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INTRA-YEAR PRICE INSTABILITY OF COMMERCIAL CROPS IN INDIA: EXPLORING THE UNDERLYING DYNAMISM

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Abstract

One serious issue which creates far reaching repercussions in the commercial agriculture sector of India is the heightened instability in price both at the inter-year and intra-year level. An exploration of intra-year price instability, which is rarely addressed in the empirical studies, is attempted in this paper by selecting the case of four major commercial crops of India namely, Small Cardamom, Black Pepper, Natural Rubber and Tea. The study concludes that even in the scenario of integrated market setting price instability at the intra-year level is guided mainly by the seasonal character of supply. Hence, market offers high price to the farmers only when they have less to offer in the market and vice versa, which makes their income unstable in the short run, highlighting the need for stabilizing producers' returns.

Key Words: *Intra-year instability, seasonality, co-efficient of variation, inter-temporal arbitraging, cyclical fluctuations.*

1. Introduction

Commercial agricultural sector of India confronts many challenges in the present era of globalization. Of them 'price instability' is one of the most serious, which has long run repercussions in the sector apart from the instability in farmers' income (Maizels, 1992; Maizels, 1999; DFID, 2004; FAO, 2002). Recently, commercial agriculture of the country in general and plantation agriculture in particular has become highly domestic market oriented (Joseph & George, 2010). In addition to the erosion of external market, the sector is currently facing import threats from low cost producing competitors like ASEAN (Veeramani & Saini, 2011; Nagoor, 2010). The uncertainty in producers' returns due to heightened price instability in the domestic as well as in the international markets further aggravates the situation. Price volatility of cash crops is found to have severely inhibited investment in the sector and destabilized the earning of small holders (Rangachary, 2006).

Price instability has two dimensions: inter-year (long run) and intra-year (short run) instability. While inter-year instability captures 'between years' or long term variations in price intra-year instability captures 'within year' or short term variations (Arango, 2006; Cashin, Liang & Mc. Dermott, 1999). Intra-year instability has severe implications on farmers' income instability in the short run, which will perpetuate itself as long run instability. It results in large-scale uncertainties in agriculture and reduces farm efficiency (Lloyd, 1956). Even though inter-year dimension of price instability of commercial crops has received some attention in the empirical literature, intra-year instability still remains as a black box. The paper is an attempt to fill this gap by exploring the nuances of intra-year price instability of four major commercial crops namely, Black Pepper, Small Cardamom, Natural Rubber and Tea. The paper is organized in four sections including an introduction. The

second section outlines the theoretical underpinnings. The third section explores the dynamism of intra-year price instability and locates the crop specific factors driving it. The paper ends with a concluding remark with a brief policy note.

2. Intra-year Price Instability- Theoretical Underpinnings

It is theoretically argued by many (Page and Andrian, 2001; Johnson, 1975; Newberry, 1989; Reinhart & Borenstein, 1994), and empirically articulated by a few studies that primary commodity prices in general and the agricultural commodity prices in particular are more volatile in the short run (at the intra-year level) as compared to the manufactured goods (UNCTAD, 2008). The heightened volatility in primary commodity prices in the short run is attributed to the difference in elasticity of demand and supply (Shepherd, 1963; Page and Andrian, 2001). Given the inelastic supply and demand, primary commodity price instability is high because of the persistence of unexpected shocks to supply, as these are rare in the case of manufactured goods. If there is any shock to supply, given the inelastic demand, price will react largely and will produce more upswings for an unanticipated reduction in supply and down swings for an unanticipated increase in supply (Schwartz & Smith, 2000; Ott, 2012; Shepherd, 1963).

