COMMODITY PRICE INSTABILITY UNDER GLOBALIZATION
A STUDY OF INDIA'S PLANTATION CROPS

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A STUDY OF INDIA'S PLANTATION CROPS

Dissertation submitted in partial fulfillment of the requirements for the award of the degree of Master of Philosophy in Economics of the Jawaharlal Nehru University.

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M Phil Programme in Applied Economics

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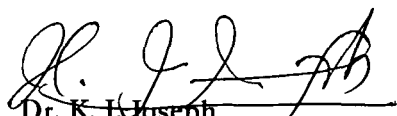
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I hereby affirm that the work for this Thesis, *"Commodity Price Instability under Globalization: A Study of India's Plantation Crops"*, being submitted as part of the requirements for award of the degree of Master of Philosophy in Applied Economics of the Jawaharlal Nehru University, was carried out entirely by myself. I also affirm that it was not part of any other programme of study and has not been submitted to any other University for the award of any Degree.

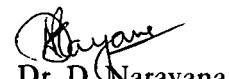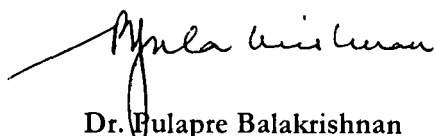Thiruvananthapuram
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To My Beloved Father and Mother…

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Abstract of the Dissertation
Commodity Price Instability under Globalization: A Study of India's Plantation Crops
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The current scenario of India's plantation sector is entirely different from what existed during the earlier period of protection and market intervention by the commodity boards. In the pre-reform period the sector was protected from external competition through trade restrictions and was operating in a regulated marketing system by the commodity boards and therefore domestic prices were governed mainly by the forces of domestic supply and demand. With the opening up of the economy and commodity market liberalization, domestic markets are increasingly getting integrated with the global market, wherein instability in domestic price is driven more by the global supply and demand forces. The present study, in this context, attempts to explore the dynamics of domestic price instability of five major plantation crops: Coffee, Tea, Natural Rubber, Black pepper and Small Cardamom. Specifically, the study examines two dimensions of price instability - inter-year and intra-year, and makes an attempt to locate the factors involved therein. Inter-year instability captures the long-term and medium-term dimensions of instability given its bearing on the long term planning and development of the sector. Intra-year instability, on the other hand, captures the short-run variations in price, which has crucial bearing on the producer returns in general and the livelihood of growers (especially small) and workers involved in particular. The period of analysis is from 1980 to 2010. The whole period has been divided in to two sub periods - pre reform period and post reform period as domestic price instability in the open and liberalized regime needs be seen differently from the earlier regime of protection and market regulations.

While inter year instability has been explained mainly by the multi year cyclicality arising in response to the cycles in production, intra year instability has been explained mainly by the seasonality of production with wide inter crop variations. The crops for which domestic market is highly integrated with the global market are found to be showing greater price instability in monthly and annual average prices in the open trade regime as compared to the closed and protected regime with widening cycles in amplitude and duration. The crops, which are highly domestic market oriented, are showing declining instability in the open trade regime as compared to the protected regime with low cyclical amplitudes in the 1990s as compared to the 1980s. Since crops like Small Cardamom and Tea are more domestic market oriented, the domestic price has been responding mostly to the cycles in domestic production rather than that of global production, with the domestic price responding to the global production only in the last few years in the 2000s. Since the markets for Black Pepper, Coffee and Natural Rubber are highly globally integrated domestic price has been responding more to the global production cycles in the open trade regime as compared to the closed regime. Hence, increased international integration of commodity markets for Natural Rubber, Coffee and Black Pepper might have resulted in increased instability. On the other hand, greater domestic market orientation of Small Cardamom and Tea appears to have helped reducing their price instability in the open trade regime as compared to the closed and protected regime.

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CHAPTER I

INTRODUCTION

Growth experience of countries, in general, tends to suggest that economic growth is associated with structural transformation wherein the share of primary sector in GDP declines which, in turn, is compensated by corresponding increase in the share of secondary sector and subsequently by the tertiary sector [Kuznets, 1966]. Indicative of the stage of development, agriculture holds a dominant position in many developing countries like India, where approximately sixty percent of the population still depends on agriculture for their livelihood. Within agriculture, plantation agriculture, historically known for the domination of large holders [George and Tharakan, 1985], has been a major source of foreign exchange earner in India. Here, the plausible exception is the import substituting crops like Natural Rubber. Currently, Plantation agriculture in India contributes to five per cent of the Net Sown Area (now owned mostly by small and marginal holders), 10 per cent of the agricultural income, 15 per cent of the agricultural exports and provides employment for 2.5 million workers annually, majority being women [Rangachary et al, 2006]. From the national perspective these figures may not look immensely impressive. However, from the point of view of the regional economies, wherein the plantation sector is concentrated, it is a major source of livelihood for their populations [Joseph, 2010].

In the present era of Globalization, involving greater integration between domestic and the world market, India's plantation agriculture is confronted with many challenges. Among them those relating to prices could be considered as one of the most important. Plantation sector in India, which contributed around 13 per cent of the total export earnings of the country during 1970-71, has become highly domestic market oriented with its share in exports today (2009-10) remains at around one per cent. Apart from the erosion of external markets the sector is currently facing import threats from other low cost producing competitors especially after the new free trade agreements like the India-Association of South East Asian Nations (ASEAN, hereafter) FTA [Nagoor, 2010]. One of the severe challenges faced by the sector is the uncertainty in producers'

returns due to heightened price instability in the domestic market. "Volatile and unpredictable prices have inhibited investment and adjustment to market conditions, particularly by the small holders and have destabilized their income and savings" [Rangachary, 2006, Chapter V, pp. 31]. Thus, unlike in the past when domestic markets were highly protected from outside competition, the scenario has completely changed with the greater integration of the domestic market with the world market. In this context, the present study is an attempt to analyze commodity price instability of plantation crops by specifically looking at two dimensions; inter-year (the long-term and medium-term) and intra-year (short-term) instabilities in price.

1.1. Larger Context and Significance of the Study:

Historically, commodity[1] prices are known for their instability in the international as well as in the respective domestic markets of the countries. "Commodity Price Instability" is a serious concern for all those countries, which depend on commodities as a main source of their expert earnings irrespective of whether they are developed or developing. The price instability problem becomes acute when a particular country depends on one or two commodities for bulk of their export earnings [Maizels, 1992; 2000]. This could be clearly seen from the export concentration of primary commodities in the total export basket of developing countries in general and High Poverty Prevalent Countries (HPPCs) in particular compared to their developed counterparts. While developed countries have an Export Concentration Index[2] of 0.12 developing countries in general have an index value of 0.23 as on 2007-08. Among the developing countries dependence on commodities as a source of export earnings is quite high in Africa and Oceania with an export concentration index of 0.49 and 0.48 respectively and comparatively low in Asia (0.22) and Latin America

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[1] When we refer to commodities we mean primary products whose price formation is happening through flexible markets (either well organized auctions or open markets). UNCTAD classifies commodities broadly in to A) Food and Tropical Beverages, B) Vegetable Oil Seeds and Oils, C), Agricultural Raw Materials, D) Minerals, Ores and Metals and E) Crude Petroleum.
[2] The Index used here is the Herfindahl-Hirschmann Index of concentration where a high index implies less diversified export basket and vice versa. Hence a higher H-H index implies a larger concentration of primary commodities in the export basket of countries.

(0.20) [UNCTAD, 2008]. Thus, high dependence on commodities in these countries leads to more vulnerability to any shock to the commodity sector.

The commodity price instability problem got wider global attention ever since the Prebisch-Singer hypothesis has been developed, empirically tested and verified [Reinhart et al, 1994; Calvo-Gonzalez et al, 2010]. Commodity prices in relation to manufactured goods have been secularly declining over long periods, which resulted in a continuous worsening of the developing countries' terms of trade. This secular decline in relative commodity prices along with greater short term and medium term volatility has been referred to as the so-called "Commodity Problematique". Even though countries from Asia, and to some extent, Latin America diversified their export base from primary commodities to other manufactures and services, a number of poorest and vulnerable countries from Africa and Oceania still depend on commodities as the main source of export earnings. While as many as 38 developing countries depend on a single commodity for more than 50 per cent of their export earnings, 48 developing countries depend on two commodities [UNCTAD, 2008]. Hence, any instability in the commodity sector will have a direct bearing on the livelihood of people in these countries. The inextricable nexus between the 'commodity problem' and the 'global poverty problem' has turned the former to be an important subject mater of policy concern at the global level.

Traditionally, the commodity problem of the developing economies had two dimensions. Firstly, the secular decline in real commodity prices[3] exported by developing countries vis-à-vis manufactured goods exported by developed countries leading to the secular decline in the developing countries' terms of trade. This secular decline has been attributed to the low income elasticity of demand for commodities in the developed countries implying that as the income increases demand for commodities grows only at a slower rate. Secondly, high short term and medium term volatility of commodity prices in the markets, jeopardizing the entire planning operations of producers leading to far reaching

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[3] Real Commodity Price in general is the nominal commodity price adjusted for global inflation by the global manufacturing unit value index. In a way it is also the relative price of commodity prices with that of the manufactured goods.

consequences for the economy in general and commodity sector in particular [UNCTAD, 2008]. This view regarding long run secular decline in real commodity prices was based on the assumption that the developing countries are the sole exporters and the developed countries are the sole importers of 'commodities'.

The current trade profile of the commodities at the global level does not hold the above stereotyping pattern. The commodity trade structure has changed in such a way that both developed and developing countries deal in commodity production and trade, with commodity trade among developing countries themselves increasing. Recently, both commodity exports to and imports from developing countries by the developing countries are on the increase because of the faster growth of South and East Asian economies. The commodity exports to developing countries by the developing countries have increased from 33 per cent during 1995-97 to around 41 per cent by 2003-05. Among the developing countries, the increase has been from 23 to 30 per cent for Africa, 31 to 33 per cent for Latin America and 37 to 48 per cent for Asia. Imports from developing countries also have increased from 56 to 61 per cent for the developing countries in general. And for Africa, Latin America and Asia the increase has been from 41 to 56, 51 to 53 and 59 to 64 per cent respectively [UNCTAD, 2008]. These developments however cannot be delinked from the growing number of PTAs and FTAs involving countries in the south.

However, since 2002 real commodity price in general at the global level is on a secular increase rather than a secular decrease. Thus, the context of 'the commodity problem' at the global level seems to have changed in such a way that the earlier stereotyping pattern of trade does not hold valid. Owing to the faster growth of the domestic market in developing countries 'commodities' have become domestic market oriented in some countries (countries like India and China), some other developing countries have successfully diversified towards manufactures and services (South - East Asian economies) and some countries still depend upon commodities as a main source for their income, employment and export earnings (countries in Africa and Oceania). Despite the fact that the

secular decline in real commodity prices has been reversed by the secular increase since 2002, greater short run and medium term variations in price still persist [UNCTAD, 2008].

Commodity price instability has micro and macro implications in the commodity producing economies. At the macro level earnings from commodities form a basis for government revenue and hence government spending on physical and human infrastructure, and also as source to repay their international debt [Page et al, 2001]. At the micro level, uncertainty about prices generally has a negative impact on investment and production planning of commodity producers leading to economy wide instability. Thus, the commodity sector needs to be strong for the better livelihood and welfare of the people in developing countries. It is this higher dependence of developing countries on commodities, whose prices are historically known for their volatility as compared to manufactured goods, for their developmental outcomes puts developing countries at a disadvantageous position as price instability has far reaching negative implications on their growth process [Parimal, 2006; Haque, 2004; CIDA, 2005]. It is said that partly as a result of this higher volatility of commodity prices commodity dependent countries have lower average long run growth rates than economies with diversified production structures which seriously inhibits their efforts to reduce poverty [UNCTAD, 2008].

Commodity problem of the developing countries has attracted greater attention both in academic and policy discussions at the global level than at the domestic level. As compared to the past commodity markets are increasingly integrated now, bridging the distinction between international price and domestic price of the countries concerned. In an increasingly integrated commodity market setting, developments in one part of the globe will have its due effect everywhere and no country is isolated in that respect. Even then, dynamics of price instability has much to do with the crop and country characteristics [UNCTAD, 2008].

Currently, for the domestic economy of India primary commodities form only a minor part of its export earnings. While primary commodities form 13.9 per cent

of the total merchandise export earnings of the country during 2008-09, manufactures and petroleum products account for 67.4 and 14.7 per cent respectively (Appendix I; Table A1.1). With in primary commodities, Agricultural and Allied Commodities which contributed around 21.2 per cent of the total merchandise export earnings of the country during 1987-88, contributes only 9.6 per cent during 2008-09. India is one among those developing countries, which has successfully diversified its export basket from primary commodities to other manufactures and services. With in primary commodities historically plantation commodities, which were mainly export oriented with very few exceptions of import substituting crops like Natural Rubber has now become highly domestic market oriented with a minor share of one per cent in total export earnings of the country. From 1987-88 to 2008-09, contribution of two main tropical commodities, Tea and Coffee, in the total merchandise export earnings of the country has declined from 3.8 to 0.3 per cent and 1.7 to 0.3 per cent respectively. This could be clearly visualized from the declining export intensity of many of the plantation commodities except Red Chilly and Coffee [Refer to Table 2.14, Chapter 2]. The export intensity[4] of Small Cardamom has declined drastically from 53.3 per cent in 1980-81 to just 5.8 per cent by 2006-07. For All Tea the export intensity has declined from 40.1 per cent in 1980.81 to 22 per cent during 2006-07. Export intensity of Black Pepper has declined from 89 per cent in 1980-81 to 58 per cent during 2006-07. Thus, the growing size of the home market due to better economic performance and increased per capita income growth has lead to low export orientation of commodities in general and plantation commodities in particular.

In nutshell, commodities appear to be loosing the external markets and face import competition. Even though plantation commodities do not contribute much to the national economy in terms of export earnings, they still remain a source of livelihood to the millions in the respective backward regions in which their production is concentrated. Thus, the growth and better performance of the plantation sector has immense potential to contribute towards the sustainable development of the less developed regions where the production of these crops is

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[4] Export Intensity gives the proportion of exports in total production of the respective commodity.

concentrated thereby making our national economy's impressive growth performance more 'inclusive'. As it is stated the plantation sector's competitiveness and prices decisively determines the ability to foster inclusive growth [Joseph, 2010]. It is in this context that the study of commodity price instability by choosing plantation commodities for the domestic economy of India assumes relevance.

1.2. Statement of the Problem and Objectives:

Commodity price instability often got less attention at the domestic level in the Indian context as compared to the global level. During the pre-reform period the economy was closed and commodity sector, in general, was protected from external competition through tariffs and non-tariff barriers like 'Quantitative Restrictions' on imports. Plantation commodities, in particular, were operating in a regulated marketing system by the respective commodity boards[5]. Under such conditions the price level in general and instability in particular were governed by the domestic forces of supply and demand in addition to the market structure that existed. With the opening up of the economy the domestic commodity markets are getting more integrated with the global commodity markets and the developments in world markets are having its due effect on the domestic commodity prices[6]. Thus, the global supply and demand are expected to influence the domestic price of the commodities.

Theoretically, market integration is expected to reduce price instability in the domestic market [Newbery and Stiglitz, 1981]. The crux of the argument is that the effect of domestic supply shocks on domestic price could be moderated by imports and an excess supply influence could be moderated by exports in an open trade system as compared to a closed system. The argument has two assumptions: i) The country is small in size and ii) Absence of interventions in commodity markets in the protected regime.

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[5] Interested readers may refer to Indira (1988), Narayana (1994)
[6] Interested readers may refer to Saikath and Sanjith (1994)

However, it could also be argued that with the opening up of the economy and greater international market integration the so far protected commodity sector is being exposed to the world markets, wherein instability in the world market gets transited to the domestic market [Brigit, 2004; Hema et al, 2007; Bastine et al, 2010; Saikath and Sanjith, 1994]. The spill over of instability in world price to the domestic price has two dimensions- it may lead to an increase in instability at the inter-year (across years) and intra-year (across months). Thus, the study aims to look at the dynamics of commodity price instability -at the 'inter-year' and 'intra-year' level- in the internationally integrated commodity market setting in comparison with the closed and protected regime by choosing five tropical commodities- three plantation commodities (Natural Rubber, Coffee and Tea) and two spices (Black Pepper and Small Cardamom). Inter-year instability captures the long-term and medium-term dimensions of instability given its bearing on the long term planning and development of the sector. Intra-year instability, on the other hand, captures the short-run variations in price, which has crucial bearing in the uncertainties in producer returns in general and the livelihood of growers (especially small) and workers involved in particular. Thus, the specific objectives of the study are the following.

1) To bring out the dynamics of inter-year and intra-year price instability of the selected plantation commodities in the post-reform period in comparison with the pre-reform period.

2) To identify the factors affecting price instability of the selected plantation commodities.

1.3. Data and Methodology:

The price data used for the analysis are the monthly and annual average prices of the chosen commodities from the respective commodity boards. For Small Cardamom[7], Coffee and All Tea the price is the average of prices observed in

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[7] For Small Cardamom price is a weighted average one. Since there are different varieties of Small Cardamom according to their quality difference like the Allappy Green from Kerala and Coorge Green from Karnataka and Tamil Nadu average price is weighted for the quality difference.

various auction centers. For Black Pepper and Natural Rubber the price is the market price observed in the Cochin and Kottayam markets respectively.

The analysis is for the period from 1980-81 to 2009-10. The total time span has been divided in to two periods - pre-reform (1980-1990) and post-reform (1991-2010). The rationale behind splitting the whole period into pre-reform and post-reform is that, compared to the pre-reform era the commodity markets are more globally integrated in the post-reform era and domestic commodity price instability is subject to the developments in the world markets. So, the price instability in the changed environment has to be seen differently from the earlier regime of protection.

Analysis of price instability has been carried out mainly at two levels- at the inter-year level and at the intra-year level- for the whole period and for the pre-reform (1980-1990) and post-reform (1991-2010) periods separately. The analysis is done for both nominal and real price of the commodities in question. Real price is obtained by adjusting the nominal price series for the general price level in the economy by deflating the series by the Wholesale Price Index (WPI) of 1993-94 as base period. Real price is important since a hundred rupee which a Small Cardamom grower got for a kilogram during 1980 is not the same as the hundred he gets for the same kilogram of the article in 2010. Thus, the real price gives the movement of domestic nominal commodity prices vis-à-vis the general price level in the economy. The advantage of using real price as well for our study is to understand clearly the cyclical nature of prices, which will be quite visible when the series is adjusted for the general price level in the economy.

