1,481	1,145	1.7	1.3	1.6	1.3
1998–1999	1,638	1,050	1,513	1,478	1.7	1.2	1.6	1.5
1999–2000	1,493	1,247	1,819	1,812	1.4	1.2	1.6	1.6
2000–2001	1,466	1,526	1,821	1,939	1.2	1.4	1.5	1.6
2001–2002	1,475	1,430	1,638	1,835	1.1	1.2	1.2	1.4
2002–2003	1,583	1,489	1,707	1,449	1.2	1.2	1.3	1.1
2003–2004	1,667	1,413	1,416	1,356	1.2	1.0	1.0	1.0
2004–2005	1,615	1,407	1,829	1,599	1.2	1.0	1.3	1.1
2005–2006	1,743	1,896	2,460	2,199	1.2	1.3	1.6	1.4
2006–2007	2,098	2,240	2,808	3,127	1.5	1.5	1.8	2.1
2007–2008	2,267	2,461	2,226	2,301	1.5	1.5	1.3	1.4
2008–2009	2,959	2,119	2,890	2,710	1.5	1.2	1.1	1.1
2009–2010	4,372	2,040	4,686	4,105	1.9	1.2	1.7	1.6
2010–2011	3,593	2,187	3,671	3,811	1.2	1.0	1.2	1.3
2011–2012	3,444	3,654	4,087	3,556	1.1	1.3	1.2	1.1

and increased sharply after that with varying levels of fluctuation.

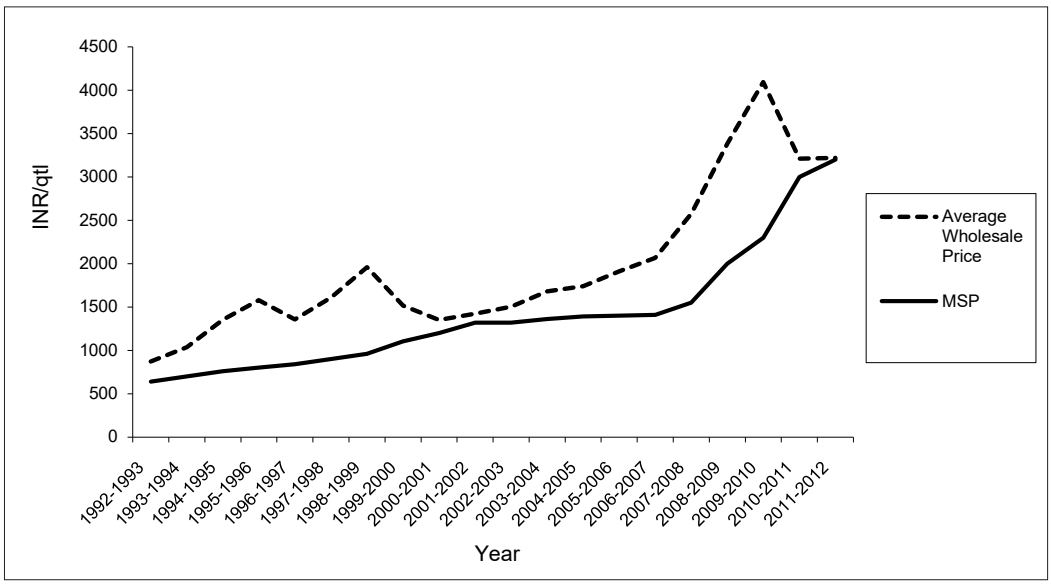
The decline in the ratio of price realized to MSP shows that the MSPs increased faster than the prices received/realized by farmers (Table 5). This is also evident when the growth rates of prices realized and MSPs are compared. In the first period of the study, MSPs grew at a higher rate than prices realized by farmers. However, the situation improved significantly from the mid-2000s onwards, when the prices realized by farmers grew faster than the MSPs. This coincided with a significant increase in area under cultivation as well as an improvement in yield levels.

The prices realized by farmers were higher than support prices, which indicates that increases in MSPs failed to match increases in market prices during this period. As a result, the ratio of MSP to wholesale price continued to decline (Chand, 2012). For instance, in Uttar Pradesh between 2001–2002 and 2009–2010, the MSP of arhar was 93 percent of the wholesale price in the Kanpur market at the beginning of the last decade, which declined gradually to 56 percent by 2009–2010 (Figure 4). An examination of the wholesale prices of gram in Morena, Madhya Pradesh reveals a similar pattern. On average, the MSP of gram was 30–35 percent below the wholesale

Table 5. Growth rates in the MSPs and prices realized by farmers for arhar, gram, moong, and urad (1990–1991 to 2011–2012)

Pulses	1990–1991 to 2002–2003	2003–2004 to 2011–2012	1990–1991 to 2002–2003	2003–2004 to 2011–2012
	MSP		Price Realized by Farmers	
Arhar	8.80	11.29	5.95	9.50
Gram	8.67	9.05	7.73	12.61
Moong	8.86	12.44	5.94	14.17
Urad	8.86	11.62	6.02	12.80