The predictable component in price variations at the intra-year level is the seasonal price movements (Lloyd, 1956; Chambers & Bailey, 1996; Shepherd, 1963; Newberry & Stiglitz, 1981; Curry, Nathan, Greely & Courvalin, 2010) apart from irregular variations (Ott, 2012; Sharma & Kumar, 2001; Dehn, 2000). The seasonal difference in prices may be either due to high cost involved in carrying the supply forward from one season to the other or due to less storability (Deaton & Laroque, 1996; Chambers & Bailey, 1996; Houthakker, 1961). When the supply is seasonal, price of the commodity touches the lowest level immediately after the harvest due to peak availability and price is normally observed to be high during the off-season months due to supply shortage. Hence, for agricultural commodities seasonal price fluctuations vary inversely with the normal pattern of monthly production cycle. Hence, the outcome of intra-year price variability is the instability in farmers' income in the short run, since high price is caught only when less is available to offer in the market. The possibility of stock holding and inter-temporal arbitrage smoothen seasonality and intra-year price instability (Deaton & Laroque, 1996). Hence, the pattern of intra-year instability is expected to be different for a storable crop from non-storable crop.

2.1 Intra-year Price Instability of Storable Commodities

Assuming a perfectly competitive market, with perfect information and full inter-temporal commodity arbitrage, the seasonal difference in prices for a storable commodity will be equal to the storage cost only, since the arbitrage will equate the price efficiently across times, leading to a low intra-year price instability (Deaton & Guy, 1990, Deaton, 1999; Lloyd, 1956). Relaxing the assumption of perfect information flow and full inert-temporal arbitraging, the market becomes imperfect and the storage by the producer depends upon the expectation regarding supply in the given crop season (Sharma & Kumar, 2001; Dehn et al, 2005; Caine, 1958; Johnson, 1975). Assuming that during a particular season the realized production is less than expected (crop failure) off-season price will increase at a higher rate, since less is available for the off-season. Theoretically, wide difference between season and off-season price during crop failure will lead to high intra-year instability. The inference is subject to the assumption that the season price will either remain the same or increase at a slower rate as compared to the off-season price due to less than expected supply realization.

On the contrary, assuming that during a season the realized output is more than expected (bumper crop), off-season price will be depressed since the increased output is going to be dumped in the off-season (Sharma & Kumar, 2001). Hence, the difference between season and off-season price will be low and consequently low intra-year instability. The observation is subject to the assumption that the price in the season will either remain the same or decline to a lesser extent as compared to the off-season. The inference is that in the case of storable commodities intra-year instability will fluctuate according to the variability in supply conditions with higher intra-year instability during crop failure and vice versa.

2.2 Intra-year Price Instability of Non-storable Commodities

Expectation regarding supply is less for a non-storable commodity, since storability and chance of inter-temporal arbitraging is comparatively low (Deaton & Laroque, 1996). Assuming that the supply is excess the seasonal price will be depressed and the off-season price will remain more or less the same at a high level (Sharma & Kumar, 2001). The resultant wide difference between season and off-season price will lead to high intra-year instability. On the contrary assuming a comparatively low supply (crop failure) the season price will increase at a faster rate than a normal supply realization by keeping the off-season price more or less the same at a higher level. In this case the difference between season price and off-season price will be low and, hence low intra-year instability.

Summing up, seasonal difference in prices will be high for a non-storable commodity like Small Cardamom as compared to a storable one like Natural Rubber and Black Pepper, in which case inter-temporal arbitraging by keeping in stock is not possible (Deaton & Laroque, 1996; Newberry & Stiglitz, 1979; Chambers & Bailey, 1996). We would also expect less seasonal difference in price if the crop were grown in more than once in a year (Tea), since supply is spread out throughout the year (Newbery & Stiglitz, 1981; Newberry, 1989). Apart from that, for a storable crop a shock to supply will amplify intra-year instability and it will be low for a non-storable crop in a similar situation (Sharma and Kumar, 2001). The inference is that intra-year instability can vary from year to year and also subject to a lot of crop specific characteristics such as storability of the crop and the number of time crop is grown in a year.

3. Intra-year Price Instability: Experience of the Selected Crops

Drawing from theory, intra-year price instability is closely associated with crop specificities. Since Small Cardamom is less storable and less possible for inter-temporal arbitraging, it is expected to have high average intra-year instability as compared to all other selected crops. Tea is available throughout the year and is expected to have low average intra-year instability. Black Pepper and Natural Rubber are storable and possible for inter-temporal arbitraging. Hence, intra-year instability is expected to be comparatively low.