Inter-year instability captures the between-year variations in annual average prices, which has all the limitation that within year (across months) or short run variation in price is not taken in to account. Intra-year instability captures price variations within a year and across months. For capturing intra-year instability most common measure of coefficient of variation and the percentage difference of the lowest monthly price from the highest monthly price in a year are made use of. The limitation of coefficient of variation that being an average the extent to

which price hikes and slumps across months in a year cannot be captured will be taken care of by the second measure. For measuring inter-year instability four indices are available- Coefficient of Variation, Cuddy-Valle Instability Measure, Mc-Bean Instability Index and Standard Deviation of Growth Rate. For understanding time varying instability price deviations from trend (5 year moving average) has also been undertaken. This can capture the year-wise movement of price differences from the trend, which can be a measure of the instability in the price data. A detailed methodology will be given in each chapter.

1.4. Outline of the thesis:

The thesis is organized in six chapters including the introduction. The second chapter gives a background for the analysis of price instability in plantation commodities by discussing the performance of plantation sector and highlighting the decisive role of price in determining the fortunes of the producers. The third chapter sets the analytical framework of the study by attempting a detailed review of the theoretical and empirical literature on commodity price instability. The fourth chapter attempts to explore some ground level realities of price instability of the selected commodities focusing mainly upon inter-year dimension of instability in annual average prices. The fifth chapter deals with analysis of short run price instability by exploring the dynamics of 'intra-year price instability' and the sixth and final chapter concludes.

APPENDIX I:

Table A1.1: Share of Commodities in Total Merchandise Export Earnings of India during 1987-88 and 2008-09

Items	1987-88	2008-09
I. Primary Commodities	26.1	13.9
A. Agriculture and Allied Products	21.2	9.6
1. Tea	3.8	0.3
2. Coffee	1.7	0.3
3. Rice	2.2	1.3
4. Wheat	0.2	0.0
5. Cotton Raw including Waste	0.7	0.3
6. Tobacco	0.9	0.4
7. Cashew including Cashew Nut Shell Liquid	2.0	0.3
8. Spices	2.1	0.8
9. Oil Meals	1.4	1.2
10. Fruits and Vegetables	0.6	0.5
11. Processed Fruits, Juices, Miscellaneous Processed Items	1.1	0.4
12. Marine Products	3.4	0.8
13. Sugar and Molasses	0.1	0.5
14. Meat and Meat Preparations	0.6	0.6
15. Other Agriculture and Allied Products	0.2	1.7
B. Ores and Minerals	5.0	4.3
II. Manufactured Goods	67.8	67.4
III. Petroleum Products	4.1	14.7
IV. Others	1.9	4.1
Total Exports	100.0	100.0

Source: *Handbook of Statistics on Indian Economy, RBI*

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CHAPTER II

PERFORMANCE OF INDIA'S PLANTATION SECTOR AND THE DECISIVE ROLE OF PRICE FACTOR

As in other countries, plantation agriculture in India has been promoted as a foreign exchange earner, with the exception of import substituting crops like Natural Rubber. The sector had been highly protected in the initial years from external competition and markets had been regulated through strategic state interventions through the respective commodity boards. Later with the improvement in foreign exchange position and faster growth of the economy pressure on plantation crops to be export intensive got reduced and the crops have become domestic market oriented. With the opening up of the economy and dismantling of protection, apart from the erosion of external markets the sector currently faces import competition from "low cost desperate exporting countries[1]" with limited domestic market like Vietnam, Guatemala and so on [Nagoor, 2010]. The situation has been further accentuated by the signing of free trade Agreement with ASEAN countries which is expected to create more imports at low cost through trade creation effect [Veeramani et al, 2011].

In this changed scenario the sectors' performance depends not only upon its international competitiveness, but also upon how effectively the sector is able to cop up with the current policy changes. No wonder, the Indo-ASEAN agreement has been a point of serious concern for plantation crops dominated states like Kerala. The concern was essentially because of the plausible decline in prices on account of heightened import competition. Thus viewed, there is a crucial bearing of prices on the livelihood of different stake holders in the plantation sector like growers (mainly small and marginal holders) and workers[2]. The

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[1] This term refers to those competing countries with substantial production and negligible domestic market. Under these conditions these countries are forced to export all their output even by resorting to such strategies as dumping. A typical example is the case of Black Pepper in Vietnam. See for reference Joseph and George 2010.

[2] In the recent past for some seven to eight years, the prices of the plantation crops crashed one by one, breaking the high ranges' economy of Kerala. Unable to survive, 18 tea estates in Peermade taluk of the district alone have closed in the past five years till 2006. Many have been abandoned by the owners. It is estimated that some 20,000 tea-related workers have lost their jobs in the Peermade region. Many survive on the five-kg-a-week free rice provided by the Government. Even in those estates, which have managed to survive, workers get only three or four days' work a week and earn only a part of the

present chapter is an attempt to analyze the performance of India's plantation sector and to highlight the decisive role of price factor in determining the fortunes of actors involved in the sector at various levels.

The chapter is organized in six sections. The first section deals with the analysis of trends in area, production and productivity, specifically taking the case of commodities in question- Natural Rubber, Coffee, Tea, Small Cardamom and Black Pepper. The second section looks at the changes in land holding pattern in the plantation sector. The third and fourth sections discuss issues related to the export performance and employment in the sector respectively. The fifth section highlights the role of price factor in determining the fortunes of the actors involved in the sector and the final section concludes the discussion.

2.1 Trends in Area, Production and Productivity

2.1.1 Natural Rubber

Natural Rubber is an industrial raw material used in the production of tyres and tubes derived from the latex of the tropical tree called "Hevea brasiliensis". Rubber is mainly grown in Thailand, Indonesia, Malaysia, India, Srilanka, Vietnam, China, Philippines, Singapore and Nigeria. The details regarding the production of Natural Rubber are presented in Table 2.1. Currently Thailand is the largest producer of Natural Rubber with a share of 30 per cent of world production, followed by Indonesia (27 per cent), Malaysia (10 per cent) and India (8 per cent).

Table 2.1: Production of Natural Rubber in
Main Producing Countries (2008)

Countries	Production (MT)	Proportion
Thailand	3166910	30.1
Indonesia	2921872	27.8
Malaysia	1072400	10.2
India	819000	7.8
others	2548717	24.2
World	10528899	100.0

Source: FAO Statistics, 2010

In India, Rubber is grown mainly in the southern state of Kerala and Kanyakumari district of Tamil Nadu (traditional areas), hinterlands of coastal

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normal wages. In many estates, trade unions have taken over the plantations and apportioned tea plants to the workers who pick the leaf and sell it at very low rates to middlemen. Unemployment and despair have forced thousands to migrate to Tamil Nadu and other States [Basheer in Hindu, Apr 18, 2006]

Karnataka, Goa, coastal Andhra Pradesh and Orissa, Konkan region of Maharashtra and some of the north eastern states like Tripura (non-traditional areas). Kerala alones accounts for 91 per cent of the total Natural Rubber production in the country, with 3 per cent in Tamil Nadu, 2 per cent in Karnataka, and 4 per cent in the North Eastern states. Within Kerala NR accounts for 24.5 per cent of the net sown area [Kerala Economic Review, 2009-10], and therefore has emerged as the single most important crop of Kerala's commercial agriculture.

Area under cultivation, production and productivity of Natural Rubber in India has been showing a consistent increase. The area under Natural Rubber cultivation was 3.38 lakh hectares during 1990-91, which has gone up to 4.63 lakh hectares by the end of 2008-09, marking an annual average growth rate of 1.91 per cent. The increase in area has been mostly on account of new areas being brought under cultivation in non-traditional areas. The production recorded a phenomenal increase from about 1.53 lakh tonnes in 1980-81 to 8.64 lakh tones in 2008-09 with an average annual growth rate of 6.86 per cent. The growth rate of production is found to be quite high in the pre-reform period and the growth rate got decelerated in the post-reform period. The productivity, which was only 788 kg per hectare in 1980-81, has gone up to 1867 kg per hectare in 2008-09, indicating an annual average growth rate of 3.31 per cent. The productivity of Natural Rubber in India is the highest in the world mostly on account of the new plant varieties developed by the Indian Rubber Research Institute of India (RRI). Even though the production growth rate got decelerated in the post-reform period as compared to the pre-reform period productivity growth rate remained more or less the same (see Table 2.2). This has been attributed mostly to the prevalence of old aged plants with low yield per hector which in turn calls for timely replanting [Joseph and George, 2010].

Table 2.2: Trends in Area, Production and Productivity of
Natural Rubber

Year	Area (Hectares)+	Production (Tonnes)	Productivity (Kg/Hectare)
1980-81	-	153100	788
1985-86	-	200465	898
1990-91	338550	329615	1076
1995-96	356444	506910	1422
2000-01	399901	630405	1576
2005-06	447015	802625	1796
2008-09	463130	864500	1867
Whole Period GR	-	6.86***	3.31***
Pre-reform Period GR	-	8.01***	2.55***
Post-Reform Period GR	1.91***	5.11***	2.63***

Note: += Area from 1993-94 to 2008-09
Source: *Rubber Statistics, Various Issues, Rubber Board*

2.1.2 Small Cardamom

Small Cardamom, popularly known as the "queen of spices", has been one of the oldest spices that originated from India as early as 5000 years ago in the mountains of south-western part of the peninsula [Singh, 2008]. The production of Small Cardamom is concentrated in the evergreen forests of south India. Though originated in India, Small Cardamom is now cultivated in countries like Guatemala, Indonesia, Tanzania, Sri Lanka, El Salvador, Vietnam, Laos and Cambodia. In India Small Cardamom is cultivated mainly in three states of Kerala, Karnataka and Tamil Nadu. In the production of Small Cardamom Guatemala dominates with a share of 37.8 per cent in world production, followed by India (20.8 per cent), Sri Lanka (3.8 per cent) and Laos (3.6 per cent).

Table 2.3: Production of Cardamom in
Main Producing Countries (2008)

Countries	Production (MT)	Proportion
Guatemala	28000	37.8
India	15450	20.8
Sri Lanka	2800	3.8
Lao PDR	2700	3.6
Others	25185	34.0
World	74135	100.0

Note: MT = Metric Tonnes
Source: *FAO Statistics, 2010*

Table 2.4: Trends in Area, Production and Productivity of Small Cardamom

Year	Area (Hectares)	Production (Tonnes)	Productivity (Kg/Hectare)*
1980-81	93950	4400	62
1985-86	100000	4700	77
1990-91	81554	4750	78
1995-96	83802	7900	128
2000-01	72320	10480	195
2005-06	73795	12540	210*
2008-09	71170	10999	-
Whole Period GR	-1.53***	5.60***	7.19***
Pre-reform Period GR	-0.36	-0.30	0.48
Post-Reform Period GR	-0.82***	5.11***	8.68***

Note: *= productivity is from 1980-81 to 2003-04
Source: *Spices Statistics, Various Issues, Spices Board*

Area under Small Cardamom cultivation in general has shown a decline over the years. The area under Small Cardamom has come down from 93,950 hectares in 1980-81 to 71,170 hectares by 2008-09 with some jumps in years in between, representing a decline of -1.53 per cent per year. Area decline has accelerated mainly in the post-reform period as area growth rate has been stagnant in the pre-reform period (no statistically significant growth rate in the pre-reform period). Production has grown from 4400 tonnes in 1980-81 to 10999 tonnes during 2008-09 at an average rate of 5.60 per cent per annum and the production growth rate has accelerated in the post-reform period as production was stagnant in the pre-reform period. Since production has expanded at a faster rate while area under cultivation is declining productivity is bound to increase at faster rate. Productivity has expanded from 62 kg per hector during 1980-81 to 210 kg per hector during 2005-06 marking a growth rate of 7.19 per cent. Productivity growth too has been accelerated in the post-reform era, which has been partly due to the decline in area growth rate and the acceleration in growth rate of production and partly due to the high yielding variety developed by Joseph Njallani [Joseph and George, 2010].

2.1.3 Black Pepper

Black Pepper, popularly known as the king of spices, is the most widely used spice in the world [Singh, 2008]. Black Pepper is the dried mature fruit of the tropical plant called, "*piper nigrum*". Black Pepper is mainly produced in countries like Vietnam, Indonesia, Brazil, India, China, Malaysia and Srilanka.

Vietnam has the highest share (24 per cent) in pepper production at global level, followed by Indonesia (19.5), Brazil (17 per cent), India (11.5 per cent), China (6.6 per cent), Malaysia (6 per cent) and Srilanka (5.6 per cent). Pepper is cultivated in India mainly in the south Indian states of Kerala (72 per cent), Karnataka (22 per cent), Tamil Nadu, Andhra Pradesh and Goa.

Table 2.5: Production of Pepper in
Main Producing Countries (2008)

Countries	Production (MT)	Proportion
Viet Nam	98300	24.0
Indonesia	79726	19.5
Brazil	69600	17.0
India	47010	11.5
China	27210	6.6
Malaysia	24500	6.0
Sri Lanka	22870	5.6
Others	40296	9.8
World	409512	100.0

Note: MT = Metric Tonnes
Source: FAO Statistics, 2010

Area under Pepper cultivation has increased from 1.09 lakh hectors during 1980-81 to 1.81 lakh hectors during 2008-09 recording an annual growth rate of 3.01 per cent. Area growth rate got decelerated in the post-reform period. Production has increased from 29490 tonnes during 1980-81 to 50000 tonnes during 2008-09 at an annual average growth rate of 3.25 per cent. Production is found to have grown at a faster rate in the pre-reform period while production has remained stagnant during the post-reform period. Since both area and production are growing almost at the same rate productivity in general has been stagnant, and increased in the pre-reform period because the production growth rate has been higher than the area growth rate. Productivity marked a negative growth rate in the post-reform period as area has been growing production has been almost stagnant.

Table 2.6: Trends in Area, Production and Productivity of
Black Pepper

Year	Area (Hectors)	Production (Tonnes)	Productivity (Kg/Hector)*
1980-81	109290	29490	270
1985-86	125120	34000	272
1990-91	173430	47950	276
1995-96	198870	70230	353
2000-01	213860	63670	298
2005-06	236177	50000	212
2008-09	181074	50000	276
Whole Period GR	3.01***	3.25***	0.30
Pre -eform Period GR	5.76***	7.88**	2.48*
Post-Reform Period GR	1.29**	0.21	-0.91

Source: *Spices Statistics, Various Issues, Spices Board*

2.1.4 Coffee

Coffee is regarded as the second most important commodity after petroleum products in international trade. At the global level even though coffee is grown in many countries Brazil enjoys the monopoly of coffee production with a share of 36.4 per cent. Other countries which produce coffee are Vietnam (13.9 per cent), Colombia (9 per cent), Indonesia (8.9 per cent), Peru (3.6 per cent), Ethiopia (3.6 per cent), Mexico (3.5 per cent), India (3.4 per cent) and Guatemala (3.2 per cent).

Table 2.7: Production of Coffee in Main
Producing Countries (2008)

Countries	Production (MT)	Proportion
Brazil	2796927	36.4
Viet Nam	1067400	13.9
Colombia	688680	9.0
Indonesia	682938	8.9
Peru	273780	3.6
Ethiopia	273400	3.6
Mexico	265817	3.5
India	262000	3.4
Guatemala	248614	3.2
World	7673558	100.0

Note: MT = Metric Tonnes
Source: *FAO Statistics, 2010*

Coffee production in India is confined to the states of Karnataka (52 per cent), Kerala (28 per cent), Tamil Nadu and Andhra Pradesh. The cultivation of Coffee is spread to a smaller extent in the states like Arunachal Pradesh, Assam, Orissa, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. At the all India level total

area planted is equal under the two varieties- Arabica and Robusta. While in many states Arabica is the dominant variety, in Kerala Robusta dominates.

Table 2.8: Trends in Area, Production and Productivity of Coffee

Year	Area (Hectares)	Production (Tonnes)	Productivity (Kg/Hectare)
1980-81	-	118646	-
1985-86	-	122445	571
1990-91	270821	169726	759
1995-96	305153	223000	921
2000-01	346716	301200	959
2005-06	379709	274000	803
2008-09	399683	289600	826
Whole Period GR	-	3.2***	-0.11
Pre-Reform Period GR	-	2.18	1.01
Post-Reform Period GR	2.22***	2.95***	0.73

Source: *Data Base on Coffee, Coffee Board*

Area under Coffee has increased from 2.71 lakh hectares in 1990-91 to 3.99 lakh hectares during 2008-09 showing a growth rate of 2.22 per cent per annum. Even though production of Coffee has grown, productivity remained stagnant during the entire period (no statistically significant growth rate). In the pre-reform period there is no improvement in production and productivity growth as area growth rate might be stagnant (data for area is not available for the pre-reform period). Not much improvement in productivity could be observed during the post-reform period as well. Thus, productivity of coffee in general has not shown significant improvement in India over the period.

2.1.5 Tea

The Tea plant got originated in the south east china, near the Naga, Manipuri and Lushai hills. Even though Tea today is known to be cultivated in many countries of the world, it is predominantly cultivated in Asia, Africa, and South America and to a smaller extent in Australia and Europe. From Asia, India, China, Bangladesh, Japan, Srilanka and Turkey; from Africa, Kenya, Malawi and Uganda; and from South America, Brazil, Argentina and Peru are the main countries which produce Tea. China ranks number one in Tea production in the world with a share of 33.3 per cent, followed by India (21 per cent) and Srilanka (8.3 per cent).

Table 2.9: Production of Tea in
Main Producing Countries (2008)

Countries	Production (MT)	Proportion
China	1275384	33.3
India	805180	21.0
Srilanka	318700	8.3
Others	1432541	37.4
World	3831805	100.0

Note: MT = Metric Tonnes
Source: FAO Statistics, 2010

In India major Tea growing areas are confined to the states of Assam (53 per cent), West Bengal (23.9 per cent), Tamil Nadu (11.3 per cent) and Kerala (8.44 per cent). Tea is produced to a smaller extent in Karnataka, Tripura, Sikkim, Manipur, Orissa, Nagaland and Arunachal Pradesh.