Figure 4. Trends in the MSP and wholesale price of arhar in Kanpur



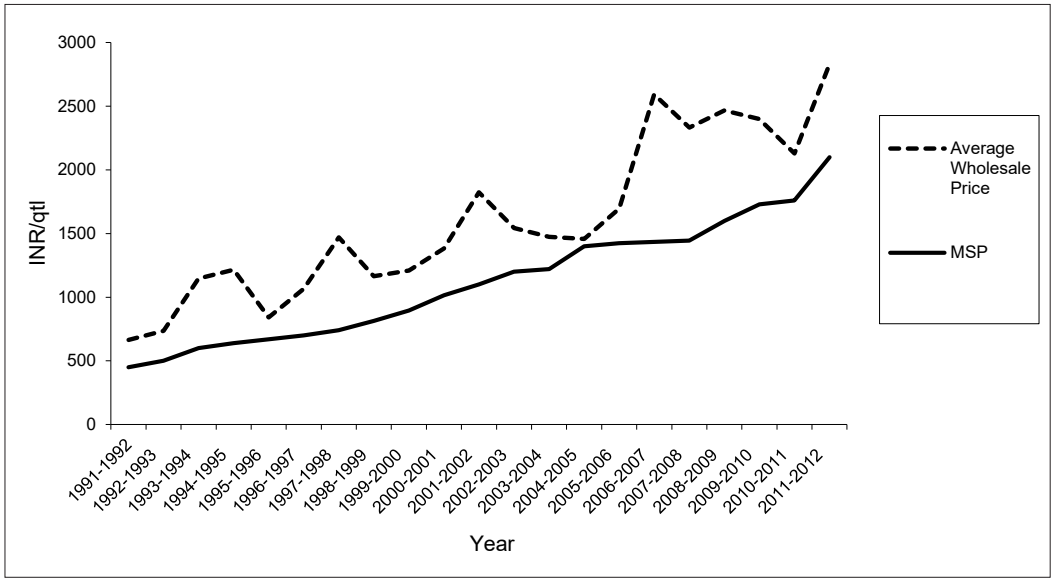
Source: GOI (2014)

price between 2004–2005 and 2008–2009 (Figure 5). These examples illustrate how pulses suffer from price policy failure. An invariably higher price realized by the farmers compared to the MSP makes the latter irrelevant to producers and consumers. For cereals, the prices received by farmers are often lower than the MSPs, making demand-side factors less relevant. For pulses, the prices received by farmers are often higher than the MSPs. Also, MSPs could not keep pace with increases in wholesale prices because they are fixed on supply-side factors. This makes a strong case for fixing MSPs for pulses based on demand-side factors, i.e., MSPs need to be linked to market prices.

Support Prices, Cost of Production, and Prices Realized

In fixing the procurement price of a particular commodity, CACP claims to rely on various criteria, ranging from production cost to the international price situation. However, the weight given to each criterion is not stated explicitly (Gulati 1987). For production costs, CACP takes into account the actual paid-out cost of purchased inputs, including purchased

Figure 5. Trends in the MSP and wholesale price of gram in Morena



Source: GOI (2014)

labor and some imputed value for land and family labor (C2 cost) and some value (10% of the C2 cost) for the farmer's managerial input. The C2 cost and the value for managerial input constitute the C3 cost, which forms the basis for the CACP support-price recommendation.

Figures 6a to 6d show how the cost of production (C2) of gram, arhar, moong and urad and their MSPs moved over time. When C2 cost is covered, it implies that farmers not only recover their paid-out costs but also get rewarded for using their own resources, such as land, family labor, and capital. The trends in the CoP and the MSP for gram show that from 1990–1991 to 2002–2003, the MSP was almost similar to the CoP without any margin, except in 2002–2003. For arhar, the MSP remained slightly above the CoP in seven out of 12 cases. However, in the recovery phase, the MSP of arhar remained below the CoP, except in 2004–2005 and 2011–2012. The opposite was the case for gram, except for 2006–2007 and 2007–2008.

On the other hand, the CoP for moong and urad was always higher than the MSP. For moong, the margins were higher from the mid-1990s onwards, especially from 2004–2005 to 2006–2007 when the MSP was able to cover only 50–60 percent of the CoP. For urad, the margins remained relatively stable and was within 15–25 percent. In comparison to pulses, the MSP of wheat was higher than the CoP from 1997–1998, which was within 20–25 percent, while the MSP of rice was 5–20 percent higher than the CoP from 1999–2000 onwards except 2002–2003 (Tripathi 2013). This partly explains why farmers prefer the paddy-wheat cropping pattern over pulses wherever feasible.

Another issue is the growth in CoP relative to the growth in prices realized by farmers. The trends in the CoP and the prices realized for gram and arhar show that in both cases, the prices realized were always higher than the CoP. However, in the first period of the study, the CoP moved faster than the prices realized by farmers; in the second period, the prices realized by farmers moved faster than the CoP. The margins over CoP were