Table 1. Intra-year Price Instability Comparison of Commercial Crops

Commodity	Average CV (1991-2010)
Small Cardamom	15.9
Black Pepper	11.7
Natural Rubber	11.1
Tea	9.3

Source: Spices Statistics, Tea Statistics, Rubber Statistics, 2012

In concord with our theoretical expectations, intra-year price instability is found to be the highest for Small Cardamom with an average Co-efficient of Variation (hereafter CV) of 15.9 and the lowest for Tea with an average CV of 9.3 (table 1). It is comparatively low for Natural Rubber (11.1) and Black Pepper (11.7). The difference in intra-year instability of crops can be traced in the specificities of the crops and the subsequent sections are devoted for the same.

3.1 Black Pepper

The production of Black Pepper is basically concentrated in South India with almost 75 per cent of the production being in the hills and plains of Kerala. The harvesting season of Black Pepper starts from November to January in the plains and from January to March in the hills. Since Pepper needs some curing in the light the product starts reaching the market with at least a month delay. Thus, we would expect the marketing season from December to April and off-season from May to November.

Table 2. Intra-Year Price Instability of Black Pepper

Year	Highest Price		Lowest Price		CV	Nature of Supply*
	Rs (Kg)	Month	Rs (Kg)	Month		
1990-91	40.22	November	28.75	July	10.43	Excess
1991-92	37.35	July	28.00	February	9.48	Excess
1992-93	32.06	November	26.25	August	6.42	Low
1993-94	48.94	March	27.03	April	19.61	Low
1994-95	78.00	October	46.19	May	18.14	Low
1995-96	83.69	May	68.83	January	7.11	Excess
1996-97	101.45	March	70.38	May-June	13.64	Low
1997-98	207.30	November	113.81	April	18.84	Excess
1998-99	219.75	August	183.95	February	5.34	Excess
1999-00	254.17	November	182.83	May	11.03	Excess
2000-01	237.55	April	103.00	March	28.04	Low
2001-02	103.44	May	63.19	February	15.41	Low
2002-03	104.75	October	79.44	July	8.85	Excess
2003-04	79.76	June	67.18	November	5.46	Excess
2004-05	75.96	April	61.50	November	6.58	Excess
2005-06	72.69	December	60.90	July	5.75	Excess
2006-07	124.64	September	69.54	June	21.71	Low
2007-08	148.71	March	125.38	September	4.96	Excess
2008-09	143.96	May	106.60	December	11.6	Excess
2009-10	147.61	November	126.09	April	5.87	Excess
Season: December to April (5 Months) Off Season: May to November (7 Months) Note: Excess = Above the Average, Low = Below the Average						

Source: Spices Statistics, 2012

Black Pepper price peaks in the off-season months in which the commodity is scarce in the market and reaches its bottom level during the peak season months, in which the commodity is available comparatively high in the market (table 2). The peak price observed off-season months are May (1995-96, 2001-02, 2008-09), June (2003-04), July (1991-92), August (1998-99), September (2006-07), October (1994-95, 2002-03) and November (1990-

91, 1992-93, 1997-98, 1999-00, 2009-10). Thus, in fourteen out of twenty cases (70 per cent) the highest price is turned out to be in conformity with our theoretical expectations. The lowest price is also found to be during the harvest: December (2008-09), January (1995-96), February (1991-92, 1998-99, 2001-02), March (2000-01) and April (1993-94, 1997-98, 2009-10). Hence, in 9 out of 20 instances (45 per cent) the lowest price has been observed in tune with our theoretical expectations.

Nevertheless, it could be observed that in some of the cases Black Pepper price is found to be peaking in the off-season month (November) just before the arrival of the next marketing season when there is the least availability in the market (1990-91, 1992-93, 1997-98, 1999-00, 2009-10). In the case of a storable commodity traders, expecting a high price in the off-marketing season, will keep the surplus under storage and sell in the off-marketing season which smoothens seasonality impact. This throws light on the fact that farmers' formed less expectations in these years in the market which limited inter-temporal arbitraging of the crop, even though it is storable.