Table 2.10: Trends in Area, Production and Productivity of All Tea

Year	Area (Hectares)	Production (Tonnes)	Productivity (Kg/Hectares)
1980-81	381086	569172	1494
1985-86	399966	656162	1641
1990-91	416269	720338	1730
1995-96	427065	756016	1770
2000-01	504366	846922	1679
2005-06	555611	945974	1703
2008-09	579353	980818	1693
Whole Period GR	1.51***	2.01***	0.34*
Pre-reform Period GR	0.01	2.42***	1.27**
Post-Reform Period GR	2.33***	1.91***	-0.67***

Source: Tea Statistics, Various Issues, Tea Board

Area under Tea cultivation has gone up from 381,086 hectors during 1980-81 to 579,353 hectors during 2008-09 with an average growth rate of 1.51 per cent per annum. The area growth has been accelerated in the post-reform era and the area growth has been more or less stagnant in the pre-reform period. Production on the other hand has increased from 5.69 lakh tonnes during 1980-81 to 9.81 lakh tonnes during 2008-09 recording an annual average growth rate of 2.01 per cent. Production growth rate got decelerated in the post-reform period to 1.91 per cent from 2.42 per cent in the pre-reform period. Productivity has shown a minor increase of 0.34 per cent per annum over the whole period. Because of the deceleration in growth rate of production despite increase in growth rate of area under cultivation of Tea productivity declined in the post-reform period as compared to the pre-reform period.

In a nutshell, area and production has shown an increase over the period for all the selected crops except Small Cardamom for which area under cultivation was found to have declined. Given the fact that cost of cultivation for many crops is higher in India as compared to its competitors [Nagoor, 2010], one of the crucial factors which determine sector's performance and competitiveness is the improvement in productivity. Productivity is found to have increased at a faster rate for crops like Small Cardamom and Natural Rubber; both of which have almost reached an internationally comparable productivity level. But for crops like Black Pepper, Coffee and Tea productivity has either remained stagnant or increased at a much lower rate.

2.2 Changes in Land Holding Pattern

Historical evidence suggests that the plantation industries in India have been mainly under the control of foreign companies and later got transferred to large holders, which has been maintained as large plantation estates. In Kerala around 77 per cent of the area under Tea cultivation had been controlled by five Non-Indian Companies and in Tamil Nadu around 59 per cent of the area under Tea cultivation had been under the control of 6 Non-Indian Companies during 1925 [George and Tharakan, 1985].

Plantation sector based production in its initial years required a large scale virgin forest clearing and development of physical infrastructures such as roads, bridges, irrigation and other facilities. Thus, large scale estate mode of production in the initial years might have been promoted by the poor infrastructure facilities and the need for lumpy capital investment. Later with the development of better infrastructure facilities and large scale migration of farmers' families and promotional measures by the commodity boards, small holder participation is found to be on the increase in the case of almost all the plantation crops in India [Joseph and George, 2010].

Table 2.11: Land Holding Pattern of Natural Rubber

Year	<2 Hectors		<4 Hectors		4 to 600 Hectors		Total
	No of Units	%	No of Units	%	No of Units	%	
1990-91	763022	97.7	776122	99.4	4797	0.6	780919
1995-96	892094	97.9	906568	99.4	5047	0.6	911615
2000-01	968656	97.7	986303	99.4	5573	0.6	991876
2005-06	1032728	98.4	1044393	99.5	5262	0.5	1049655
2006-07	1055885	98.4	1067810	99.5	5310	0.5	1073120
2007-08	1079950	98.4	1092150	99.5	5419	0.5	1097569
2008-09	1114540	98.4	1127120	99.5	5578	0.5	1132698

Source: Rubber Statistics, Various Issues, Rubber Board

In the case of Natural Rubber the share of planters with less than two hectares were only to the extent of 21.81 per cent during 1955-56 [George and Tharakan, 2010]. Now the share of small holders with less than 4 hectors has almost reached 99.5 per cent, with in that the planters with less than 2 hectares has been to the extent of 98.4 per cent as on 2008-09 (Table 2.11). In the case of Tea which has been largely dominated by large holders with more than 10.12 hectors in the past has now become highly concentrated by small holders with a share of 98.9 per cent as of 2007-08. The same has been the case with other crops as well. Hence, the holding pattern of plantation agriculture sector has turned out to be small holder dominated unlike in the past.

Table 2.12: Land Holding Pattern of Tea

Year	<10.12 Hectors		10.12 to 400 Hectors		Total
	No of Units	%	No of Units	%	
2000-01	110396	98.6	1614	1.4	112010
2001-02	113650	98.6	1614	1.4	115264
2002-03	126167	98.7	1634	1.3	127801
2003-04	127366	98.7	1661	1.3	129027
2004-05	127366	98.7	1661	1.3	129027
2005-06	139041	98.8	1672	1.2	140713
2006-07	141544	98.8	1673	1.2	143217
2007-08	157504	98.9	1686	1.1	159190

Source: Tea Statistics, Various Issues; Tea board

2.3 Export Performance

As stated earlier, historically plantation sector in India has been promoted as an earner of foreign exchange and it served the purpose of financing our necessary imports in the import substitution regime to a larger extent. Either export

promotion (for Commodities like Cardamom) or import substitution (for commodities like Natural Rubber) has been the primary reason behind the setting up of commodity boards under the Ministry of Commerce [Joseph and George, 2010]. But, with the emergence of a vibrant service sector and growing manufacturing sector the role of plantation sector in the export basket of the country has been dwindling. As it is clear from Table 2.13, Plantation sector which contributed around 13.09 per cent to the total export earnings of the country during 1970-71, currently contributes hardly one per cent to the total export earnings of the country.

Table 2.13: Export of Plantation Crops in Total Exports

Year	Export of Plantation Crops (Rs. Crore)	Total Export (Rs. Crore)	Proportion
1970-71	200.916	1535.3	13.09
1975-76	359.984	4036.3	8.92
1980-81	718.754	6710.7	10.71
1985-86	1136.46	10894.6	10.43
1990-91	1564.44	32557.6	4.81
1995-96	3484.22	106353	3.28
2000-01	4848.65	203571	2.38
2001-02	4779.98	209018	2.29
2002-03	4999.08	255137	1.96
2003-04	5054.6	293367	1.72
2004-05	5539.96	375340	1.48
2005-06	6595.47	456418	1.45
2006-07	8023.49	571779	1.40
2007-08	8992.3	655864	1.37

Source: *Joseph and George, 2010*

The declining share of export earnings of the plantation sector to the total export earnings has often been attributed to the obvious structural change in the economy where in the emergence of service sector and manufacturing sector as major exporters results in decline in export share of the plantation sector [Joseph and George, 2010]. The same thing could be observed from the export intensity of many of the plantation commodities. Small cardamom was a highly export oriented commodity in the pre-reform period with 53. 3 per cent of the Small Cardamom produced in India entering to the export market. The export intensity of Small Cardamom declined drastically to 5.8 per cent during 2006-07. Even though export intensity of Black Pepper has declined, Black Pepper is still an

export oriented crop with almost 57.5 per cent of the produce being exported during 2006-07. Export intensity of Tea has declined from 40.1 per cent during 1980-81 to 22 per cent by 2006-07. Coffee on the other hand has shown an increase in export intensity from 73.6 per cent during 1980-81 to 86.5 per cent during 2006-07. One possible reason to this could be the involvement of re-export of Coffee by importing from other countries. Natural Rubber export has been a new phenomenon mainly since the opening up of the economy with 7 per cent of the Natural Rubber produced being exported during 2006-07.

Table 2.14: Export Intensity of Plantation Crops

Year	Small Cardamom	Black Pepper*	Tea	Coffee	Natural Rubber
1980-81	53.3	89.4	40.1	73.6	-
1985-86	69.6	110.6	32.6	81.1	-
1990-91	8.4	62.5	29.0	59.0	-
1995-96	6.7	37.4	22.1	76.7	0.2
1996-97	3.4	86.2	20.5	88.4	0.3
1997-98	4.7	62.6	24.8	78.4	0.2
1998-99	6.6	50.0	23.8	79.9	0.3
1999-00	7.2	85.4	22.9	83.9	1.0
2000-01	14.7	34.3	24.1	82.0	2.1
2001-02	9.1	37.2	21.1	71.1	1.1
2002-03	5.7	30.9	23.6	75.3	8.5
2003-04	6.0	25.7	19.4	86.0	10.7
2004-05	6.3	26.0	21.7	76.9	6.2
2005-06	6.9	34.7	20.6	73.6	9.2
2006-07	5.8	57.5	22.0	86.5	6.6

Note: Export intensity of Black Pepper is a little exaggeration as production of Black Pepper includes only black pepper, export includes Black Pepper and it's by products.
Source: *Derived from the Production and Export Data of Various Commodity Boards*

In general what we could observe is an increased domestic market orientation of the plantation crops except for commodities like Coffee. This trend of increased domestic market orientation has to be seen in the larger context of opening up of the economy and the vigorous competition in the international market. It is argued that owing to growing domestic demand and emergence of new low cost producers like Vietnam (for Black Pepper), Guatemala (for Small Cardamom) and Thailand (for Natural Rubber) on the one hand and emergence of European countries in exporting value added products in the international market on the other, India is losing export competitiveness in the international market [Nagoor, 2010]. Thus, it is also important that in an open economy to remain

internationally competitive, the sector needs to be domestically competitive as well, since there is every possibility of high cost domestic production being replaced by low cost imports from outside. The situation has been further accentuated by the signing of preferential trade agreement with ASEAN countries as ASEAN countries are a source of low priced plantation products.

2.4 Employment Generation

Despite many efforts to raise the level of employment, one major criticism of the faster growth performance of India and other emerging economies has been the "job-less growth". In Plantation sector, estate sector alone provides 2.5 million days of employment annually. The figure may not be so impressive for the national economy but significant for livelihood of the people in the regional economies in which the production of these crops are concentrated [Joseph, 2010]. It could also be noted that the proportion of women in the total employment has been quite high across all the crops. In the case of Tea women labour intensity has increased from 51.3 per cent during 1958-59 to 54.2 per cent during 2006-07. In the case of Natural Rubber it has increased from 25.6 per cent to 42.3 per cent. In the case of Coffee the increase has been from 45.7 per cent to 54.7 per cent.

Table 2.15: Proportion of Women in Total Employment in Tea, Rubber and Coffee Plantations

Commodities		Estimated Number (Principal Status)	No. of Women	Proportion of Women
Tea	1958-59	766473	393201	51.3
	1974-75	612079	300531	49.1
	1985-86	612079	300531	49.1
	2006-07	811854	440350	54.2
Rubber	1958-59	11900	3048	25.6
	1974-75	24824	8961	36.1
	1985-86	24824	8961	36.1
	2006-07	61270	25917	42.3
Coffee	1958-59	95700	43735	45.7
	1974-75	-	-	-
	1985-86	-	-	-
	2006-07	105288	57603	54.7

Source: *Joseph, 2010*

2.5 Role of Price Factor

Thus far we have discussed the performance of India's plantation sector in terms of area, production, export and employment. We have argued that the role of plantation sector as an export earner has declined significantly over the years. However, studies have argued that, notwithstanding the decline in the share of export earnings, the importance of plantation sector in India today is more than ever before. This is primarily because of its importance in employment generation (especially women), bearing on livelihood of growers (especially small holders) and its role in fostering balanced regional development because of its concentration in less developed regions of the country [Joseph and George, 2010]. In accomplishing the above new roles of the plantation sector, the role of the sector's performance cannot be ignored. Performance could be approached from difference perspectives like production and productivity, export, employment and prices. All these factors going by the empirical evidence is susceptible to endogenous and exogenous changes.

Table 2.16: Instability in Area, Production, Productivity and Price (Annual Data)

Commodities	Variables	Coefficient of Variation	Cuddy Valle Index[3]
1. Natural Rubber	Area	27.7	4.4
	Production	9.8	1.0
	Productivity	5.0	0.7
	Price	71.9	38.7
2. All Tea	Area	13.2	4.7
	Production	16.5	3.1
	Productivity	7.0	5.7
	Price	47.8	19.1
3. Coffee	Area	11.4	1.7
	Production	30.7	14.8
	Productivity	15.0	14.2
	Price	70.2	40.8
4. Small Cardamom	Area	48.3	19.5
	Production	55.0	22.5
	Productivity	13.9	7.3
	Price	55.4	48.8
5. Black Pepper	Area	30.1	20.2
	Production	25.3	12.0
	Productivity	16.0	16.1
	Price	74.9	56.6

Source: *Derived from Area, Production, Productivity and Price Data from Various Commodity Boards*

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[3] Measurement is detailed in section 4.2, "Choice of an Appropriate Price Instability Measure" of Chapter IV

However, it could be argued that among these variables price is the most important factor. As is evident from Table 2.16, among all the variables considered price is the most volatile factor. Especially With the opening up of the economy and greater international integration of commodity markets, the problem of price instability becomes an important concern, as price is completely left for the market forces. It is often argued that higher productivity can compensate the adverse effect of low prices. But if price goes miserably below a certain level, productivity expansion will not yield benefits as more has to be unleashed in to the market at a very low price. Even though Productivity is found to have increased at a faster rate for crops like Small Cardamom and Natural Rubber, it has either remained stagnant (Black Pepper and Coffee) or increased at a much slower rate (Tea). Increased productivity can be beneficial if the supply of the commodity can be effectively controlled for inter temporal arbitraging (sell the excess when price turns out to be in the boom phase). This becomes difficult for the small holders, who dominate the sector, as they are large in numbers. In a liberalized and internationally integrated market setting repercussions on domestic price will be much higher than the protected regime in which there were enough mechanisms like procurement by the commodity boards to control the domestic price. Since majority of the producers are small and marginal holders, they simply have to remain as price takers. Hence, when hard time arrives the entire sector is hit the hardest. Thus, price becomes a crucial factor which determines the fortunes of the actors involved in the plantation sector.

2.6 Summary

The chapter examines the performance of plantation sector in India by looking at the trend in area, production and productivity, changes in holding pattern, export performance and nature of employment and highlight the decisive role of price factor in determining the fortunes of the actors involved in the sector at various levels. It has been observed that the expansion in productivity has not been uniform across all the crops, while for some crops like Small Cardamom and Natural Rubber productivity has shown drastic expansion over the years, for

commodities like Black Pepper, Tea and Coffee productivity has not shown any improvement. Since the sector is dominated by small and marginal holders there are obvious limitations in taking advantage of the higher productivity situations since price is notoriously volatile and unpredictable. Hence, it affects the investment in the sector adversely. Even though the crops in general are domestic market oriented the concerns regarding price are accentuated by the greater international integration of markets since 1990's and the signing of free trade agreements with ASEAN countries. When hard time comes (when price is miserably low) the entire sector is hit the hardest. Hence, price, which is the most volatile among all other variables determining the performance of the sector, turns out to be a crucial factor in determining the fortunes of the producers in general and workers in particular.

CHAPTER III

ANALYTICAL CONTEXT

Having highlighted the importance of price factor in understanding the performance of plantation sector in general and bearing on the livelihood of different stake holders in particular, the aim of this chapter is to set an analytical context for studying the commodity price instability. The chapter has been organized in three broad sections. The first section details with the issues in the theoretical literature. The second section deals with the discussion of empirical literature on commodity price instability at the global and domestic level. The final section concludes the discussion by drawing some inferences for our further enquiry.

3.1 Theoretical Literature

Often the factors affecting commodity prices are popularly put in the broad heading of supply and demand mainly for it is simple to include each and every factor affecting price in these broad headings [Hoffman, 1931]:

> "...Supply and demand becomes a sort of coupled catchall through which every price influence must pass and in which one may hope to find all shades and varieties of price determinants"   ---[Hoffman, 1931; pp 91]

The implication is that the supply and demand changes resulting in price variability are not the ultimate factors rather it is the multiplicity of other factors which lead to variability in supply and demand. For instance, the variability in climate leads to changes in supply, which cause changes in the expectation of the actors in the market, resulting finally in the changes in price. These factors may be natural or artificial. Natural factors in general, are price elements inherently associated with the production conditions of the commodity like seasonality, cyclicality of production and artificial factors are man-made instruments or institutional mechanisms that influence price by manipulating either of the market forces such as futures trade, international commodity Agreements (ICA) and so on. This section gives an account of these factors driving commodity prices drawing from the existing studies.

3.1.1. Fundamentals of Commodity Price Instability

Newberry and Stiglitz [1981] give a detailed account of factors affecting commodity prices in general and agricultural commodity prices in particular in the same broad heads discussed by Hoffman by adding two more factors. According to them sources of price instability are on account of the variability in the following factors;

  i) Variability in Demand;
      -Systematic and
      -Nonsystematic.

  ii) Variability in Supply;
      -Systematic and
      -Nonsystematic.

  iii) Arbitraging and Speculating and

  iv) Government or third party Interventions.

3.1.1.1 Variability in Demand

Demand variability resulting in variability in price can be both systematic and non-systematic. Systematic demand variability occurs when there is variability in income and variability in the price of related goods, either substitutes or complements. When income varies over a period of time the commodities subject to demand variability forms cycles with respect to the cycles in income. For commodities like Metals, Minerals and Petroleum the demand variability in the industrialized countries cause the cycles in prices [UNCTAD, 2008]. Variations in the price of related commodities affect the price of the commodities in question by affecting the demand for the commodities concerned[1]. For instance if two goods are substitutes a systematic increase in the price of its substitute commodity will result in a shift in demand towards the commodity in question thereby affecting its price. Similarly, an increase in price of Synthetic Rubber can result in an increase in demand for Natural Rubber and its price since both are

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[1] The simple micro economic logic which states that prices of two goods are positively related if they are substitutes and indirectly related if they are complimentary goods

substitutes. Thus price of two commodities move together. This is referred to as co-movement of commodity prices. The opposite is the case if the goods are complementary.

Non-systematic variability in demand is due to changes in tastes and technology. Changes in technological conditions matter when the demand for the commodity is a derived one. For instance, demand for coal, oil and gas comes from demand for energy. If any alternative cost effective technology is developed for conserving and using energy the demand for coal, oil and gas will be adversely affected. Similarly, the demand for Natural Rubber is derived from the demand for tyre and other rubber products. If there is any technological advancement in tyre manufacturing by saving the usage of Natural Rubber the demand for Natural Rubber would be adversely affected and hence its price. These changes in general are expected only in the long run and not in the short run like systematic changes.

3.1.1.2 Variability in Supply

Supply variability is the most crucial factor for variability in the price of agricultural commodities. Supply variability from time to time can also be in the same two ways in which demand varies- systematic and non-systematic variability. Systematic variability in supply can occur due to i) variability in rainfall and other production conditions, ii) variability in input prices and iii) variability in price expectations and Non-systematic variability can be due to technological changes in production of the commodity.