Figure 6a. Trends in the MSP, CoP, and price realized for gram*

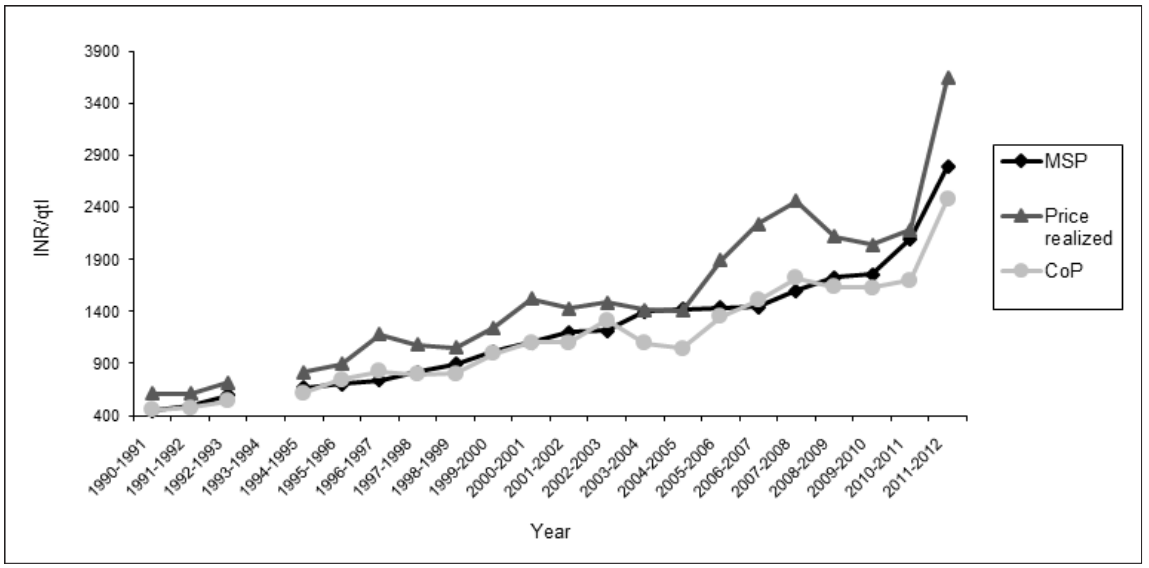
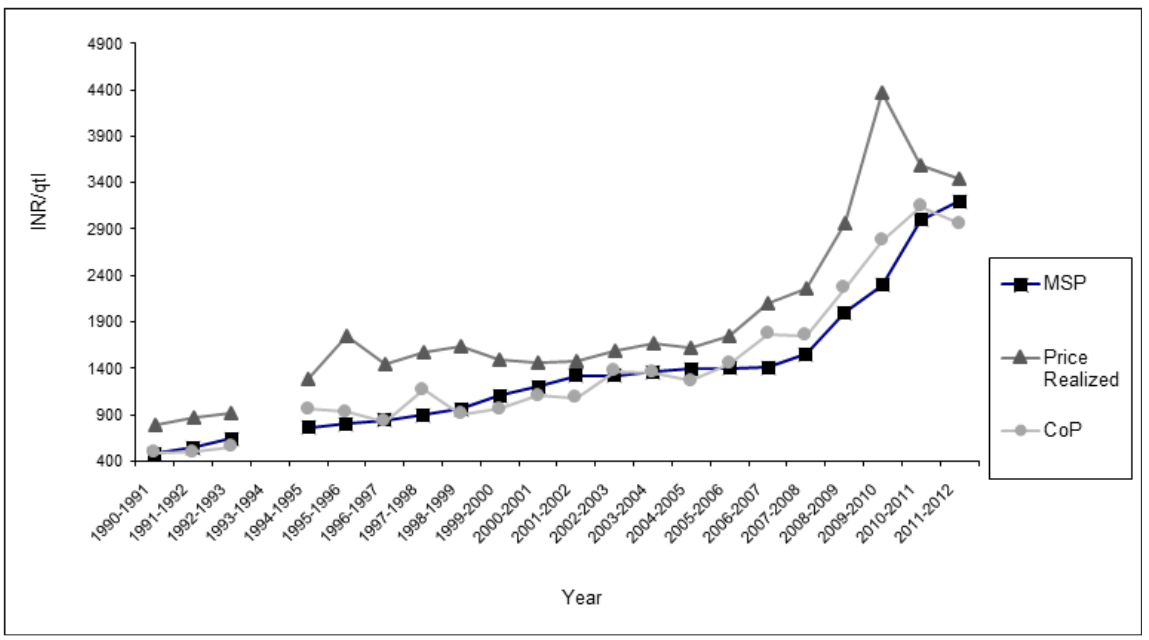