Turning to the nature of intra-year instability across years, in majority of the cases it is turned out to be high in those years with supply shortage (1993-94, 1994-95, 1996-97, 2000-01, 2001-02, 2006-07) and low intra-year instability is associated with years with excess supply (1991-92, 1995-96, 1998-99, 2002-03, 2003-04, 2004-05, 2005-06, 2007-08) (table 2). The observation strongly supports our theoretical argument regarding a storable commodity that supply shortage will amplify intra-year instability by lifting the off-season price at a faster rate than a normal supply realized year.

3.2 Small Cardamom

Small Cardamom is also grown in the south Indian states of Kerala, Karnataka and Tamil Nadu and the marketing season of Small cardamom is from September to February with the peak marketing during October, November and December and off-season from March to August (Joseph, 1985). The quality of Small Cardamom is reflected in its green colour, and hence Cardamom needs to be properly cured and marketed as soon as possible before losing its green colour.

Agricultural commodities in general exhibit the co-existence of high price during the slack season and a low price during the peak season. Small Cardamom has been historically an exception to this rule and peak price is observed during peak season itself (Joseph & George, 2010). This exclusive price behavior is observed because of the inherent properties of the product and the nature of demand. The quality of Small Cardamom is reflected by its green colour, which can be maintained if it is properly cured and not kept for a longer time in storage. When it was a highly export oriented crop the export demand coincided mostly with the peak season since the green coloured Cardamom is available more in the peak season (Joseph, 1985). Hence, high export demand for green Cardamom in the peak season results in 'peak price during peak season'.

Small Cardamom today almost has become a home market oriented crop with only a negligible proportion of it goes for exports (Joseph & George, 2010). Nevertheless, the same nature of peak price during peak season can be expected in the present context given the demand to be either export or domestic. During the time when it was exported also the peak price was due to the inherent nature of the product itself (greater demand due to good quality green Cardamom in the season). In the changed scenario it is of our interest to revisit and see whether price is peaking in the peak season itself and understand its implications on intra-year price differences. Apart from that, we would expect high intra-year instability during periods of supply shock and vice versa, since supply shock will raise season price at a faster rate by keeping the offseason price to be low due to peak price during peak season and low price during slack season.

It could be observed that 'the peak price during peak season' has not disappeared almost (table 3). Peak season months with peak price are September (1993-94, 1994-95, 2002-03, 2003-04, 2005-06, 2006-07) and January (1996-97, 2007-08). Peak price is also observed during off-season months such as February (2000-01), April (1999-00, 2001-02), May (1992-93, 1995-96, 1998-99), June (1997-98, 2009-10), July (1991-92, 2008-09) and August (1990-91, 2004-05). In most of the cases we could observe the lowest price in the off-season months in support of our theoretical argument. Even though only in 8 out of 20 cases (40 per cent) peak price during peak season has come out, the lowest price during slack season has come out in favour of our theoretical anticipations in 14 out of 20 cases (70 per cent). Putting both the cases together the normal seasonality impact with at least any one of the two (either the highest price during peak season or the lowest price during off-season months) has been turned out to be in 14 out of 20 cases (70 per cent).

Table 3. Intra-Year Price Instability of Small Cardamom

Year	Highest Price		Lowest Price		CV	Nature of Supply*
	Rs (Kg)	Month	Rs (Kg)	Month		
1990-91	350.20	August	218.80	January	14.3	Excess
1991-92	328.83	July	221.76	August	13	Excess
1992-93	656.13	May	268.32	August	24	Low
1993-94	507.64	September	288.56	July	22.6	Low
1994-95	305.77	September	210.03	July	12.7	Excess
1995-96	320.87	May	161.56	February	24.1	Low
1996-97	437.80	January	283.34	June	14.8	Low
1997-98	354.95	June	230.29	December	14.7	Excess
1998-99	617.14	May	324.94	August	19	Low
1999-00	703.37	April	360.79	December	24.7	low
2000-01	628.47	February	424.41	July	10.4	Excess
2001-02	719.84	April	569.78	June	8.1	Excess
2002-03	746.79	September	381.00	July	21.1	Low
2003-04	434.33	September	328.00	February	9.7	Excess
2004-05	355.52	August	257.89	July	8.2	Excess
2005-06	239.71	September	190.57	March	7.1	Excess
2006-07	369.39	September	258.04	December	11.8	Excess
2007-08	601.83	January	395.07	August	14.8	Low
2008-09	684.45	July	440.10	December	14.5	Excess
2009-10	1564.37	June	659.15	October	29.2	Excess
Season: September to January (5 Months) Off season: February to August (7 Months) Note: Excess = Above the Average, Low = Below the Average						