The extent to which variability in supply can cause variability in price depends up on the geographical concentration of production. If the production is geographically concentrated, then price instability due to supply variability will be higher than if the production were highly dispersed. This is due to the reason that shocks to supply is probably large if the production is concentrated, and in a dispersed production structure always production failure in one place will be some how compensated by the production expansion in the other areas. Systematic variability in input prices will lead to the variability in supply

schedule of the commodity in such a way that a higher input price leads to lower demand for it and hence low supply and high price. The case has been very close to the metal products, where input price and supply schedule of the commodity are closely linked. For instance, a rise in price of raw materials due to the scarcity of raw materials like coal and iron ore leads to low supply schedule of steel leading to high price of steel. Variability in supply due to price expectations could be attributed to the obvious delay between production decisions and marketing decisions for agricultural commodities. Most often, farmers considering the current price to be high expand the supply leading to a decline in price when it is marketed. This, in turn, leads to a low supply in the next crop season and high price, producing perpetuating price cycles of Cobb Web nature.

Non-systematic variability in supply also is attributed to the variability in supply due to the variability in technological conditions. Technological change actually leads to faster expansion in supply by considerably raising the level of productivity of the commodity concerned. Given the demand, higher supply expansion due to technical progress often leads to low prices in the long run.

3.1.1.3 Arbitraging and Speculating

Arbitraging is expected to reduce price instability both inter-temporally and spatially. Spatial arbitraging is often with a view to get profit from geographical price differences by buying in low price markets and selling in high price markets. In doing so, they even reduce the price differences across spaces. Through the same process they even out the inter-temporal price differences and hence reduce price instability. Speculators, on the other, are the least understood components in the markets whose contribution to instability (whether mitigates or adds) is still mixed in the literature [Newbery and Stiglitz, 1981; Hoffman, 1931; UNCTAD, 2008; Sen, 2008].

3.1.1.4 Government or Third Party Interventions

Government or third party intervention in the market is often an instability mitigating as well as instability aggravating mechanism. Instability mitigating mechanisms is understood as government procurement and buffer stock actions

as supply management actions, which will reduce price instability. Government actions like taxation can create instability in markets by distorting supply and therefore price.

3.1.2 Reasons of Higher Commodity Price Instability

It is generally stated by many [Page et al, 2001; Gilson et al 2004; Reinhart et al, 1994], and empirically articulated by a few studies that the primary commodity prices are more volatile or unstable both in the short run and medium-term as compared to the manufactured goods [UNCTAD, 2008; Jacks et al, 2009]. Theoretically, the extra volatility in 'commodity prices' in both short-term and medium-term as compared to the manufacturing goods is due to the difference in elasticity of demand and supply [Shepherd, 1963; Page et al, 2001]. Demand and supply elasticity is less for commodities in general as compared to the manufacturing goods in both short and medium-term. Given this supply and demand structure commodity price instability becomes high because of the persistence of unexpected shocks in demand and supply, as these kinds of shocks are less in the case of manufactured goods. If there is any shock to supply (unanticipated increase or decrease) given the inelastic demand, then price will react largely and will produce more upswings (for an unanticipated reduction in supply) and down swings (for an unanticipated increase in supply) in the short-run. In the medium-term demand for both commodities and manufacturing goods fluctuates according fluctuations in income but the effect of changes in demand are largely offset in the corresponding changes in the supply of manufacturing goods, whereas for commodities in general and agricultural commodities in particular supply can be adjusted only after a time lag [Shepherd, 1963]. Agricultural commodities are the classic cases of inelastic supply and demand and possibilities of unpredictable supply shocks due to climatic variations.

Given this nature of supply and demand for primary commodities in general and agricultural commodities in particular instability in price in the short run and medium-term will be high. Short-term fluctuations are those, which persist for less than a production period normally one year, and medium tem fluctuations

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are referred to as price fluctuations, which extend beyond one production period or a year. The predictable component in the short-term variations is the regular seasonal price variations. Agricultural production being subject to rain and climatic conditions is always subject to seasonal variations. Most often during the peak production and marketing seasons in the year price goes down and during the slack season price normally goes up. This is subject to the assumption of demand being highly inelastic in the short run under normal conditions. Thus, given the demand an increased availability in the market implies low price and vice versa.

This seasonal nature of price behavior is one of the main components in the short-term variations in price of agricultural commodities [Lloyd, 1956]. Farmers often do not have control over the output because of this seasonal nature of output variability leading to price changes. Price variability in the short run is made sharper by the inelastic nature of demand. This seasonal nature of price arises either due to the existence of cost involved in carrying forward supply from one season to another or due to relatively less durability of the commodity. Short-term Price instability results in large-scale uncertainties in agriculture production and reduces farm efficiency, by raising the costs and lowering production than reasonably stable and predictable prices [Lloyd, 1956].

For medium tem fluctuations two things are important- i) Very often it is found that the producers do not respond to anything less than a large price change and ii) their response is often delayed one and sometimes too late. This relatively inelastic nature of supply of commodities is the important factor creating medium-term fluctuations in price. The implication is that a large price change is required for the producers to decide whether to increase or contract the production of a commodity. Thus, low prices associated with over production of the commodity often do not bring a quick automatic adjustment in production and often high prices do not call forth needed supplies with out a considerable time lag, partly due to the long gestation lag in agricultural production. Because of this time lag, by the time production adjusts to previously existing glut or shortage those conditions would have disappeared and the market will again be

reorganized. This is often described as- 'agricultural supply is always a jump or two behind demand' [Lloyd, 1956]. Because of this lagged supply response price instability of a self-perpetuating type of cobweb nature called price cycles occur. These cyclical natures of prices are often caused by the miscalculations of farmers about future prices. Thus a proper future price expectation out of futures trade can reduce cyclicality in price [Lloyd, 1956].

Hence, multi year price cycles will continue so long as current period supply is the function of price in the previous period and current period price is the function of current period supply. A high quantity of the current year will lead to a low price in the current year and low price will bring about a low output and high price in the next period and the cycle continues like that. Hence price cycle will be the opposite of the production cycle. Based on the elasticity of demand and supply cycles will be fluctuating continuously (if elasticity of demand and supply are equal), fluctuating and diverging (if elasticity of supply is higher than elasticity of demand) and fluctuating and converging (if elasticity of supply is lower than elasticity of demand) [Shepherd, 1963]. Thus based on the difference in elasticity of demand and supply regular price cycles with different amplitudes will occur. But most often price cycles are irregular in amplitudes because of the effect of natural variations in weather on supply schedule of the commodity. Based on the time required for supply to react for a price change cycles of specific duration will occur. Theoretically if supply takes two years for reacting to a price change cycles will be of four years duration. Cycles are regular only if the supply is determined exclusively by the previous period's price. But cycles practically are often not regular in duration because apart from the physiology of the crop psychology of the farmers is also important [Shepherd, 1963]. As it is said farmers often do not react to price changes immediately if it is not substantial.

In nutshell, theoretically the dominant factors affecting commodity price variability are variability in supply and demand. But the nature and intensity of the role of each factor is different for different commodities and countries [UNCTAD, 2008], even though variability in price is assumed to be due to the variability in demand and supply and their nature of elasticity. For commodities

like metals, minerals and industrial raw materials price movements are strongly affected by the changes in demand and closely linked to the global industrial economic activities whereas for agricultural commodities in general price movements are affected mainly by the variability in supply due to weather or climatic shocks, plant and animal diseases [UNCTAD, 2008; Hoffman, 1931]. It is important that the typical distribution of agricultural supply itself makes the market highly uncertain. A large number of competing individual units all around the world with globalization are dealing in the production of the commodities making it difficult for an individual unit or farmer to have a clear idea of how much is going to come to the market at a time making the market always uncertain.

3.2 Empirical Literature

The interests in commodity price instability, both at the global level and domestic level, are more often policy driven rather than of mere academic interest. Commodity price instability in general has attracted large-scale attention more often at the global level than for the domestic economy of India. Empirical literature is discussed under the broad heads of global level studies and studies pertaining to India.

3.2.1 Literature at the Global level

The commodity price instability problem has three aspects -1) the long run behavior (whether secular increase or secular decrease), 2) medium-term fluctuations (fluctuations of more than one year) and 3) short run fluctuations (mostly within year and across months). The analysis of commodity price instability at the global level goes along two lines- i) understanding the long run trend of commodity price instability with little focus on the short run and medium-term dynamics of commodity price instability and their volatility properties and ii) understanding the short run and medium-term dynamics through analysis of price cycles.

3.2.1.1 Long Run Movement in Commodity Prices

The commodity problem of the developing countries has attracted the attention of scholars ever since the Prebisch - Singer Hypothesis has been proposed. The hypothesis states that the real commodity price[2] (nominal price of the commodities in relation to that of manufactures) will show a secular decline in the long run which will lead to a secular decline in the developing countries' terms of trade as against the developed countries [quoted in Gilson et al, 2004]. This has been developed in the context of a commodity trade structure in which the developed countries are the exclusive exporters of manufactured goods and the developing countries are the exclusive exporters of the 'commodities'. Because of the low income elasticity of demand for the primary commodities compared to the manufactured goods demand for commodities in the developed country's market will grow only at a lower rate as compared to the manufactured goods which ultimately results in declining relative price of primary commodities and a secular decline in the developing countries' terms of trade.

It has often been articulated that the commodity prices started showing a secular declining trend at the global level since the 1980s before which the trend was more often on a raise [Maizels, 2000; UNCTAD, 2008; Harvey et al, 2008; Cuddington et al, 2002]. This new trend since 1980s was due to the marked slow down in the growth performance of the industrialized economies and the resultant contraction of demand for commodities and raw materials due to the tight monetary policies followed by these countries during the 1980s [Maizels, 2000]. The secular decline in the real price of commodities since the 1980s was also observed to be due to the substantial increase in the developing countries' commodity export volume at the rate of 40 percent during ten year period from 1980 to 1990, which resulted in depressed prices to a larger extent through out the 1980s [Maizels, 2000; UNCTAD, 2008].

Even though price was getting depressed commodity exports was increasing year after year. The reason could be that increased foreign exchange bottlenecks due

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[2] Nominal Commodity price index deflated by the Manufacturing Unit Value Index which is nothing but the relative commodity price index

to earlier collapse in prices and interest charges on foreign debt actually put pressure on the commodity dependent developing countries to expand exports even though the price is showing a secular decline in tend. Hence, the inference is that the increased supply of commodities in the market along with a slow growing or decline in demand resulted in depressing the real price of the commodities at the global level through out two decade or so. Apart from the low-income elasticity of demand and increased exports, other reasons like asymmetric market structure for manufactures and primary commodities are also relevant [Harvey et al, 2008]. While manufactured goods work in oligopoly or monopolistic competitive market structures markets for primary commodities in general are competitive. The terms of trade loss of the developing countries arising from this secular decline in commodity price during the period from 1980 to 1992 was estimated to be around 350 billion dollars [Maizels, 1999].

The obvious limitation of these studies with respect to searching for a long run trend in the commodity price is that the instability characteristics were often neglected or not given the recognition, which they deserved. Commodity problem of the developing countries is not simply the long run decline in commodity price (which for the last one decade is reversed to a secular increase) but the short run and medium-term instability which is putting more pressure on producers by making the production and marketing more uncertain. It is also to be seen that these studies are primarily focused at exploring a secular trend in commodity price indices neglecting the disaggregated level dynamism for individual commodities. The commodity wise dynamism is relevant to understand which commodity or commodity group is actually driving the general commodity price indices to move up or down.

As it could be seen that the commodity price has been secularly increasing in general for All Commodities Category (ACC) since 2002, mainly the commodities like 'Crude Petroleum' and 'Minerals, Ores and Metals' have driven it. While the crude petroleum and Minerals, Ores and Metals have increased at the rate of 158 per cent and 220 per cent respectively over the period from 2002 to 2006, commodities like 'Food and Tropical Beverages', 'Vegetable Oil Seeds and Oils'

and 'Agricultural Raw Materials' have increased only by 48 per cent, 26 per cent and 62 per cent respectively [UNCTAD, 2008]. This rebound in commodity prices since 2002 may be due to the huge increase in demand for primary commodities in the newly industrializing developing countries. The same observation has to be read along with the earlier observation by UNCTAD that the commodity trade structure at the global level has changed since 2000's in such a way that the developing countries themselves are becoming the exporters and importers of 'commodities'. One more explanation could be given to this trend. Due to secular decline in prices for a prolonged period of two decades and low inventory level of the commodities, supply response of primary commodities for a huge increase in global demand has been slow, in turn resulted in rising price of commodities especially like Minerals and Metals [UNCTAD, 2008]. Thus, the inference is that the global demand growth driven by the newly industrializing developing countries of South and East Asia along with a sluggish growth in supply resulted in the recent upsurge in price of primary commodities in general.

3.2.1.2 Medium-term and Short-term instability in Commodity Prices

Similar to 'wage' in the national economy, which determines the purchasing power of its public and the cost of production of the firms, 'Commodity Price' is such a crucial variable, which determines the incomes of producers and the cost to the users or consumers. Apart from its long run movement its short run and medium-term dynamics are also important to understand the relative positions of the producers.

Since 1970 at the global level the pricing mechanism for the primary commodities has been undergoing changes. It was unanimously agreed that this was the period in which the short-term and medium-term instability in global commodity price has been increasing. Cycles have become shorter duration with increased amplitudes creating large up swings and down swings. The developments, which contributed to the increase in commodity price instability at the global level since 1970 were i) the Nixon shock of 1971, which cancelled the convertibility of gold in to Dollar, ii) floating exchange rate system that resulted

in making exchange rate to be market determined, iii) change of crude oil from a cartel commodity to a market sensitive commodity and iv) the introduction of futures markets and new financial instruments and the inter-linkage between the commodity markets and the financial markets [Kuchiki, 1990].

At the global level it has been articulated that both real and nominal commodity price instability increased since the adoption of the flexible exchange rate regime [Cuddington et al, 2003]. The increased instability in nominal commodity prices is due to the reason that the commodity prices are generally represented in dollars and any change in the value of dollar against other currencies will result in instability in commodity prices. The real commodity price also showed the same effect. The real commodity price used here is the nominal commodity price indices deflated by the manufacturing unit value index. The implication, which we could derive from the study, is that the exchange rate pass through effect is different for the primary products and manufactured goods. If both had the same pass through effect the result could have been no increase in instability in real price (relative price) in the flexible exchange rate regime. This could be seen in context where in primary products are sold through flexible price markets (well organized auctions) and manufactured goods are sold through oligopoly or monopolistic competitive markets.

The increased commodity price instability at the global level has been attributed to i) the changes in policy and institutional environment, ii) over supply of the commodities, iii) increased vertical concentration along the commodity value chain, iv) market access and market entry barriers and of course v) the low responsiveness of demand for and supply of commodities to the price changes [Maizels, 2000; Borensztein et al, 1994; South Centre, 2005; Gillson et al, 2004]. The decades during 1970s and early 1980s were the periods friendly to the stabilization of commodity markets through active market interventions by the government. These were the periods of International Commodity Agreements (ICA) with active role for the state marketing boards in commodity supply management and price stabilization. However, since the mid 1980s developed countries and Bretton-Woods institutions championed the market liberalization

and structural adjustment programmes in the developing countries, which resulted in the reduced interventions in markets. Most international commodity agreements failed in the first half of 1980s (Commodity Agreements for Sugar failed in 1984, tin in 1985, Cocoa in 1988 and Coffee in 1989) with only Natural Rubber agreement effectively remaining up to April 1993 [Borensztein et al, 1994]. They were able to manage supply of commodities at the national level by the state marketing boards by relying on national stock piles for managing supply of commodities for exports (especially for tropical beverages and tree crops) and at the international level by maintaining physical buffer stocks to maintain world prices stable. Buffer stock operation was done by regulating supply of commodities- keeping the commodities in stock when the price falls below a fixed trend and leaving the supply when the price rises above the fixed trend.

The international commodity agreements failed with the withdrawal of support by the consuming developed countries [South Centre, 2005][3]. The failure could be due to: i) the difficulties of influencing the prices in a drastic supply expansion with productivity improvements ii) difficulty of maintaining high costly buffer stock schemes with out any institutional and financial support (the Common Fund for financing buffer stock scheme under the International Programme for Commodities (IPC) was only in paper and it was implemented late during 1989 when the environment in commodity market had completely changed towards market liberalization), iii) difficulties in agreeing on a common price trend which is very difficult to maintain in a period of supply expansion and lack of enforcement mechanism for solving the problem of free riding [Cashin et al, 1999b; South Centre, 2005; Gillson et al, 2004]. Thus the commodity marketing reforms and the failure of ICAs and the removal of marketing functions of commodity marketing boards resulted in an institutional vacuum in the

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[3] Prior to the 1980's from the end of the Second World War developed countries saw the ICAs as a better option to get raw materials and commodities at a stable price for financing their war shuttered economy. Hence, the ICAs served the interests both developed and developing countries during that time. During the 1980's the supply of commodities started expanding at a faster rate with greater improvement in technology. Price stabilization has been only the interest of developing countries and the developed consuming countries wanted the ICAs to be withdrawn so that the commodities will be cheaply available.

developing countries which resulted in the commodity crises since the 1980's [Maizels, 2000; South Centre, 2005; Parimal, 2006].

It has been unanimously agreed that the sustained decline in real price of the commodity at the global level during the 1980s has been mainly due to the over supply of commodities. When supply grows at a faster rate compared to demand, price has to decline and the automatic adjustment in commodity market is extremely low because of the nature of production. The case has been so severe for commodities like Coffee and Cocoa for which the supply was more than the demand continuously for a long time resulting in depressed prices for more than a decade. Over the 1980's annually when the supply grew by three per cent demand lag was at one per cent. The technological expansion has contributed much to the expansion in supply outstripping the growth of demand. Thus with respect to commodity prices it is argued that the expansion in supply has been the crucial factor in depressing the price over two decades or so [Maizels, 2000; South Centre, 2005; Reinhart et al, 1994].

3.2.1.3 Market Integration and Commodity Price Instability

Currently commodity markets are highly integrated ever than before. Now no country is isolated from that rule and almost all have liberalized their commodity markets notwithstanding the arguments that developed countries still hold market-distorting measures like subsidies for some commodities [Findley et al, 2001; South Centre, 2005]. Theoretically, market integration is expected to reduce the instability in commodity prices [Newbery and Stiglitz, 1981]. According to this argument trade restrictions like tariffs and quota are prone to create commodity price instability by fragmenting the markets. If markets are fragmented the shocks to supply in the domestic economy will lead to wide fluctuations in prices compared to when markets are integrated (because of the nature of demand being inelastic in the short run). The crux of this argument is that when the local economy is in free trade with the larger global economy, domestic shocks to supply are substantially nullified by the imports from outside. For instance whenever there is a reduction in supply due to some unanticipated crop failure the domestic price is prone to shoot up in the very

short run, which will automatically call for imports from outside which will reduce the instability by managing the domestic supply gap.