Figure 6b. Trends in the MSP, CoP, and price realized for arhar*



Source: *Computed from CACP data

Figure 6c. Trends in the MSP, CoP, and price realized for moong*

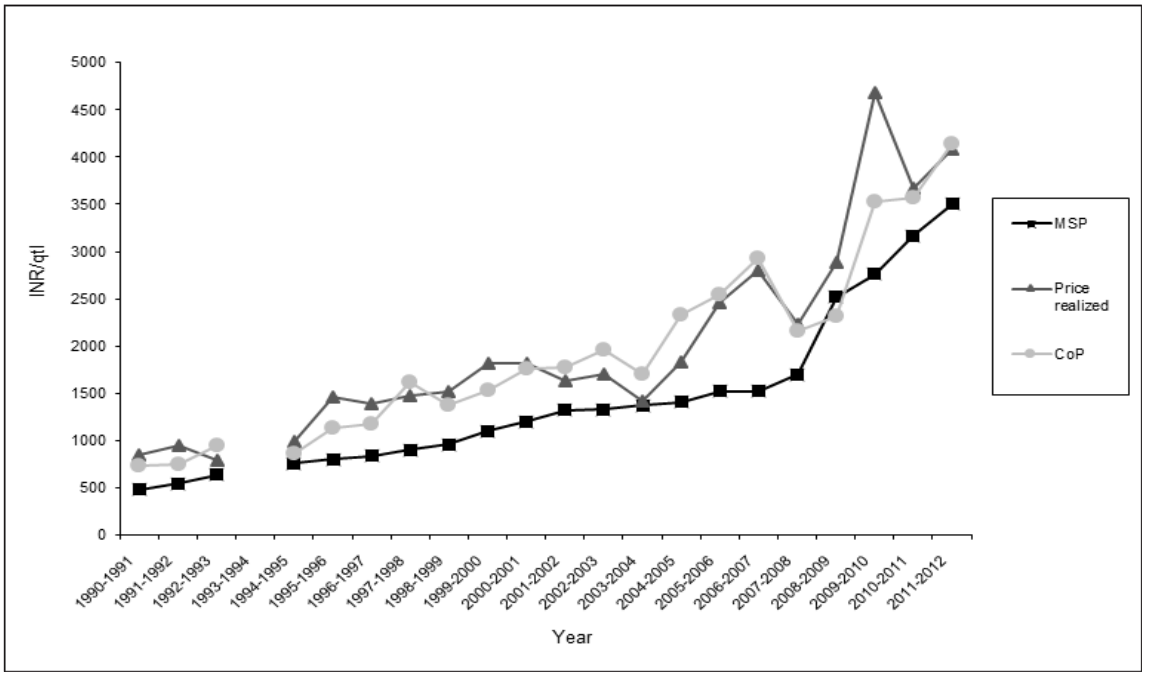
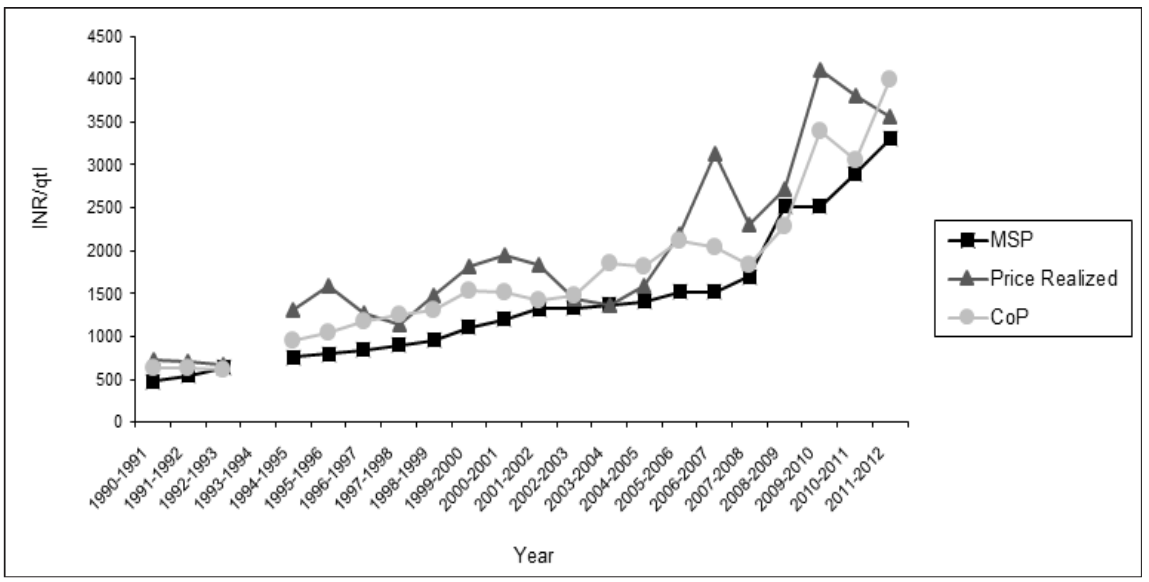


Figure 6d. Trends in the MSP, CoP, and price realized for urad*



Source: *Computed from CACP data

Table 6. Average ratios of GVO to CoC (1990–1991 to 2011–2012)

Period	Arhar		Gram		Moong		Urad	
	GVO/C2 CoC	GVO/A2 CoC	GVO/C2 CoC	GVO/A2 CoC	GVO/C2 CoC	GVO/A2 CoC	GVO/C2 CoC	GVO/A2 CoC
1990–1991 to 1994–1995	1.51	3.19	1.31	2.65	1.09	2.08	1.20	2.41
1995–1996 to 1999–2000	1.64	3.89	1.31	2.78	1.13	2.02	1.17	2.38
2000–2001 to 2004–2005	1.27	2.67	1.30	2.76	0.90	1.46	1.07	2.01
2005–2006 to 2011–2012	1.26	2.49	1.38	3.01	1.10	2.00	1.24	2.45
1990–1991 to 2002–2003	1.49	3.32	1.30	2.73	1.05	1.84	1.19	2.37
2003–2004 to 2011–2012	1.26	2.50	1.37	2.98	1.06	1.88	1.19	2.33

Source: Computed from CACP data

higher for arhar and gram in the first and second periods, respectively.

In sharp contrast to gram and arhar, the price realized by farmers for moong was lower than the CoP from 2001–2002 to 2006–2007. However, the situation improved from 2007–2008 onwards. For urad, the situation was slightly better because the prices realized by farmers were higher than the CoP from 2005–2006 onwards. In the first period, it turned out to be higher in 10 cases out of 14 cases with varying margin levels.

Farm Profitability: the General Trend

Farmers are more interested in the net income from the cultivation of a crop than in the price of the product they receive. CACP has the data on gross value of output (i.e., value of the main product plus value of the by-product) and cost of cultivation per hectare. Though it used eight different concepts of costs, this study preferred to use the C2 cost concept to calculate net farm income. The difference between gross value of output (GVO) and C2 cost provides a measure for net farm income. Similarly, to calculate farm business income, the study used the A2 cost concept. To get the level of margins over total cost and variable costs, the trends in the ratio of GVO to C2 cost and the ratio of GVO to A2 cost were considered.