Source: Spices Statistics, 2012

In favour of our theoretical expectations intra-year instability is found to be high mostly in those years with supply is low (1992-93, 1993-94, 1995-96, 1996-97, 1998-99, 2002-03, 2007-08, 2008-09 and 2009-10) and low intra-year instability is observed during periods of excess supply (1991-92, 1994-95, 1997-98, 2000-01, 2001-02, 2003-04, 2004-05, 2005-06, 2006-07) (table 3). The observation strongly supports our theoretical expectation regarding a non-storable crop, which has a seasonality impact opposite to a normal non-storable crop. The supply shock may be amplifying the season price at a faster rate by keeping the off-

season price approximately at a lower level and hence intra-year instability is high and vice versa.

3.3 Natural Rubber

Natural Rubber is a perennial crop, which requires about 6 to 7 years from the date of planting to harvest. The production of Natural Rubber peaks during October to March and from April to September the production will be comparatively low. Even then the crop is available throughout the year with some seasonal variations. Hence, we would expect a less seasonal variation in price and intra-year instability. This is mainly because of the reason that being an industrial raw material with continuous demand and more storability compared to other crops, supply can be inter-temporarily adjusted.

It is found that the price is peaking in majority of the years in the off-season months with many exceptional years as well (1991-92, 1994-95, 2001-03, 2003-04, 2005-06, 2007-08, 2009-10) (table 4). Thus, the highest price of Natural Rubber has come in favor of our theoretical expectations in 13 out of 20 cases (65 per cent), with less difference between season and off-season price (because of more stock holding and inter-temporal arbitrage as theoretically expected). The price peaks normally during May (1995-96, 2000-01), June (1990-91, 1996-97, 1998-99, 1999-00, 2004-05, 2006-07), July (1993-94) and August (1992-93, 1997-98, 2001-02, 2008-09).

Table 4. Intra-year Price Instability of Natural Rubber – RSS 4

Year	Highest Price		Lowest Price		CV	Nature of Supply*
	Rs (Kg)	Month	Rs (Kg)	Month		
1990-91	24.08	June	19.80	November	6.56	Low
1991-92	25.62	February	17.76	May	10.01	Excess
1992-93	25.77	August	17.76	May	16.17	Low
1993-94	26.81	July	23.90	October	4.03	Excess
1994-95	51.95	March	26.21	April	22.16	Low
1995-96	60.47	May	41.97	September	11.91	Excess
1996-97	53.85	June	41.99	March	7.38	Excess
1997-98	42.98	August	27.00	March	18.01	Low
1998-99	34.57	June	26.25	February	9.79	Excess
1999-00	34.08	June	28.18	April	6.18	Excess
2000-01	33.56	May	26.67	March	7.61	Low
2001-02	36.01	August	26.79	April	6.57	Excess
2002-03	45.17	March	33.89	April	9.03	Excess
2003-04	55.67	March	44.53	July	6.21	Low
2004-05	63.43	June	51.49	February	8.54	Excess
2005-06	80.69	March	58.40	April	11.29	Low
2006-07	106.92	June	82.60	November	8.33	Low
2007-08	103.54	March	79.43	July	7.51	Excess
2008-09	137.82	August	64.88	December	28.9	Low
2009-10	137.72	January	94.88	April	16.7	Low
Season: October to March (6 months) Off season: April to September (6 months) Note: Excess = Above the Average, Low = Below the Average						

Source: Rubber Statistics, 2012

On the other hand, the lowest price is observed mostly in the off-season months (1991-92, 1992-93, 1994-95, 1995-96, 1999-00, 2001-02, 2002-03, 2003-04, 2005-06, 2007-08, 2009-10) and a very few years show a lower price during seasons. Hence, low price has come in favor of our theoretical expectations only in 9 out of 20 cases (45 per cent). The observation is in conformity with our theoretical expectation regarding a storable commodity. By expecting a high price in the off-seasons more supply is injected in the market, depressing the price in those months. This also throws light on the possible irregularities in the price of Natural Rubber, being an industrial raw material.