Using historical commodity price data from Philadelphia, Dutch, Danish and English data base over the period from 1700 to 1979 augmented with the IMF data series from 1980 to 2008, it has been argued that the world commodity price instability had been low when the world went global after the European wars in the 19th century and commodity prices became highly unstable when the world went autarkic between the world wars [Jacks et al, 2009]. The conclusion was based on the observation that price instability during the war period from 1776 to 1815 and also from 1914 to 1950 was ever higher than in the peacetime after and before that. The main problem with the finding is with respect to the periodisation. Classification that the wartime as globally closed time and peacetime as globally open is not an agreeable criterion to judge the instability in commodity price as war times are always abnormal periods as far as commodity prices are concerned. And also the periods after 1970's are difficult to judge because of the operation of market stabilization mechanisms during the 1970's. It also contradicts with the findings of many other studies that found an increase in instability in the post 1970's [Cuddington et al, 2003; Kuchiki, 1990].

3.2.2 Literature on Indian Commodity Markets

Commodity price instability has often received less attention at the domestic level when compared to the global level discussions. The rationale behind domestic commodity price instability is that the factors affecting commodity prices is not always global, country specific characteristics are also relevant for understanding the dynamics of commodity price instability [UNCTAD, 2008].

A study which looked at the commodity price instability in the major domestic and international markets comes out with the finding that the inter year commodity price instability has been low in the domestic market for 1980 to 2001 as compared to the major international markets for many of the food crops like Wheat, Rice, Sugar, Ground Nut Oil and Coconut oil in both Nineties and eighties separately implying lesser market integration [Sekhar, 2004]. Intra-year

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instability is higher in the domestic markets as compared to the international markets for all these crops except for Sugar, implying a greater role for seasonal nature of production in explaining the intra year instability. The study has found that the domestic production and international price movements are affecting the price of some commodities and for some others only domestic production is affecting the domestic price instability. The obvious limitation of the study is with respect to the method used, which is the regression of price data on the domestic production, international price and time trend with out considering the time series properties of the price series and neglecting many relevant variables.

A study which looked in to the agricultural development in general and price movement of agricultural commodities in particular in the post reform period has argued that there is no statistically significant worsening of real prices of many of the commodities especially after the WTO regime [Balakrishnan, 2008]. The instability in price for many of the commodities is lower in the domestic markets as compared to the international markets implying less than full market integration for many of the commodities with considerable variation in instability across individual commodities. The study also finds that while the domestic price of food has become less volatile, the price of non-food commodities has become more volatile during 2003-07 compared to the period from 1998-2002. The simple CV used in the study may be an exaggeration of the price instability due to the involvement of trend in the data. Study argues that even though imports by enhancing the supply of agricultural commodities can lead to lower prices the involvement of imports in lowering prices for most of the crops in the post reform period is marginal except for some crops in some periods only. The study is basically an analysis of agricultural price behavior in the post reform era not in comparison with the pre reform era.

A study conducted for analyzing the behavior of essential agricultural commodities like rice, wheat and groundnut oil at the procurement price, farm gate price and the wholesale price level and the instability in prices-intra year, inter year, inter market and intra market- at the WPI level during 1980 to 2000 has concluded that the price instability in general is higher for Ground nut oil

and wheat as compared to rice, the production of which is highly geographically dispersed [Sharma et al, 2001]. Seasonal fluctuation in price is found to be explaining most of the intra-year instability. The unexpected changes in supply leads to variability in seasonal price difference across years and the influence of government act of buying and selling to stabilize the seasonal fluctuations is found to be very less for these food crops. The study also found that there is strong influence of substitutes in influencing the price movements of the commodity in question. The study is done at the domestic levels completely in isolation from the developments at the international level and the study does not give a proper explanation regarding the price movements in the post reform era in comparison with the pre reform era.

A study which analyzed the influence of international trade on commodity price instability for the period 1970 to 1990 by taking the case of Black Pepper has found that the price of Black Pepper in India moves in tandem with the international prices implying that the market for Black Pepper is internationally integrated [Saikath and Sanjith, 1994]. How ever, the study does not look into the implications of international integration on domestic commodity price instability.

The discourse on commodity price instability has received less attention at the domestic level compared to the global level. Moreover, the studies at the domestic level have looked primarily in to the price instability of food crops. Price instability problem of the plantation crops or cash crops which account for a significant livelihood option for majority of people in the respective regions in which these crops are cultivated has not received the attention which it deserved.

3.3 Summary

Commodity prices are prone to be highly unstable as their price formation is happening through flexible markets either through well-organized auctions or open markets. Theoretically most of the instability in price is explained by the variability in the market forces of supply and demand. Thus, fundamental to price instability is the variability in supply and demand. Depending up on the variability in demand and supply there can be both short run and medium-term

instability in price. In the short run, the source of price variability is different for different commodities depending up on the probability of shock to supply or demand. For agricultural commodities source of price instability is mostly in the supply variability since for agricultural commodities shocks to supply are more probable than the shock to demand with demand being highly inelastic or given in the short run. In the medium-term, depending up on the time required for adjusting supply to any change in price due to change in demand in the medium-term multi-year cycles of different kind will appear. But for other commodities like 'Metals, Minerals and Ores' sources of price instability are most often in the demand side, since supply is given in the short run. In the medium-term depending up on the variability in income or demand price cycles are formed. Even though the source of instability in price is due to variability in the supply and demand forces, the instability can be either mitigated or aggravated by factors like arbitraging, speculating, government or third party interventions.

CHAPTER IV

DYNAMICS OF INTER-YEAR COMMODITY PRICE INSTABILITY

Having set the analytical context, the study has reached a stage to explore different aspects of price instability per se. In this thesis we intend to look at two aspects of price instability: inter year and intra year instability. While inter-year instability captures between year variations in prices, which has serious implications on long term planning aspects of the sector, intra-year instability captures within year variations in price across months, which adversely affects the farmers' returns in the short run. While this chapter deals with inter-year instability a detailed analysis of intra-year instability is reserved for the next chapter.

The chapter has six sections including the concluding remarks. The first section gives a background on price formation of the selected crops. The second section is an attempt to highlight some methodological issues in measuring price instability and for choosing an appropriate index of price instability measurement. The third section is a comparison of inter-year price instability of crops using the chosen index in the pre and post-reform periods. The forth section deals with the analysis of long run movement and the medium term cyclicality in annual price. The fifth section verifies the observations on inter-year price instability in the earlier sections by looking at the time varying instability aspects and the final section concludes the discussion.

4.1 Price Formation of Selected Plantation Crops

The primary marketing of Small Cardamom, Tea[1] and Coffee are different from that of Natural Rubber and Black Pepper. While Small Cardamom, Tea and Coffee are marketed through well-organized auction systems, Natural Rubber and Black Pepper are sold in the open markets. For understanding the dynamics of price instability it is necessary to understand their price formation.

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[1] Price of Tea is the average of the price of both dust and leaf observed across various auction centers spread all over India

During the export oriented period, the auction price[2] of Small Cardamom was determined by bidders bidding for individual lots with the market forces of demand (from dealers and exporters) and supply (from growers and auctioneers) operating at the background. During the 1970s and the first half of the 1980s the price formation at the primary level had a close connection with the export price, which was exogenously determined [Joseph, 1985]. Exporter's profit depended upon the margin between export price and the auction price. Exporters after discussion with the importers came to the auction with an already agreed price. Hence, the exporters always tried to depress the auction price to raise their profit margin. For small cardamom the pricing decisions were often influenced by the nature and quality of the product like the green colour (implying good quality) leading to limited storability. This, in many cases, lead to market clearing in the same crop year with less carry over stock to the next year. In recent times, Small Cardamom is a domestic market oriented crop with hardly five per cent of the production exported. Small Cardamom is getting a consistent domestic demand mainly form the industrial sector particularly by Pharmaceutical, Ayurveda and Cosmetics accounting for around 45 per cent of the domestic consumption [Multi-commodity Exchange Board of India, 2006]. Thus, for Small Cardamom the price formation at the domestic level is largely domestic demand and supply driven with out neglecting the imports in an internationally integrated market setting.

Generally, in India, Tea is marketed through two channels: Primary marketing and Secondary marketing. Primary marketing channels help in moving made-tea from the grower (Tea estates) to the bulk tea buyers/traders catering to the domestic and international markets through the auction centers. The secondary marketing channel includes the movement of bulk tea (which is purchased in bulk through auction centers) to ultimate consumers. In this chain tea passes through wholesalers, commission agents, blenders, packers and retailers. Tea producers are either small growers (currently increasing even though large holders dominated in the past) or large estate owners. Tea growers, having no

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[2] The traditional system of auction has been replaced by the e-auction system wherein the anonymity of the bidder is fully guaranteed. E-auctioning marketing system is found to have been more effective than the traditional system in making auction more inclusive to the small holders as well [Joseph, 2011]

factory of their own sell their green leafs to the big tea estates having factory or to the Bought Leaf factory (BLF) for processing. From this major portion of made tea goes to auction centers and a small part goes to international or domestic market directly. At the auction platform registered brokers[3] sell their tea to the registered buyers which are big tea companies having their own blending, packing and trading network all over the world like Hindustan Unilever Ltd., Tata Tea and so on. Here, the price formation at the primary level is through the interaction between the supply (brokers) and demand (big companies). The bulk buyers or big companies may come with the need for a specific quantity based on their expectation of demand- domestic and international. Thus, the buyers will try to depress the price in the auction and the brokers are expected to push the price up. Thus, the price is ultimately the result of the forces of demand and availability.

Unlike other producing countries India's uniqueness in Natural Rubber production is the increased dominance of small holders averaging less than five hectors per family. As the growers are small in size and large in number, they will have to act as the price takers. But even then the formation of Rubber Producer Societies acting as a cooperative in marketing and input purchases reduces the problem of price taking to some extent. The demand for Natural Rubber comes from the industrial sector mainly from the tyre-manufacturing sector. Thus, the marketing involves sometimes intermediaries such as co-operatives, processors and traders before it reaches the manufactures. Since 1991, both imports and exports of natural rubber have increased indicating greater integration. If the domestic price is higher than the international price domestic consuming units will resort to imports and vice-versa. With integration of domestic market with the world markets price becomes an ultimate result of global demand and supply interaction.

Black Pepper is a highly export oriented crop. Black Pepper also involves large number of intermediaries before reaching the export market. In the closed and

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[3] Producers do not directly participate in the auction system. Registered brokers will appear for producers in the auction

protected regime domestic supply and demand are expected to influence the domestic price. Now the international conditions of supply and demand are expected to determine the Black Pepper prices since the domestic market for Black Pepper is integrated with the world market [Multi Commodity Exchange of India, 2006].

Like Black Pepper, Coffee is also a highly export oriented commodity with an export intensity of 75 per cent in 2008-09. Marketing of coffee involves two stages- primary marketing (marketing of made coffee through well organized auctions) and secondary marketing, wherein made coffee moves from auction centers to the ultimate consumers at the domestic and international level. Coffee had a well organized centralized pooled marketing system by the commodity board in the past at the national level and a well formulated international commodity agreement at the international level for the smooth functioning of trade [Indira, 1988]. In the protected regime Coffee Board had taken the complete responsibility of coffee auctions wherein planters were required to surrender their produce to the board with some exemption for home consumption. Thus, through the internal pooled auctioning system The Board acted as a complete controller of the supply at the domestic level for exports. Thus, domestic supply and international demand conditions affected domestic coffee prices. With the liberalization of the commodity markets price of coffee is expected to be influenced by the international conditions of supply and demand.

4.2 Choice of an Appropriate Price Instability Measure

Since many measures of commodity price instability are available and each of which has its own limitation we may have to restrict to some good measures, which are apt for our problem. Conventionally instability in a time series data has been measured by the Coefficient of Variation (CV) in the data. Coefficient of variation is the relative measure of standard deviation, which is arrived at by dividing the standard deviation of the data by the respective mean value and multiplying it by hundred. In a way it captures the proportionate variation in the data from the average value. The problem with using coefficient of variation as a summary measure of the instability in the time series data is that the CV may

overestimate the presence of instability in the data if the data involves some trend, which is quite common in the annual price data. Thus, before using CV as a measure of instability in the annual data, the data should be either de-trended or alternative methods should be adopted. CV can be used as a measure of intra year instability because of the absence of long run trend in the monthly data for a short period of twelve months. Other measures apart from CV are discussed below.

4.2.1 Standard Deviation of Growth Rate

Standard deviation of growth rate is also often used as a measure of instability in annual data, which measures average deviations of price growth from an average growth during that period. Standard deviation is taken instead of CV as price variations can be either positive or negative CV can even go negative in exceptional cases which will make the interpretation a bit difficult. The formula is as follows:

$$\text{SD of GR} = \text{Square Root } \{\Sigma[(P_t-P_{t-1})*100 - \text{Mean of } (P_t-P_{t-1})*100]^2/N\}$$

$$= \text{Square Root } \{\Sigma[G_i - \text{Mean of } G_i]^2/N\}$$

4.2.2 Mc-Bean Instability Index

Another important measure of instability has been the one suggested by Mc-Bean, which has been used primarily for measuring the instability of the export earnings [Mc Bean, 1966]. Mc-Bean instability index is a measure of the average variation of the data from a five-year moving average. This can capture the time varying instability in a time series data. The index can be used for the inter-temporal comparisons by taking the average Mc-Bean instability index, which takes the following form;

$$\text{MI} = [100/(N-4)] * [\Sigma |X - MA|/MA],$$

Where MA stands for the five-year moving average, X is the price variable and the summation is over the observations ranging from 3 to N-2 (because while taking a five year moving average the first two and the last two observations need not be taken in to account in the total N and hence in the multiplying factor N-4 is used as the denominator). This measure is sensitive to the number of years under consideration. When N increases being a decimal (since price difference

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from the MA is normalized by the MA) the rate of increase in last term [Σ |X - MA| / MA] will always be at a lesser rate compared to the rate of decline in the first term [100/N-4] and underestimate the instability in the data. Thus, the problem arises when a shorter period of pre-reform (1980-1989) is compared with a much longer period of post-reform period (1990-2010) using this index. It can be solved by dividing the post-reform in to two equal periods, which is comparable to the pre-reform as well in terms of the number of years and an average of Mc-Bean index for the two sub periods of post-reform period can be taken for comparison purpose.

4.2.3 Cuddy Valle Index

Cuddy and Valle (2009) have suggested an instability measure, which can be used for all types of time series data- whether it is linear trended or exponentially trended. The new measure of instability suggested by Cuddy and Valle is nothing but an adjusted CV. The CV is adjusted by the unexplained variation in a trend regression. If the data is trended, the variable has to be regressed with time. The adjusted R-squared of the trend regression is to be subtracted from one and should be converted into square root and this value is used to weight the CV. The method is nothing but weighting the CV by the standard deviation of the unexplained variation of the trend regression. The value of the Cuddy-Valle instability index ranges between zero and the CV. An instability index of zero implies no instability since the R^2 from the trend regression is equal to one implying that the trend regression explains the entire variation and there is no instability in the data. A zero R^2 on the other hand implies greater instability in the data and it will be equal to the CV it self since the trend regression does not explain anything at all. Cuddy-Valle instability index takes the following form;

$$Ix = CV * Square\ root\ [1- R-square\ adjusted]$$

The reliability of the measure depends up on the reliability of the model we fit for the data. Thus the trend and Adjusted R2 should be significant. The implication is that weighting the CV by the unexplained variation of the trend regression with out significant trend may under estimate the instability involved in the data. Thus, the measure necessitates that if the trend is not significant the CV itself

should be followed as the measure of instability. Thus, we can stick to Cuddy Valle Instability index for measuring instability in the long time series data and the CV if the model fitted is not significant (if there is no linear trend in the data).

4.3 Price Instability in Annual Price of Plantation Crops- A Comparison of Pre and Post-Reform Periods

Theoretically, opening up of an economy resulting in greater integration of the domestic market with the world market will reduce the extent of commodity price instability in general [Jacks et al, 2009] and the agricultural commodity price instability in particular [Stiglitz and Newbery, 1981]. According to this argument, trade restrictions like tariff and quota are the main causes of price instability at the global level. When the economy is protected from the external trade world markets become fragmented and a small variation in supply in the main producing country will cause large fluctuations in price in that country. Two main assumptions underlying this argument are the country is small in size (small size of the home market and major part of the product is catering to the world market) and prices are not government regulated in the protected regime.

But it could be argued that the domestic price instability may be increased if the economy is opened because of the perpetuation of the world price instability to the domestic economy when markets are fully integrated. This argument has an implicit assumption that the instability in the closed system is quite low because of the intervention of government in the market through price stabilization mechanisms. Opening of the economy along with the removal of governmental interventions in the commodity markets can increase the commodity price instability by exposing the domestic commodities to the oscillations in the international markets. Keeping all the developments in the sector in mind with the open trade regime an attempt is made to quantify price instability (in both nominal and real prices separately) in the selected plantation commodities for the whole period ranging from 1980-2010 and also during the pre-reform and post-reform periods separately.

Table 4.1: Annual Nominal Price Instability Comparison for Plantation Commodities- Pre-Reform Vs Post-Reform Period

Commodities	Instability Indices	1980-2010	1980-1990	1991-2010	% Change
1. Tea	Observations	30.00	10.00	20.00	-
	CV#	47.82	30.92	27.69	-10.45
	Cuddy-Valle Index	19.12	18.30	18.05	-1.37
	SD of GR##	18.40	22.57	15.72	-30.35
	Mc-Bean Index	9.73	12.46	8.24	-33.87
2. Natural Rubber	Observations	30.00	10.00	20.00	-
	CV	71.89	16.87	57.05	238.17
	Cuddy-Valle Index	38.73	7.01	31.61	350.62
	SD of GR	16.11	8.07	13.58	68.28
	Mc-Bean Index	8.12	4.62	11.02	138.53
3.Small Cardamom	Observations	30.00	10.00	20.00	-
	CV	55.42	48.71	40.77	-16.30
	Cuddy-Valle Index	48.80	48.70	36.70	-24.64
	SD of GR	47.29	55.97	43.55	-22.19
	Mc-Bean Index	20.75	27.22	20.52	-24.61
4.Black Pepper	Observations	30.00	10.00	20.00	-
	CV	74.89	54.16	57.03	5.30
	Cuddy-Valle Index	56.59	31.01	53.74	73.30
	SD of GR	33.46	30.57	35.70	16.78
	Mc-Bean Index	16.37	18.85	25.11	33.21 .
5. Coffee	Observations	27	10	17	-
	CV	70.21	28.29	33.83	19.58
	Cuddy-Valle Index	40.81	7.50	33.83	351.34
	SD of GR	16.96	13.08	18.87	44.31
	Mc-Bean Index	14.12	7.41	10.40	19.58

Notes: (i) Since Mc Been index of Instability is biased towards the number of years used, we have measured instability for the post reform separately from 1990-1999 and from 2000-2010 and an average of the two is taken as a summary index for the post reform period for comparison purpose., 2) All the indices indicate higher the value higher the instability in the price series, 3) For All Coffee the instability is a slight underestimation of actual instability since data is missing for the period from 1990-91 to 1993-94

(ii) # = Co-efficient of Variation, ## = Standard Deviation of Growth Rate

Source: *Derived using Price Data from Various Commodity Boards*

Apart from Cuddy-Valle instability measure other measures like Co-efficient of Variation, Mc-Bean Instability index and Standard Deviation of Growth Rate are also reported. Considering the entire period the instability in nominal price is found to be quite high for all commodities under consideration. Cuddy-Valle instability measure, which is more realistic since it is adjusted for the involvement of trend in the data, shows Black Pepper is having the highest price instability followed by Small Cardamom (48.80), Coffee (40.81), Natural Rubber (37.91) and Tea (19.12). But, CV is found to be the highest for the Black Pepper (74.89), which is followed by Natural Rubber (70.65), Coffee (70.21), Small Cardamom (55.42) and Tea(47.82) (Table 4.1). Mc-Been Index and Standard

Deviation of Growth Rate of Price show Small Cardamom having the highest instability and Natural Rubber is having the lowest instability.