The ratios of GVO to costs show that the value of output was greater than all the costs throughout the period for both arhar and gram (Table 6, Figures 7, and 8). For arhar, the averages show that the ratio of GVO to C2 cost was more than 1.5 until 2000 but declined to 1.27 in 2001–2005 and to 1.26 in 2006–2012. The ratio of GVO to A2 cost (for arhar) exhibits the same pattern. This indicates that the profitability of arhar was decreasing (Table 7).

Gram farmers improved their profitability from 2003–2004 to 2011–2012. The ratio of GVO to C2 cost for gram increased over time. The ratio increased from 1.30 in 1991–2003 to 1.37 in 2004–2012. The ratio of GVO to A2 cost also increased in 2004–2012 (Table 6). The major point of distress for arhar farmers was that the returns over paid out costs also declined in 2004–2012. Nonetheless, arhar was more profitable than gram in the 1990s, despite having lower growth in yield levels. This could be partly due to better prices realized by farmers for arhar. The situation became favorable for gram farmers during the 2000s because of significant improvement in yield levels.

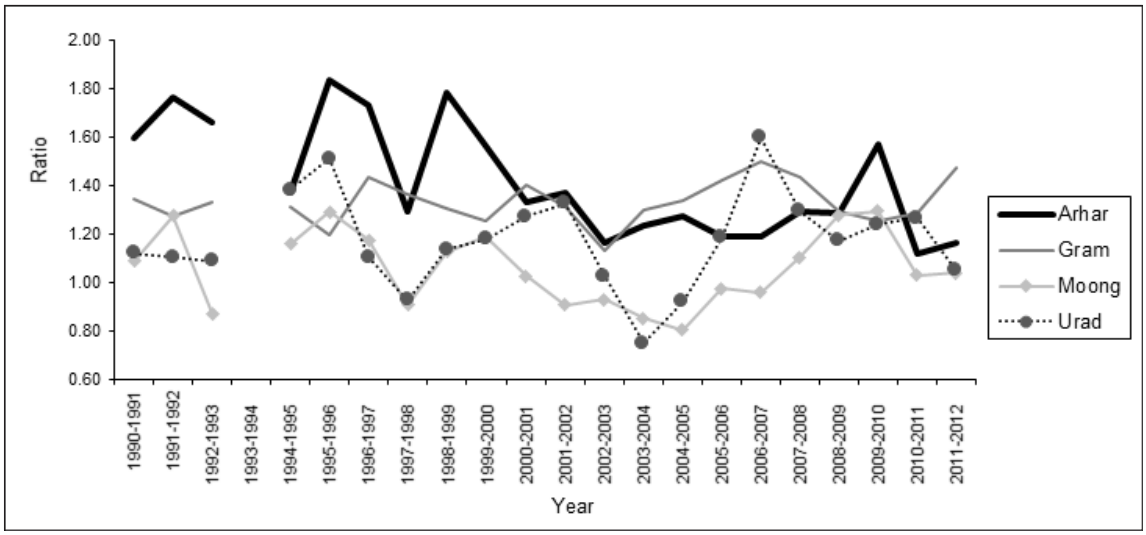
Table 7. Average ratios of GVO to CoC (1990–1991 to 2011–2012)

Period	Arhar		Gram		Moong		Urad	
	NI	FBI	NI	FBI	NI	FBI	NI	FBI
1990–1991	2,503	5,254	1,598	3,996	180	1,245	323	1,597
1991–1992	3,414	6,053	1,332	3,695	699	2,231	295	1,755
1992–1993	3,379	6,013	1,554	3,891	-392	927	287	1,911
1993–1994	NA	NA	NA	NA	NA	NA	NA	NA
1994–1995	2,534	6,191	1,922	5,088	447	1,521	1,705	3,989
1995–1996	6,542	11,119	1,176	4,335	1,062	2,502	2,829	5,835
1996–1997	5,461	9,858	3,329	7,437	902	3,293	587	3,405
1997–1998	2,299	6,574	2,713	6,577	-497	1,665	-393	2,227
1998–1999	6,401	11,054	2,184	5,690	765	3,468	742	3,856
1999–2000	5,490	11,302	2,218	7,077	1,514	5,200	1,266	4,568
2000–2001	2,899	7,940	4,500	10,642	216	3,585	1,966	5,673
2001–2002	4,121	10,174	3,590	9,607	-904	2,546	2,879	6,991
2002–2003	1,906	7,842	1,482	7,396	-577	2,696	202	3,942
2003–2004	3,110	9,884	3,144	8,775	-1,144	1,738	-1,732	1,211
2004–2005	3,791	10,892	3,501	8,939	-1,611	1,152	-596	2,798
2005–2006	2,915	10,471	5,779	13,217	-265	4,021	1,711	6,348
2006–2007	3,023	10,675	7,464	15,400	-485	4,131	7,350	14,013
2007–2008	5,351	14,479	6,632	14,767	1,250	6,363	3,395	8,902
2008–2009	6,137	16,895	4,756	13,276	3,589	9,994	2,177	8,719
2009–2010	17,515	33,286	4,486	13,853	4,357	11,545	4,046	12,375
2010–2011	3,871	18,104	5,130	14,994	517	8,171	4,913	14,041
2011–2012	5,657	23,465	13,107	28,661	859	11,271	1,112	11,946
Averages								
1990–1991 to 1994–1995	2,681.2	5,458.1	1,601	4,167	186.95	1,184.74	521.87	1,850.39
1995–1996 to 1999–2000	5,238.3	9,981.3	2,324	6,223	749.22	3,225.80	1,006.24	3,978.17
2000–2001 to 2004–2005	3,165.6	9,346.4	3,243	9,072	-804.12	2,343.48	543.97	4,123.11
2005–2006 to 2011–2012	6,352.7	18,196.4	6,765	16,310	1,403.25	7,927.88	3,529.20	10,906.24