Putting both the cases together the normal seasonality effect of at least one of the two (either the highest or the lowest price) has been turned out to be only in 13 out of 20 cases (65 per cent). This may lead us to the inference that there is high extent of inter-temporal arbitraging through stock holding and a lot of irregular influences on the price of Natural Rubber.

Being a storable crop, Intra-year instability of Natural Rubber is found to be high in those years with supply is comparatively low (1992-93, 1994-95, 1997-98, 2005-06, 2008-09, 2009-10) and it is found to be low in years with comparatively high supply (1993-94, 1996-97, 1998-99, 1999-00, 2001-02, 2002-03, 2004-05, 2007-08) (Table 4). The observation throws light on high extent of inter-temporal arbitraging in the case of Natural Rubber. The stock holding behavior of the traders suppress the off-season price at a faster rate during the periods of excess supply making intra-year instability to be low.

3.4 Tea

Tea, on the other hand, is a continuous crop. Even then, Tea production peaks during June to October and availability will be comparatively low during November to May. Hence, seasonal difference in price is expected to be quite low for Tea as compared to the other three selected crops.

It could be observed that the highest price is coming mostly in the months in which Tea is comparatively less available like January (1994-95, 1998-99, 2001-02), February (1993-94, 2003-04), April (1990-91, 1996-97), May (1992-93, 1999-00, 2009-10), November (1995-96) and December (1997-98, 2005-06) (table 5). The highest price of Tea has come in conformity with our theoretical expectations in 13 out of 20 cases (65 per cent).

On the contrary, the lowest price is rarely observed during the seasons and mostly the lowest price comes when Tea is relatively less available like January (1997-98), February (2007-08, 2008-09, 2009-10), March (1991-92, 1992-93, 1994-95, 1995-96, 1996-97, 1999-00, 2002-03, 2004-05, 2005-06, 2006-07) and April (2000-01). Thus, the lowest price has come in conformity with our theoretical expectations only in 6 out of 20 cases (30 per cent). Putting both the cases together the normal seasonality impact of at least one of the two (either the highest price or the lowest price) is turned out be in 13 out of 20 cases (65 per cent). This leads us to the inference that the seasonality effect is quite low for Tea as it is available more or less throughout the year and there are wide irregularities in the price of Tea.

Nevertheless, in conformity with our theoretical expectation regarding a non-storable crop intra-year instability is found to be high during periods in which supply is comparatively high (1995-96, 1997-98, 1998-99, 2001-02, 2002-03, 2004-05, 2009-10) and low in periods with low supply (1990-91, 1993-94, 1996-97, 1999-00, 2003-04, 2005-06) with some exceptional years (table 5). Tea, being a non-storable crop, is expected to have low intra-year instability when supply is low, because the season price will be increasing at a faster rate by keeping the off-season price more or less the same.

Table 5. Intra-Year Price Instability of Tea

Year	Highest Price		Lowest Price		CV	Nature of Supply*
	Rs (Kg)	Month	Rs (Kg)	Month		
1990-91	46.27	April	38.74	August	5.32	Low
1991-92	40.31	July	34.35	March	5.09	Excess
1992-93	40.92	May	32.17	March	7.98	Low
1993-94	52.63	February	44.53	October	4.87	Low
1994-95	45.49	January	32.55	March	8.9	Excess
1995-96	52.80	November	35.82	March	10.72	Excess
1996-97	51.30	April	44.28	March	5.85	Low
1997-98	82.08	December	48.75	January	17.38	Excess
1998-99	89.96	January	65.59	September	10.75	Excess
1999-00	76.49	May	58.65	March	7.57	Low
2000-01	70.37	July	48.85	April	10.17	Low
2001-02	73.91	January	52.97	October	9.89	Excess
2002-03	62.50	June	44.10	March	10.88	Excess
2003-04	62.28	February	52.20	September	5.43	Low
2004-05	70.76	September	48.59	March	12.63	Low
2005-06	61.56	December	52.65	March	5.15	Low
2006-07	71.84	June	55.30	March	8.99	Excess
2007-08	75.67	June	57.30	February	8.18	Low
2008-09	101.54	September	59.82	February	16.74	Low
2009-10	119.12	May	80.18	February	13.27	Excess
Season: June to October (5 months) Off season: November to May (7 months) Note: Excess = Above the Average, Low = Below the Average						