Now, we move on to see whether there is any regime dependent change in commodity price instability of pre-reform in comparison with the post-reform period. It is found that for Small Cardamom and Tea price instability is found to have declined and for Black Pepper, Coffee and Natural Rubber the instability is found to have increased in the post-reform as compared to the pre-reform period. Using Cuddy Valle Index while Small Cardamom showed a decline in price instability to the extent of 24.64 per cent, Tea has shown only a marginal decline of 1.37 per cent. While Black Pepper has shown an increase of 73 per cent, Coffee and Natural Rubber has shown a huge increase of 351.34 and 350.62 per cent respectively (Table 4.1). All measures give consistent results in this regard.

Table 4.2: Real Price Instability Comparisons for Plantation Commodities- Pre-Reform Vs Post-Reform Period

Commodities	Instability Indices	1980-2010	1980-1990	1991-2010	% Change
1. Tea	Observations	30.00	10.00	20.00	-
	CV #	18.66	19.56	18.45	-5.67
	Cuddy-Valle Index	18.66*	17.37	16.14	-7.08
2.Natural Rubber	Observations	30.00	10.00	20.00	-
	CV	23.3	8.16	28.55	249.88
	Cuddy-Valle Index	23.3*	6.94	26.67	284.29
3. Small Cardamom	Observations	30.00	10.00	20.00	-
	CV	43.52	51.01	35.78	-29.86
	Cuddy-Valle Index	41.30	51.01*	33.68	-33.97
4. Black Pepper	Observations	30.00	10.00	20.00	-
	CV	52.71	43.98	56.26	27.92
	Cuddy-Valle Index	52.71*	33.33	56.26*	68.80
5. All Coffee	Observations	27	10	17	-
	CV	41.54	11.44	35.09	206.73
	Cuddy-Valle Index	40.12	8.19	30.03	266.55

Note: * Implies that the trend is not significant in the data. Hence, the CV and Cuddy-Valle Index will be the same, # = Co-efficient of Variation
Source: *Derived using Price Data from Various Commodity Boards*

The result does not change even if we take the instability in the real prices for the commodities in question. Using Cuddy Valle Index instability in real price for the whole period is found to be the highest for Black Pepper (52.71), Followed by Small Cardamom (41.30), Coffee (40.12) Natural Rubber (23.3) and Tea (18.66) (Table 4.2). This is also of the same order in the nominal price data. Instability calculation for the real price as well show that the instability has declined in the

post-reform period for the commodities like Tea (with a marginal decline of 7 per cent) and Small Cardamom (a considerable decline of 34 per cent) and increased considerably for Black Pepper, Coffee and Natural Rubber.

Specific commodity cases for both nominal and real prices do not show a uniform result of either an increase or a decrease in commodity price instability in the post-reform period as compared to the pre-reform period (when some commodities are showing a decline in price instability some are showing an increase). This leads us to the inference that the commodity specific characteristics of different kinds are very much relevant in explaining the price instability for the specific commodities. It could be inferred that the domestic market orientation of Small Cardamom might have helped in reducing its instability, since during the time when it was highly export oriented price was highly influenced by the export price, which was highly fluctuating (Joseph 1985), and a reduction in export orientation might have helped to reduce the instability of Small Cardamom. For Tea also what we saw is the increased domestic market orientation and a slight decline in instability in both nominal and real prices. For Natural Rubber, Coffee and Black Pepper the markets are highly internationally integrated with the liberalization of commodity markets. This leads us to the question, has international integration resulted in increasing domestic price instability of Black Pepper, Coffee and Natural Rubber and increased home market orientation resulted in reducing the instability of Small Cardamom and Tea?

4.4 Analysis of Annual Price – Long Term and Medium Term Instability

Before attempting to answer the question of what might have caused the commodity price instability to be different across different commodities and across different regimes we need to get a clear idea of the price behavior of the chosen commodities in question. Thus, the first step in understanding the dynamics of commodity price instability becomes a clear understanding of the nature and behavior of prices over the period leading to instability of different kinds. Basically there are three types of commodity price instability problem. They are:

1) Short term fluctuations,

2) Medium term fluctuations and

3) Long-term movement of the price series.

Short-term fluctuations are mainly intra-year or across months. Medium-term fluctuations are mainly the multi-year cyclicality in prices. Long-term nature can be either secular increase or secular decrease. Short-term variations in price are more observed in monthly data and the multi-year cyclicality and long term trend of the price are observed clearly in the annual data. Since short-term instability needs to be looked at in greater length a separate chapter is devoted for it and we will keep it for later discussion.

4.4.1 Secular Movement in Annual Average Price

The annual average prices of five selected plantation commodities are shown in the following figures. Prices plotted are both nominal and the inflation-adjusted prices (real price) for the period.

Figure 4.1: Annual Average Price of Black Pepper, Small Cardamom, Tea, Natural Rubber and Coffee (Rupees /Kg)

A) Black Pepper

B) Small Cardamom

Annual Average Price (Nominal and Real) of Small Cardamom (in Rs/Kg)

C) Tea

Annual Average Price (Nominal and Real) of Tea (in Rs/Kg)

D) Natural Rubber

Annual Average Price (Nominal and Real) of Natural Rubber (in Rs/Kg)

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E) Coffee

Annual Average Price (Nominal and Real) of Coffee (in Rs/Kg)

—▲— CoffeeNominal   —♦— CoffeeReal
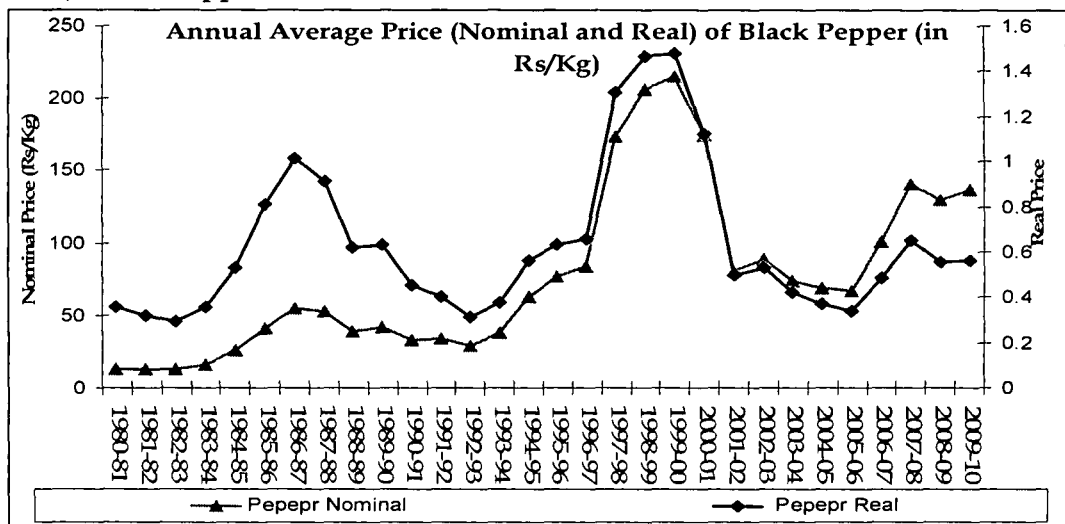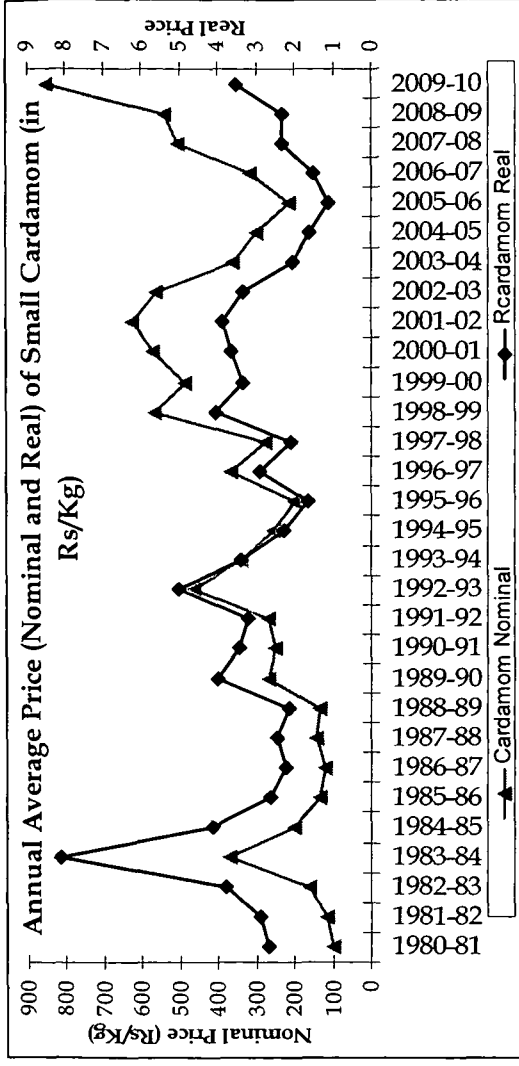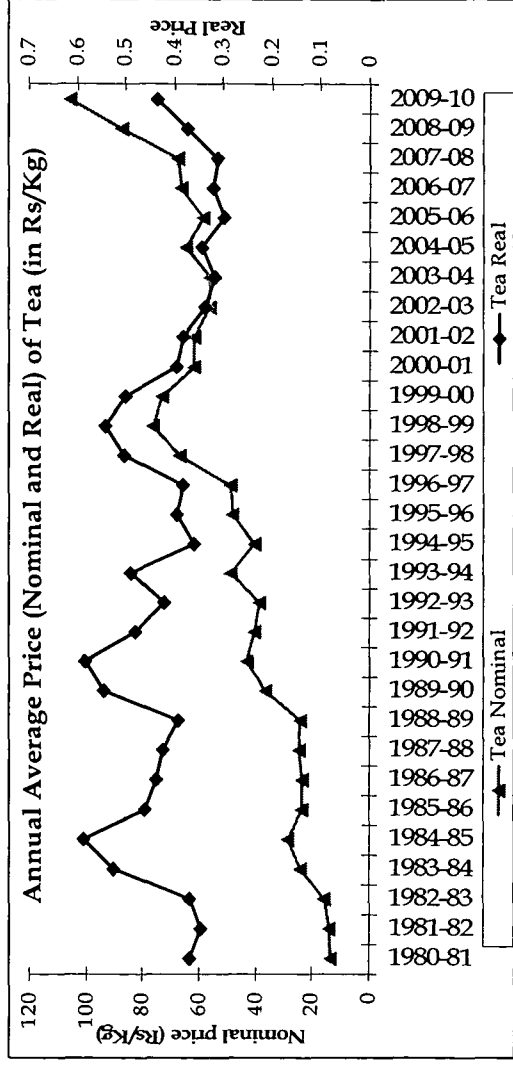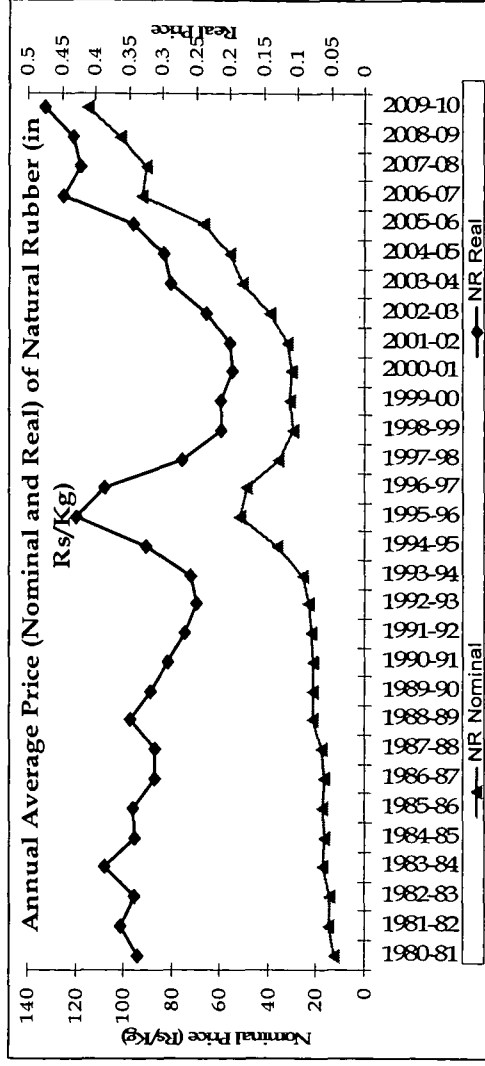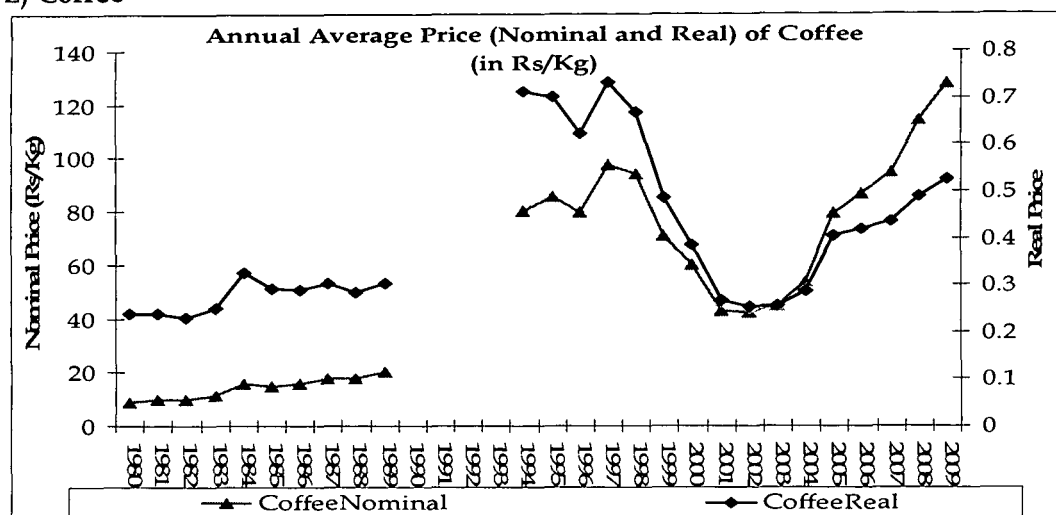
Source: *Price Data from the relevant Commodity Boards*

A visual examination of the figures explains that the nominal price of all commodities shows in general an increasing trend. To understand the long-term movement in the annual prices (nominal and real) of the selected commodities we estimated the log-linear trend growth rates for the whole period (1980-2010) and for the pre-reform (1980-1990) and post-reform periods (1991-2010) separately.

Table 4.3: Growth Rates of Annual Average Price (Nominal and Real) of Black Pepper, Small Cardamom, Tea, Natural Rubber and All Coffee - Pre Reform Vs Post Reform Period

Commodities	Trend Growth Rate		
	1980-2010	1980-1990	1991-2010
I. Nominal Price			
1. Black Pepper	7.60*** (7.42)	17.79*** (5.38)	5.91*** (2.94)
2. Small Cardamom	4.94*** (6.02)	3.38 (0.72)	3.07** (2.15)
3. Tea	5.79*** (13.18)	9.01*** (4.61)	3.61*** (5.78)
4. Natural Rubber	6.67*** (14.12)	4.67*** (6.1)	7.46*** (7.21)
5. Coffee	10.12*** (8.18)	9.44*** (10.03)	1.21 (0.64)
II. Real Price			
1. Black Pepper	0.87 (0.89)	11.44** (3.35)	0.18 (.10)
2. Small Cardamom	-1.77** (-2.24)	-3.12 (-0.68)	-2.64* (-1.85)
3. Tea	-0.93** (-2.44)	2.65 (1.37)	-2.12** (-3.43)
4. Natural Rubber	-0.04 (-0.07)	-1.69** (-2.42)	1.75* (1.68)
5. Coffee	2.01** (2.11)	3.07*** (3.34)	-3.8** (-2.05)

Note: 1) *** = Significant at 1 per cent level, ** = Significant at 5 percent level, * = Significant at 10 percent level, 2) Trend growth rate is estimated by using the semi-log (log- linear) regression method in which the natural log of price is regressed on the time variable, which takes the values such as 1, 2, and so on, 3) The coefficient of time expressed in percentage will become the growth rate of price over the period, 4) Figures in parenthesis are the respective t-values of the trend regression.

Source: *Derived using Price Data from different Commodity Boards*

As is clear from the visual examination of the price data, estimated growth rates also show that the nominal prices of all commodities are showing a secular increasing trend for the whole period. The same trend of secular increase could also be seen for the two sub periods separately for all the commodities, except for Small Cardamom in the pre-reform period and Coffee in the post reform period showing no statistically significant growth rate. For the whole period while nominal price of Coffee has grown at the rate of 10.12 per cent per annum, price of Black Pepper, Natural Rubber, Tea and Small Cardamom have grown at the rate of 7.60, 6.67, 5.97 and 4.94 per cent per annum respectively. When the price is adjusted for the general price level in the economy (real price) the picture becomes altogether different. While real price of Black Pepper and Natural Rubber do not show any significant growth for the whole period the real price of Small Cardamom and Tea show a secular declining trend and real price of Coffee is showing a secular increasing trend. This goes along with the discussion of secular decline in real general commodity prices in the long run at the global level except in the case of coffee.