Note: NI = net income; FBI = farm business income
Source: Computed from CACP data

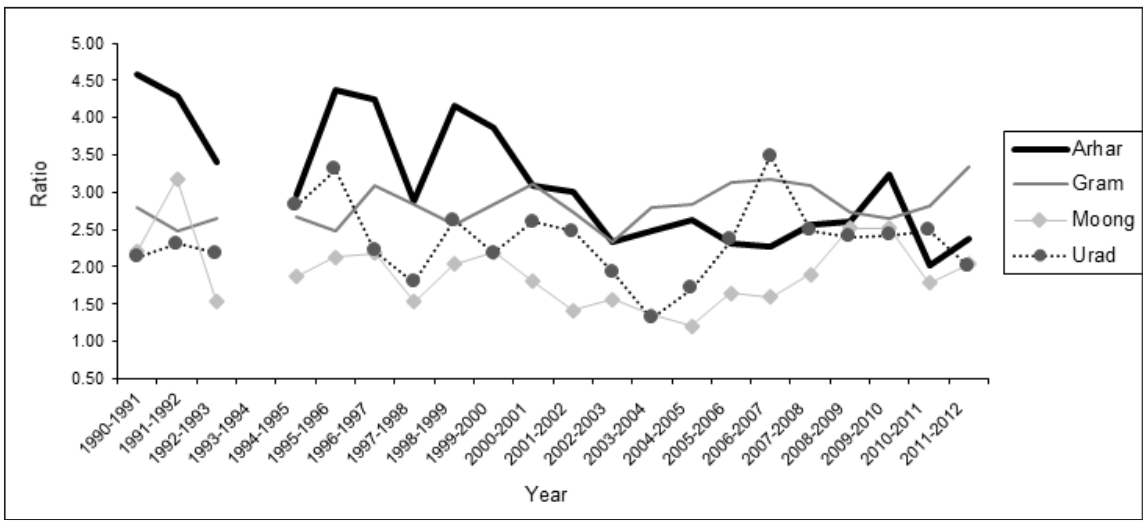
For moong, the value of output was lower than the total cost between 2001–2002 and 2006–2007 (Figure 7). The averages show that the ratio of GVO to C2 cost for moong has been 1.13 in 1996–2000 but declined to 0.90 in 2001–2005 (Table 6). As a result, farmers incurred a net loss of INR 804/ha in 2001–2005. However, moong farmers improved their profitability, particularly after 2004–2005 (Figure 7). For instance, for C2 costs, moong farmers received 28 percent net returns over costs in 2008–2009. Urad

Figure 7. Ratio of returns to total costs for arhar, gram, moong, and urad



Source: Computed from CACP data

Figure 8. Ratio of returns to total costs for arhar, gram, moong, and urad



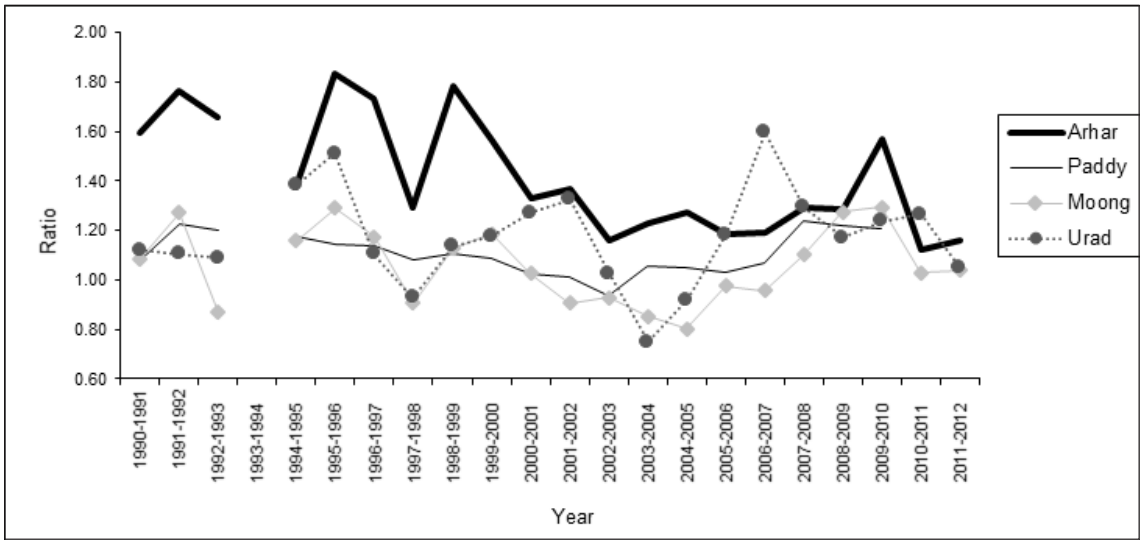
Source: Computed from CACP data

cultivation turned out to be more profitable because farmers were able to obtain higher margins over total cost, but income was more volatile compared to moong.