Source: Tea Statistics, 2012

4. Concluding Remarks and Policy Note

The present enquiry was an attempt to understand the dynamics of intra-year price instability of commercial crops specifically looking at Small Cardamom, Black Pepper, Natural Rubber and Tea. The study also tried to locate the factors which determine intra-year instability. Our analysis has come out with the following findings, which are policy relevant.

Given the difference in crop specificities, intra-year instability varies widely across the selected crops. As expected theoretically average intra-year instability for the whole period is found to be the lowest for Tea (9.3), since Tea is a continuous crop available throughout the year even though less storable. Small Cardamom (15.9) shows the highest intra-year instability because of less storability, which makes inter-temporal arbitraging less possible. Since Black Pepper and Natural Rubber are storable and more possible for inter-temporal arbitraging both the crops exhibit comparatively less degree of intra-year instability to the tune of 11.7 and 11.1 respectively. While for Black Pepper the normal seasonality impact (either the highest or the lowest price in conformity with the theory) has been observed in 80 per cent of the cases, for Natural Rubber, Small Cardamom and Tea it is 65, 73 and 65 per cent respectively. It should be noted that the order of intra-year instability is in strong conformity with the order of seasonality effect with Black Pepper being an exception. Hence, seasonality is identified to be one predominant predictable component in the intra-year price instability of commercial agricultural crops of India, notwithstanding the influence of random elements.

The intra-year instability is also found to be widely fluctuating across years for all the selected crops. Theoretically, the difference in intra-year instability across time periods can be explained in terms of supply conditions. It has been observed that the degree of intra-year instability is high during times of crop failure and low during bumper crop for storable commodities like Black Pepper and Natural Rubber. The observation goes along with the theory that during crop failure years less availability for off-seasons will pull the off-season price up at a faster rate by keeping the season price more or less the same and thereby increasing intra-year instability. A more than expected supply on the other hand will depress the off-season price at a faster rate since the excess is dumped in the off-season by keeping the season price more or less the same, thereby reducing intra-year instability. On the contrary, for a non-storable crop like Tea higher intra-year instability is observed during bumper crop and low during crop failure. As per the theory, a crop failure will raise the season price at a faster rate by keeping the off-season price more or less the same and thereby raising intra-year instability and vice versa. Small Cardamom requires a separate discussion since it is a unique crop which catches peak price during peak season and vice versa. Even though Small Cardamom is a non-storable crop higher intra-year instability is associated with crop failure and low with excess in the market. Since peak price comes in the peak season, a supply shortage will raise the season price at a faster rate by keeping the off-season price unchanged at low level and thereby raising intra-year instability. On the contrary, an excess in the market will depress the season price at a faster rate by keeping the off-season price at a low level and hence reducing intra-year instability.

The so far made discussion clarifies the fact that farmers' income in the short run or at the intra-year level is unstable and high price occurs only when less is available to offer in the market except for Small Cardamom, in which case peak price is observed during the peak season itself. Apart from that, only low price is quoted when there is more to offer in the market. The study throws light on the need for revisiting the price stabilization programmes of the Government of India namely Price Stabilization Fund*, which does not incorporate crop specific dynamism at the intra-year level. The study unanimously suggests that the price stabilization programmes of the governments should be crop specific since price instability dynamism is different for different crops as programmes suitable for a storable crop like Black Pepper and Natural Rubber may not be successful in the case of a non-storable crop like Tea and Cardamom.

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Footnote:

*Price Stabilization Fund is a scheme which aims at farmer's income stabilization. Under this scheme the farmers should contribute a given sum to the fund when price goes above a normal level and the amount contributed by the farmer with a given contribution from the government will be returned to the farmers during times of depressed prices.