When we look at the growth rate of prices of the selected commodities in the pre-reform in comparison with the post-reform period nominal price has grown at a faster rate in the pre-reform period compared to the post-reform period for Black Pepper and Tea and no significant growth for Small Cardamom and low growth rate for the Natural Rubber in the pre-reform period. In the case of real price, in the pre-reform period while the price of Black Pepper has grown at the rate of 17.79 per cent per annum, Natural Rubber price has shown a declining growth rate of -1.69 per cent and for Small Cardamom and for Tea there is no statistically significant growth at all. Price of Coffee has shown an increase to the extent of 3.07 per cent. Whereas in the post reform period, except Natural Rubber, Small Cardamom Coffee and Tea have shown a decline in real price growth rate and no significant growth rate is found for Black Pepper. Thus, the general discussion at the global level that the real commodity prices recently are raising at a faster rate finds support at the domestic level only for one of the crop – Natural Rubber- which is an industrial raw material. This pinpoints to the drawbacks in using

general commodity price indices and commodity group indices in generalizing the commodity price trends and instability.

In a nutshell, the nominal prices for all the chosen commodities are showing an increasing trend in the long run. But, when it comes to real prices, except Coffee price of two commodities are showing a secular decline in trend (Small Cardamom and Tea) while the other two (Natural Rubber and Black Pepper) do not show any statistically significant growth at all. This leads us to the inference that except for Coffee the domestic real price of commodities has either declined (Small Cardamom and Tea) or remained stagnant (Natural Rubber and Black Pepper). This needs to be read along with the overwhelming discussion in the literature at the global level regarding the secular decline in real commodity price leading to long run deterioration of the developing country's terms of trade as the "Commodity Problematique". With the greater domestic market orientation of the plantation commodities owing to the rapid growth performance of the economy and faster growth of the domestic market, even though the terms of trade erosion problem due to the secular decline in real price do not arise for us (since only a less part is exported), the farmers have become worse off in real terms.

4.4.2 Medium Term Price Instability: Issue of Multi-Year Price Cyclicality

The most significant characteristic of annual price data is its cyclical nature with multi-year spans, which does not have a clear nature of its own (Cashin et all, 1999). A commodity price cycle is generally understood as the years ranging from one peak to the other. It will have hence a trough phase or contraction phase followed by a boom phase. Analysis of price cycles is important from many respects as it aids the policy makers for counter cyclical policy measures (Cashin et all, 1999). Agricultural commodities (especially Plantation crops) are well known for their cyclical behavior. Studies at the global level have found that for commodities in general price slumps last longer than price booms, the magnitude of price falls in price slump is slightly larger than those of price raises in the subsequent booms; there is very little evidence to the consistent shape of the cycle (Cashin et all, 1999). These are observations at the global level and for

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commodities in general and a more disaggregated level analysis of cycles for specific commodities at the domestic level is worthwhile. The present section aims at exploring the nature, characteristics and reasons of the cyclicality in annual price of the selected plantation commodities and their role in price instability.

For identifying cycles through visual observation real price data is used, in which cycles will be much more vivid as it could be observed from the figures already shown. Price Cycles in real price are identified using the following simple rule [Cashin et al, 1999]:

Local Peak occurring at time period 't' = {Yt > Yt - k or Yt + k}, where k= 1...k

Local Trough occurring at time period 't' = {Yt < Yt - k or Yt + k}, where k=1...k

The same rule has been supported by filtering cycles in the nominal price as well through an appropriate cycle filtering method. For filtering the cycles from the nominal series Hodrick-Prescott cycle filtering method is used. Cycle obtained from the Hodrick-Prescott filtering method is the residual of Hodrick Prescott trend. The method filters trend through the following minimization process:

$$\text{Minimize } \Sigma (Xt - Tt)^2 + \lambda \Sigma (Tt+1 - Tt) - (Tt - Tt-1)^2 \{Tt\}$$

Where, Tt is the trend, Xt stands for the actual series and λ stands for the adjusting parameter, which is endogenously determined. As λ approaches to zero the trend approaches the actual series and when λ approaches to infinity the trend approaches to linearity. Thus, the cyclical fluctuations are filtered by endogenously determining a trend in the data.

After clearly dating the cycles, for understanding the role of multi year cycles in price instability of the selected commodities price amplitudes across different phases of the cycle have been calculated. Theoretically, the multi-year cycles in price are due to the multi-year delay in adjusting the supply of the commodity to the changed market conditions. Thus, based on the time required for the supply adjustment the duration of the cycles will vary from commodity to commodity.

Hence, theoretically the price cycle of the commodities is the opposite of the production cycle. For reasoning out of price cycles, annual price cycles have been compared with the annual production cycles of the commodities.

Figure 4.2: Annual Price Cycles of Black Pepper, Small Cardamom, Tea, Natural Rubber and Coffee (HP Filtered)

Multi-Year Price Cycle of Black Pepper (HP Filtered)

Multi-Year Price Cycle of Small Cardamom (HP Filtered)

Multi-Year Price Cycle of Tea (HP Filtered)
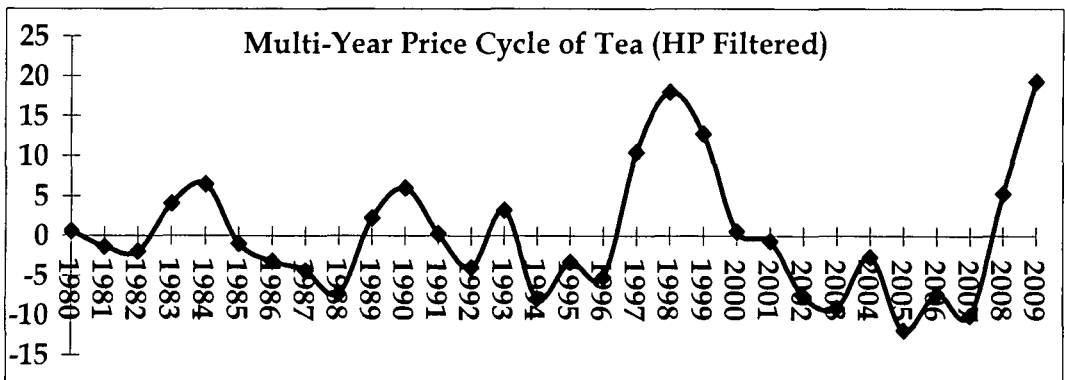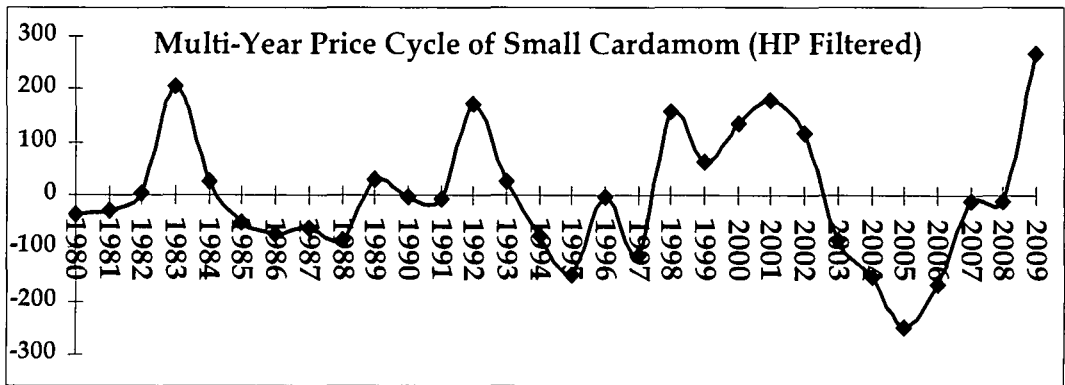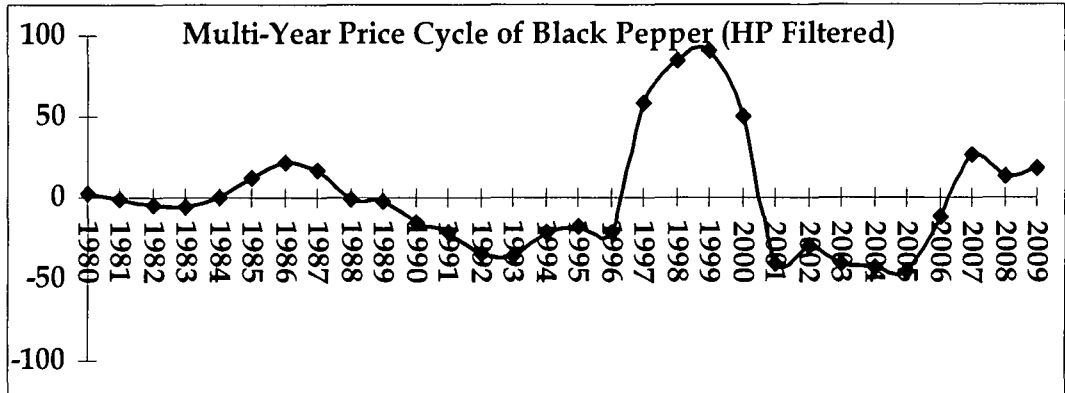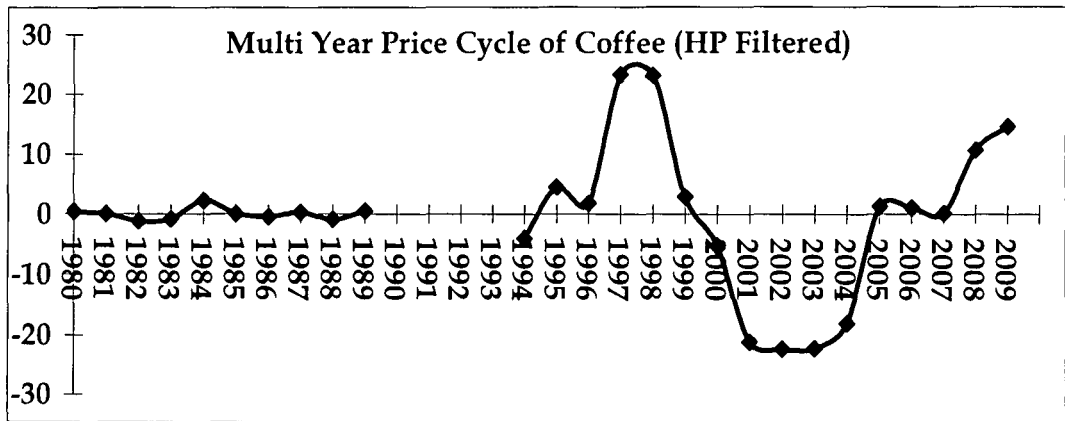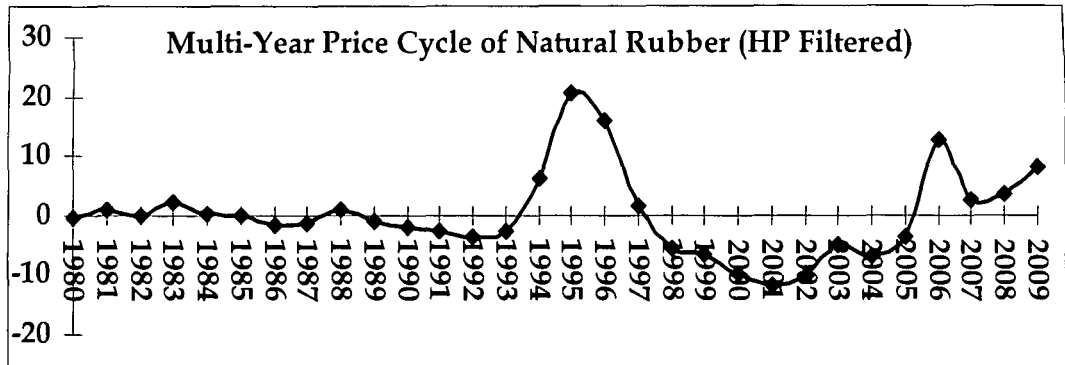
Source: *Derived using Price Data from Various Commodity Boards*

The cycles in commodity price are identified using real price data. The same are supported by the HP filtered nominal price series, which is given in Figure 4.2. Details of the price cycles are reported in the table 4.4 on summary statistics of price cycles.

Table 4.4: Price Cycles- Summary Statistics

Cycles		Black Pepper	Small Cardamom	Tea	Natural Rubber	All Coffee
1st	Date	1980-81 to 1986-87 *	1980-81 to 1983-84 *	1980-81 to 1984-85 *	1980-81 to 1983-84#	1980-81 to 1984-85
	Duration (Years)	6	3	4	3	4
2nd	Date	1986-87 to 1999-00	1983-84 to 1992-93	1984-85 to 1990-91	1983-84 to 1988-89	1984-85 to 1989-90
	Duration (Years)	13	9	6	5	5
3rd	Date	1999-00 to 2009-10#	1992-93 to 1998-99	1990-91 to 1993-94	1988-89 to1995-96	1989-90 to 1997-98++
	Duration (Years)	10	6	3	7	8
4th	Date	-	1998-99 to 2001-02	1993-94 to 1998-99	1995-96 to2009-10	1997-98 to 2009-10
	Duration (Years)	-	3	5	14	12
5th	Date	-	2001-02 to 2009-10	1998-99 to2009-10	-	-
	Duration (Years)	-	8	11	-	-
Total Duration #		29	29	29	29	29
Properties of Price Cycles						
1. Number of Cycles		3	5	5	4	4
2. Average Duration		9.75	5.80	5.80	7.25	7.25
3. Declining Phase (%) ##		16/29 (55%)	17/29 (58%)	19/29 (65%)	17/29 (58%)	15/24 (63%) @
4. MA of Slump ###		-77.03	-73.59	-44.44	-55.81	-64.38
4(a) Duration (years)		1999-00 to 2005-06 (7)	1983-84 to 1988-89 (5)	1998-99 to 2005-06 (8)	1995-96 to 2000-01 (6)	1997-98 to 2003-04 (6)
5. MA of Boom ####		377.42	219.09	68.57	147.37	103.85
5(a) Duration (Years)		1992-93 to 1999-00 (8)	1981-82 to 1984-85 (5)	2005-06 to 2009-10 (4)	2000-01 to 2009-10 (9)	2003-04 to 2009-10 (6)

Note: 1) # = since total data point is 30, total period of cycle is 29 years, ## = proportion of time in slump phase, ### = Maximum Amplitude of the slump phase, #### = Maximum Amplitude of the boom phase, 2) * = the cycle is often partial or do not know whether the cycle is over by there or not, 3) ++= Data from 1990-91 to 1993-94 is missing, 4) @= missing periods are not taken in to account.

Source: *Derived using Price Data from Various Commodity Boards*

The information provided is regarding 1) the number of cycles in the 30-year data for the individual commodities, with their exact time and duration, 2) the proportion of total time in the slump phase (proportion of times price is in the declining phase of the cycle), 3) average duration of a cycle, 4) maximum amplitude of the slump phase and its duration and exact date, 5) maximum amplitude of the boom phase and duration and date of the boom phase.

It is observed that Tea(5) and Small Cardamom (5) have the largest number of cycles (short duration cycles than other commodities in question) and the other two commodities - Black Pepper and Natural Rubber and Coffee - have 3, 4 and 4 cycles respectively (partial cycles are also included). The extent of cyclicality in annual price is found to be the highest for Black Pepper for which a cycle on an average ranges for 9.75 years. While for Natural Rubber and Coffee cycle takes on an average 7.25 years to complete for Small Cardamom and Tea cycle takes around 5.80 years to complete. Hence, for Tea and Small Cardamom relatively cycles are of short duration compared to the other three crops. This may be an indication of the fact that the time taken for the supply of these crops to adjust to the changed market conditions varies from crop to crop.

While Black Pepper, Coffee and Natural Rubber are perennial crops having long pre bearing period other two are not like that. While Natural Rubber takes around 7 years from the time of planting to yield, Black Pepper and Coffee takes around 5 to 6 years and 3 to 4 years respectively for harvesting from the days of planting. While Small Cardamom takes now around 2 to 3 years Tea takes only 1 to 2 years to give yield from the days of its planting. Thus, we would expect a cyclical duration of 14 years for Natural Rubber, 10 to 12 years for Black Pepper, 6 to 8 years for Coffee, 4 to 6 years for Small Cardamom and 2 to 4 years for Tea. While for Small Cardamom Black Pepper and Tea the cycle has come in conformity with the a priori expectation for Natural Rubber and Coffee the cyclical duration has been less than the expected number of years. This has been due to the comparatively less cyclical duration due to stabilized prices in the protected regime. Thus, in general commodities requiring

more years for a proper supply adjustment to the changes in market conditions reflect longer duration cycles as compared to the crops requiring lesser years to adjust.

It could also be noted that moving from the 1980's to the latest the cycles for each commodity is showing an expansion in duration. While Black Pepper took only 6 years in its first cycle (notwithstanding the fact that the cycle is not full) the last cycle took almost 10 years to complete. For Small Cardamom the first cycle was of the duration of 3 years has widened to 8 years at the end of the time point. Price cycle in Tea initially has taken only 4 years and when it came to the last cycle the duration has expanded to 11 years. Natural Rubber and Coffee are clear cases of continuous expansion in the cycle duration. While the first cycle of Natural Rubber took only 3 years to complete the last cycle has taken 14 years to complete. For Coffee the duration has expanded from 4 to 12 years. The expansion has been quite prevalent in the post reform phase for all the commodities except Tea and Small Cardamom. For Small Cardamom (second cycle) and Tea (second cycle) the higher duration cycles were also there in the pre-reform phase as well. The commodities, which showed clear widening of cycles, also showed increases in price instability in the post-reform period in comparison with the pre-reform period.

One interesting thing, which comes out of the analysis of price cycles, is that the duration of total time span in the declining phase of the cycles is greater than the duration of the time spent in the increasing phase of the cycle. While for Black Pepper the proportion of time price remains in the slump or contraction phase of the cycle is 52 per cent, for Small Cardamom, Tea, Coffee and Natural Rubber the figures are 58, 65, 63 and 58 per cent respectively. Thus, most often price declines are more than price hikes implying shorter duration of price boom and much higher duration of price slump in the real commodity prices. In other words, the cycles in prices for plantation commodities are characterized by asymmetric phases. Thus, we should be very cautious while commenting on the higher price the producers of the

primary products like plantation crops are getting by simply looking at the general trend in the nominal commodity prices.