Many people argue that lower returns from the cultivation of pulses compared to rice and wheat discourage them to diversify to pulses. Figure 9 and 10 illustrate the movement of the ratios of GVO to C2 cost for pulses, paddy, and wheat. The ratios of GVO to C2 cost for wheat and paddy were taken from Tripathi (2013).

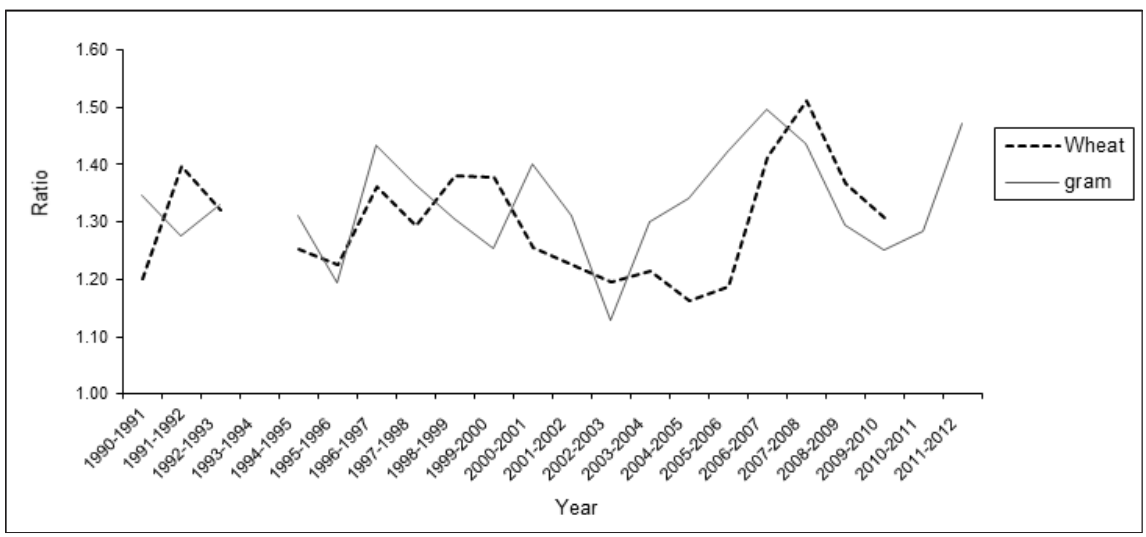
In the case of Kharif crops, arhar turned out to be more profitable than paddy as the margins over total costs remained higher for arhar throughout the study period. However, the gap between margins and total costs for arhar and paddy cultivation

Figure 9. Ratio of returns to total costs for arhar, moong, urad, and paddy



Source: Computed from CACP data

Figure 10. Ratio of returns to total costs for wheat and gram



Source: Computed from CACP data and Tripathi (2013)

narrowed significantly when the profitability of arhar declined and that of paddy increased, particularly after 2004–2005. Paddy was more profitable than moong, particularly during the 2000s.

Unlike Kharif crops, no specific pattern was observed in the relative profitability of wheat and gram. However, it is important to mention that during the 1990s, the years when wheat became more profitable than gram were the years when the wheat procurement price was increased substantially (Chand 2005). The situation improved considerably for gram during the 2000s as margins over total costs significantly increased.

The dramatic increase in international prices of wheat urged the government to raise its MSP by 21 percent in 2007 and 18 percent

in 2008. This resulted in higher margins over total costs for wheat farmers. For instance, wheat farmers received 51 percent and 37 percent returns over their total CoP in 2007–2008 and 2008–2009, respectively. These changes made wheat more profitable than gram.

The analysis shows that among Kharif crops, arhar is more profitable than paddy, while moong is less remunerative. Among Rabi pulses, gram loses to wheat in terms of relative returns over total costs. Therefore, if gram or moong will be promoted, the relative incentive structure has to be changed, or productivity should be increased, or both.

CONCLUSION

The agricultural price policy, which aims to provide a remunerative and stable price environment to farmers through the system of assured prices (i.e., MSP and obligatory procurement by government agencies), has largely been irrelevant in the case of pulses. The prices received by farmers for these crops have always been higher than the MSPs. The ratio of price realized to MSP was greater than one for the four pulses for nearly the entire period of the study, which makes the MSP irrelevant to both producers and consumers. It also indicates that increases in the MSPs did not keep pace with increases in market prices. Its irrelevance to farmers can also be observed in how, despite having a favorable support price regime vis-à-vis wheat and paddy, the MSPs could not increase the area under cultivation. Therefore, to make the MSP relevant to pulses, there is an urgent need to link it to market prices.

Compared to rice and wheat, for which the MSPs have provided a reasonable level of margin of about 20 percent over total costs to farmers, the MSPs of pulses have either remained very close to the CoP without leaving any margins or were below the CoP, which partly explains why farmers preferred the paddy-wheat cropping pattern instead of pulses. The MSPs of pulses registered an increase of more than 100 percent from 2010–2011 to 2004–2005, but this was significantly offset by the increasing cost of production. However, given the significant improvement in yield levels, the CoP for the four pulses witnessed higher growth in the recovery phase, mainly because of higher growth in the CoC that outstripped the growth in yield. The rate of return for the four pulses was found to be very attractive compared to the level of return because the cost per unit area turned out to be higher than the cost per unit of output. This requires a shift from CoP to CoC in (support) price policy with respect to pulses.

The study found that the profitability of arhar and gram diminished and improved, respectively. For instance, arhar farmers received only 26 percent returns over their total CoP from 2005–2006 to 2011–2012, whereas gram farmers received 38 percent returns over costs. However, arhar turned out to be more profitable during the 1990s, despite having relatively poor yield growth rates, because it has better prices realized by farmers compared to gram. For moong, the value of output was lower than all the costs between 2001–2002 and 2006–2007. For urad, cultivation was more profitable because farmers were able to obtain higher margins over total costs, but income was more volatile. On average, the returns over total CoP for arhar and urad were almost similar from 2005–2006 to 2011–2012.

Among Kharif pulses, arhar was more profitable than paddy. This was based on relative returns over total costs for various pulses compared to wheat and paddy. The margins over total costs remained higher for arhar throughout the study period. Paddy

cultivation was more profitable than moong cultivation, particularly during the 2000s. There was no specific pattern observed among Rabi pulses in terms of relative profitability for wheat and gram during the 1990s. However, gram lost to wheat in terms of relative returns over total costs because of the substantive increase in the MSP of wheat from 2007 onwards. Therefore, if gram or moong will be promoted, the relative incentive structure has to be changed, or productivity should be increased or both.

As the price policy has done little to minimize the vast gap between the prices received by farmers and wholesale market prices, there is a need to review the criteria for fixing the MSP of pulses by making it sensitive to prevailing market prices. Also, as the margin of the MSP over the cost of production varied widely, there is a need for greater transparency in the methods applied to determine the MSP. The procurement of pulses remains a deficit area that deprives farmers of the full advantage of the price policy. This highlights the need to designate appropriate agencies for procurement operations by the state to incentivize farmers to adopt modern technology, and raise productivity and overall production in line with the emerging demand patterns.

REFERENCES

Byerlee, D., and R. White. 1997. "Agricultural Systems Intensification and Diversification through Food Legumes, Technological and Policy Options." Paper presented at the III International Food Legumes Research Conference, Adelaide, Australia, 22–26 September 1997.

Chand, R. 2000. "Trade Liberalisation, Agricultural Prices and Net Social Welfare in India." Keynote paper presented at the Third Asian Conference of Agricultural Economics, Jaipur, India, 18–20 October 2000.

———. 2003. "Minimum Support Prices: Changing Requirements." E*conomic & Political Weekly* 38 (29): 3027–3028.

———. 2005. "Whither India's Food Policy? From Food Security to Food Deprivation." *Economic & Political Weekly* 40 (11): 1055–1062.

———. 2008. "Global Food and Financial Crisis: Experiences and Perspectives from India." In *Agricultural Reforms and Trade Liberalization in China and Selected Asian Countries: Lessons of Three Decades, Policy Assistance Series 6,* RAP Publication 2009/15, 151–161. Bangkok: Regional Office for Asia and the Pacific (RAP), Food and Agriculture Organization of the United Nations.

———. 2012. "Development Policies and Agricultural Markets." *Economic & Political Weekly* 47 (52): 53–63.

GOI (Government of India). 1965. Government Resolution on the Terms of Reference of the Agricultural Prices. New Delhi: Agricultural Prices Commission, Ministry of Food and Agriculture.

———. 2009. Report of Expert Group on Pulses. New Delhi: Department of Agriculture and Cooperation, Ministry of Agriculture.

———. 2014. Agricultural Statistics at a Glance. New Delhi: Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture.

———. 2015a. Price Policy of Kharif Crops: The Marketing Season 2015–16. New Delhi: Commission for Agricultural Costs and Prices, Department of Agriculture and Cooperation, Ministry of Agriculture.

———. 2015b. Price Policy of Rabi Crops: The Marketing Season 2015–16, New Delhi: Commission for Agricultural Costs and Prices, Department of Agriculture and Cooperation, Ministry of Agriculture.

Gulati, A. 1987. *Agricultural Price Policy in India: An Econometric Approach*. New Delhi: Concept Publishing, Co.

Joshi, P.K., and R. Saxena. 2002. "A Profile of Pulses Production in India: Facts, Trends and Opportunities." I*ndian Journal of Agricultural Economics* 57 (3): 326–339.

Joshi, P.K., M. Asokan, K.K. Datta, and P. Kumar. 2000. "Socio-economic Constraints to Legumes Production in Rice-Wheat Cropping Systems of India." In *Legumes in Rice and Wheat Cropping Systems of the Indo-Gangetic Plain: Constraints and Opportunities,* edited by C. Johansen, J.M. Duxburv, S.M. Virmani, C.L.L Gowda, S. Pande, and P.K. Joshi, 176–184. Patancheru: International Crops Research Institute for the Semi-Arid Tropics; and Ithaca, New York, USA: Cornell University.

Kumar, B.L. 1978. "Declining Trend in Production of Pulses and Factors Affecting It." *Economic & Political Weekly* 13 (27): 1112–1114.

Reddy, A.A., M.C.S. Bantilan, and G. Mohan. 2013. "Pulses Production Scenario: Policy and Technological Options." Policy Brief No. 26. Patancheru: International Crops Research Institute for the Semi-Arid Tropics.

Tripathi, A.K. 2013. "Agricultural Price Policy, Output, and Farm Profitability—Examining Linkages during Post-Reform Period in India." *Asian Journal of Agriculture and Development* 10 (1): 91–111.