But, the maximum amplitude of slump phase of the cycle is found to be generally lower for all commodities compared to the maximum amplitude of boom phase. While for Black Pepper the maximum amplitude of the slump phase (the percentage difference of the peak point to the trough point) is -77.03 per cent, they are -64.38, -73.59 per cent, - 44.44 per cent and - 55.81 per cent respectively for Coffee, Small Cardamom, Tea and Natural Rubber. On the other hand the maximum amplitude of the boom phase for the Coffee, Black Pepper, Small Cardamom, Natural Rubber and Tea are 103.85, 377.42, 219.09, 147.37 and 68.57 per cent respectively. This implies that the price boom is much faster than the price slump. This is not in conformity with the observation made by some studies (Cashin et all, 1999) at the global level for the general non-oil commodity price indices. When we look at the duration of price slump and price boom with maximum amplitude price boom is longer than price slumps for two commodities except for Tea, Coffee and Small Cardamom. When the maximum duration of a boom for Black Pepper is 8 years the slump phase takes around 7 years. For Natural Rubber it is 9 years and 6 years respectively. For Small Cardamom (5 years) and Coffee (6 years) the maximum boom and the maximum slump amplitude took almost the same number of years. For Tea the maximum duration of slump (8 years) is larger than the maximum duration of boom (4 years). This need not necessarily mean that the boom phases in general are with higher amplitude and longer duration as compared to the slump phases of the commodity price cycle. General conclusion regarding amplitude and duration should not be made only by looking at the maximum amplitude and maximum duration of the cycle since that represents only one particular phase of many cycles.

The inference is that the domestic prices of plantation commodities are showing high multi-year cyclical oscillations. We could also observe that the ranking of commodities on the basis of the extent of instability is also the same as the ranking of commodities on the basis of the amplitude of cycle, which leads us to the inference

that the multi-year cycles may be adding much to the instability of tropical commodities. It can also be inferred that the nature of cyclicality differs from commodity to commodity and the individual commodity characteristics are relevant in explaining the cyclicality. Wide range of cycles is an indication of the multi-year requirement of commodity production to adjust to the changed demand scenario. Coffee, Black Pepper and Natural Rubber are long duration crops and Small Cardamom and Tea are not so.

Since cyclicality is an important characteristic of commodity prices periodical movement of different phases of cycles and their amplitude need to be understood. This will also help us to understand the price instability dynamics in the post-reform period in comparison with the pre-reform period, because instability variations can be explained in terms of the cyclical amplitude variations. The amplitude, clear dating and duration of each phase of the cycle are reported in table 4.5.

Table 4.5: Price Amplitudes across Different Phases of the Annual Price Cycle

Phases		Black Pepper	Small Cardamom	Tea	Natural Rubber	All Coffee**
1st B	Amplitude	236.67	203.73	68.57	11.76	28.00
	Date and Duration	1982-83 to 1986-87 (4)	1980-81 to 1983-84 (3)	1981-82 to 1984-85 (3)	1980-81 to 1983-84 (3)	1982-83 to 1984-85 (2)
1st S	Amplitude	-69.31	-73.59	-33.90	-18.42	-4.17
	Date and Duration	1986-87 to 1992-93 (6)	1983-84 to 1988-89 (5)	1984-85 to 1988-89 (4)	1983-84 to 1986-87 (3)	1980-81 to 1982-83 (2)
2nd B	Amplitude	377.42	134.42	51.28	12.90	7.14
	Date and Duration	1992-93 to 1999-00 (7)	1988-89 to 1992-93 (4)	1988-89 to 1990-91 (2)	1986-87 to 1988-89 (2)	1988-89 to 1989-90 (1)
2nd S	Amplitude	-77.03	-67.06	-18.64	-28.57	-12.50
	Date and Duration	1999-00 to 2005-06 (6)	1992-93 to 1995-96 (3)	1990-91 to 1992-93 (2)	1988-89 to 1992-93 (4)	1984-85 to 1988-89 (4)
3rd B	Amplitude	5.88	142.77	2.08	72.00	2.82
	Date and Duration	2005-06 to 2007-08 (2)	1995-96 to 1998-99 (3)	1992-93 to 1993-94 (1)	1992-93 to 1995-96 (3)	1994-95 to 1997-98 (3)
3rd S	Amplitude	-	-16.87	-26.53	-55.81	-
	Date and Duration	-	1998-99 to 1999-00 (1)	1993-94 to 1994-95 (1)	1995-96 to 2000-01 (5)	-
4th B	Amplitude	-	15.22	50.00	219.09	103.85
	Date and Duration	-	1999-00 to 2001-02 (2)	1994-95 to 1998-99 (4)	2001-06 to 2006-07 (7)	2003-04 to 2009-10 (6)
4th S	Amplitude	-	-71.50	-44.44	-	-64.38
	Date and Duration	-	2001-02 to 2005-06 (4)	1998-99 to 2005-06 (7)	-	1997-98 to 2003-04 (6)
5th B	Amplitude	-	219.09	46.67	-	-
	Date and Duration	-	2005-06 to 2009-10 (4)	2005-06 to 2009-10 (4)	-	-
AD of Boom Phase		4.30	3.20	2.80	3.75	3.00
AD of Slump Phase		6.00	3.25	3.50	4.00	4.00
Total Period		25	29	28	29	24

Note: 1) Phases of the cycle are not given in the order of the cycle of the respective commodity, which we have seen earlier, 2) Data starts from the boom phase for commodities like Small Cardamom and Natural Rubber, hence the cycle can be defined either as a 'peak to peak' or 'trough to trough' phases, since both way of understanding of a cycle will not affect the analysis, 3) In the first case the first column will be only a phase of the cycle (hence half cycle) and the first cycle will be the first slump and the second boom and in the second case the cycle will be in the given order it self, 4) **= For All Coffee cycle starts with slump and hence, unlike other commodities cycle phases are given in the reversal order, B and S stand for Boom and Slump phase of the cycle respectively, 5) AD stands for Average Duration of the phases of the cycle.

Source: Derived using Price Data from Various Commodity Boards

The average duration of boom phase is found to be lower than that of the slump phase. While for Black Pepper the average duration of the boom phase is 4.30 years and for slump phase 6.00 years, for Small Cardamom, Tea, Coffee and Natural Rubber they are 3.20 and 3.25, 2.80 and 3.50, 3.00 and 4.00 and 3.75 and 4.00 years respectively. The implication is that even though the amplitude in boom phase is generally high as compared to that of the slump phase the boom phase is short lived than the slump phase.

A close examination of the amplitude of cycles and their duration reveals that the amplitude in general has widened for commodities like Coffee, Black Pepper and Natural Rubber in the post reform as compared to the pre reform period. Amplitude is observed for both the phases of the cycle separately- from trough to peak (expansion phase) and from the peak to the trough (contraction phase). For Black Pepper during the first expansion phase (1982-83 to 1986-87) real price has increased at the rate of 236.67 per cent and the contraction phase that followed (1986-87 to 1992-93) resulted in a price decline of -69.31 per cent. The second expansion phase from 1992-93 to 1999-00 resulted in an amplitude of 377.42 per cent and the subsequent contraction phase from 1999-00 to 2005-06 also resulted in an increased amplitude of -77.03 per cent. The last expansion phase shows negligible amplitude, since the cycle is still not complete. This leads us to the question whether market liberalization and increased openness of the economy resulted in increase in cyclical amplitude, which resulted in increase in instability in annual price of Black Pepper in the post reform era.

In the case of Natural Rubber the first expansion phase (1980-81 to 1983-84) had amplitude of 11.76 per cent and the accompanied slump phase resulted in amplitude of -18.42 per cent. The second boom phase (1986-87 to 1988-89) had not shown much increase in amplitude (12.20 %) compared to the previous boom phase. The second contraction phase (1988-89 to 1992-93) resulted in an increase in amplitude of -28.57 per cent compared to the previous contraction phase. The third (1992-93 to 1995-96) and fourth boom (2000-01 to 2009-10) phases clearly show acceleration in cyclical

amplitudes to the extent of 72 per cent and 219.09 per cent respectively. This also clearly shows the increased amplitude of price cycles in the annual price of Natural Rubber in the post reform period.

Coffee is also a clear case of expansion in cyclical amplitudes in the post reform period as compared to the pre reform period. The first slump (1980-81 to 1982-83) and boom phase (1982-83 to 1984-85) had amplitude of -4.17 and 28 per cent respectively. The second slump (1984-85 to 1988-89) and second boom (1988-89 to 1989-90) resulted in amplitude of -12.50 and 7.14 per cent respectively. The third boom phase (19994-95 to 1997-98) had an amplitude of 2.82 per cent (the data for the third slump phase is not available). Fourth slump (1997-98 to 2003-04) and boom phase (2003-04 to 2009-10) showed higher amplitude of 64.38 and 103.85 respectively.

For Small Cardamom the first expansion phase (1980-81 to 1983-84) and the last expansion phase (2005-06 to 2009-10) are high and almost comparable with 203.73 and 219.09 per cent respectively. But the price amplitudes in the 1990's (for both boom and contraction phase) especially during the second half of the 1990's were very less and not comparable to the 1980's. For Tea also the same kind of observations could be made. Tea had high price amplitudes in the 1980's. In the first half of the 1990's price amplitudes (only for shorter duration) were quite low which is not comparable to price amplitudes of any of the periods before and after that. The amplitudes during the second half of the 1990's and 2000's are comparable to the amplitudes during the 1980's.

What does it tell us? Does it mean that the increased openness has resulted in increased amplitude in the case of three crops and it has resulted in high decline in amplitude for crops like Small Cardamom and marginally for Tea? One thing is clear that the change in amplitudes of cycles explains changes in instability of the crops across the regimes. Have the increased domestic market orientation of Commodities like Small Cardamom and Tea and the increased exposure of commodities like Black

Pepper, Coffee and Natural Rubber to the international markets contributed to increased cyclical amplitudes, which caused the expansion of their instability to a larger extent? An explanation for this requires an analysis of the price cycles with the domestic and international supply conditions of the respective commodities.

4.4.3 Cyclical Fluctuations in Annual Price: Role of Domestic and Global Production Cycles

In the previous section, we have looked at the nature and characteristics of annual price cycles and their dominant role in annual price instability. We have inferred from the earlier analysis that the price cycles do follow the time required for the supply of commodities to adjust to the changes in market conditions. Thus, theoretically fluctuations in price are exactly the opposite of the fluctuations in production. Thus, a greater availability in the market in a year implies a low annual average price and vice versa. Analysis of 'production and price' is subject to the limitation that production in one particular year is not exactly the availability in the market as there can be carry over stocks from the previous year and a part of the current year production need not reach the market at all, depending up on the nature of the commodity whether they are storable or not. Comparison of actual production with price is often difficult to interpret as both are subject to difference in trend factor. Thus, we would adopt a method of comparing the price cycle with the production cycle of the respective commodities. The price cycles and production cycles are obtained by the Hodrick-Prescott cycle filtering method, which filters the cycle in the data by endogenously determining a common trend, either linear or non-linear in the data.

In an internationally integrated market domestic price cycle is theoretically expected to respond to the global production cycle and if the commodity market is not integrated the domestic price cycle will respond to the domestic production cycle. With the opening up of the economy commodity markets in general are globally integrated to a larger extent as compared to the closed regime. Thus, in the pre-reform period we would expect the domestic price cycle to be responding to the

domestic production cycle and in the post reform period domestic price cycle is expected to respond to the global production cycle. This section investigates the role of both global production cycles (especially in the post-reform period) and domestic production cycles (in the pre-reform period) in explaining the cyclicality in annual average price.

Figure 4.3: Comparison of Production Cycles (Global and Domestic) and Domestic Price Cycles of Small Cardamom
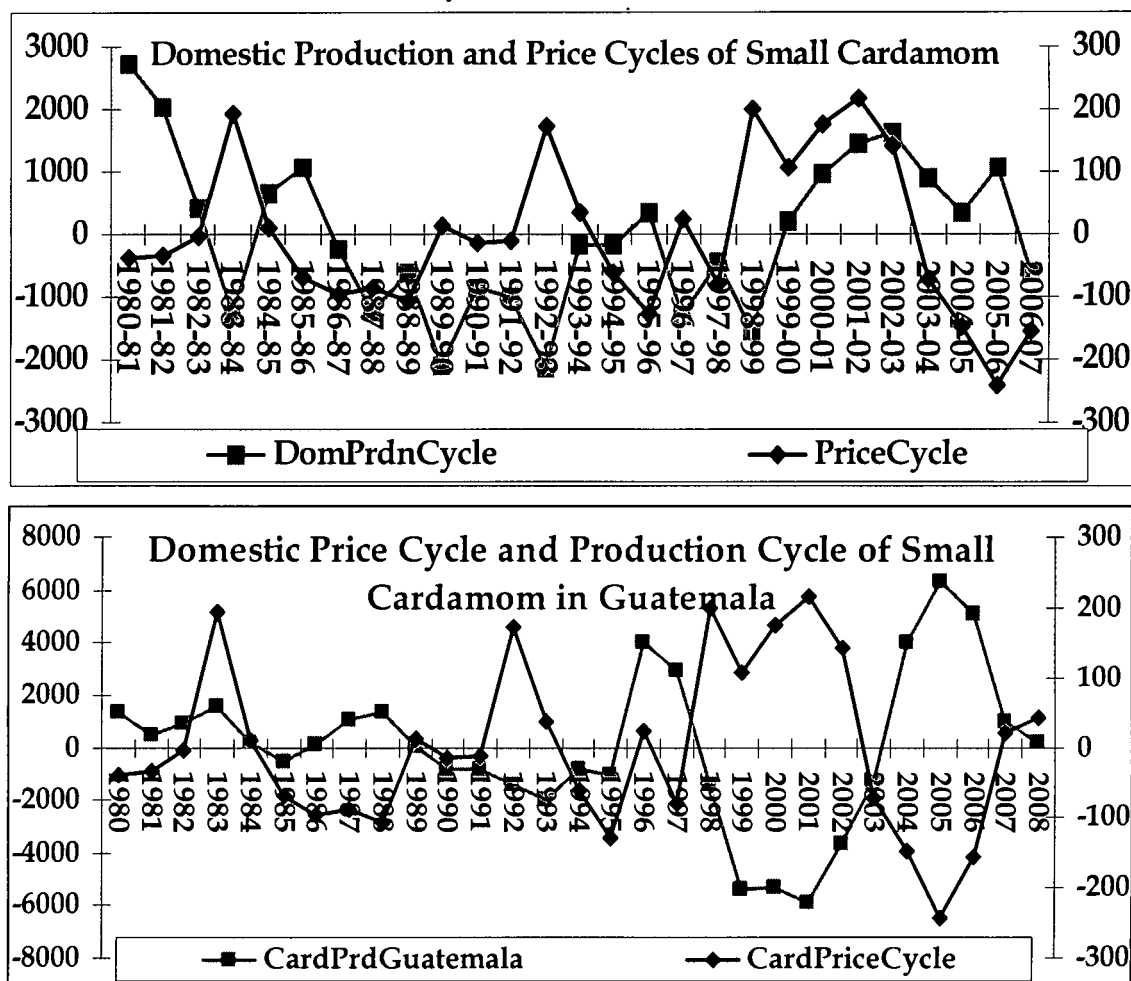
It could be seen from the panel one of the Figure 3 that the domestic price cycle of Small Cardamom is just the opposite of the domestic production cycle for most of the years in the pre as well as in the post-reform period, except for a few years: 1985-86 to 1986-87, 1999-00 to 2001-02 and 2002-03 to 2004-05. Thus, a decline or increase in domestic production of Small Cardamom was followed by an increase or decline

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of its domestic price in many of the years in the pre reform period and in some of the years in the post reform period. Price shoots up when the production cycle reaches the lowest point and vice versa. For instance, the period from 1980-81 to 1983-84 was a period of continuous decline in domestic production and hence continuous increase in price. The period from 1983-84 to 1985-86 was a period of continuous increase in production and continuous decrease in price. The period from 1985-86 to 1992-93, 1992-93 to 1998-99, 1998-99 to 1999-00 and 2004-05 to 2006-07 are the cyclical periods with fluctuations in production as well as fluctuations in price. A close examination of the figure reveals that every production increase has resulted in a decline in price with only five exceptional years in the twenty-seven year data. The exceptional periods are from 1985-86 to 1986-87, 1999-00 to 2001-02 and 2002-03 to 2004-05. Thus, in 22 out of 27 cases (81 per cent) the domestic price and domestic production association has come in support of the theoretical expectations. Since the global production data is not given for Cardamom alone, we have used the production cycle of Cardamom in the main competing country, Guatemala. The period from 1999-00 to 2008-09, where the domestic production does not explain the instability in domestic price the production variability in the competing country, Guatemala is clearly explaining it. This implies that the multi year price cycle of Small Cardamom is caused mainly by the cycles in the domestic production in the pre reform period and the initial years of reform and partly by the production variability in the competing country in the recent years. This also highlights the global market integration of Small Cardamom market in the recent years.

Thus, cycles in domestic annual price of Small Cardamom is explained mostly by the cycles in the domestic production and partly by the cycles in the competing country. The cycles in domestic production is less wide as compared to the cycles in global production of Cardamom. Now, it becomes clear that the reduced price instability of Small Cardamom in the open trade regime is due to the lack of international integration of Small Cardamom market in the initial years of reform (1990's).

Figure 4.4: Comparison of Production Cycles (Global and Domestic) and Domestic Price Cycles of Black Pepper

Source: *Derived using Price and domestic Production Data from Spices Board and Global Production Data from Agricultural Statistics of FAO, Various Issues*

For Black Pepper domestic production cycle and domestic price cycle have an association in the pre reform period. The period form 1980 to 1985 was the declining phase of the domestic production cycle and the booming phase of the domestic price cycle. The period from 1985 to 1990 was the period of expansion in domestic production and slump in domestic price. It could also be observed that the domestic price of Black Pepper during this period is having some association with the global production cycle as well. The period from 1980 to 1986 showed an expansion in domestic price and contraction in global production. The period from 1986 to 1990 showed a contraction in domestic price and expansion in global production. This

could be due to the reason that Black Pepper was highly export oriented during the pre-reform period. Even then, domestic price is found to be more stable than global production. The domestic price cycle and the domestic production cycle do not hold any association in the post-reform period and the domestic price cycle becomes the opposite of the wide global production cycle as it could be seen from Figure 4, which is an indication of greater global market integration for Black Pepper. The period from 1990 to 1997 was the period of contraction in global production and expansion in domestic price of Black Pepper. The period from 1997 to 2005 was the period of expansion in global production and contraction in domestic price. However, one could observe that there is generally three-year delay between the top and bottom point of the production cycle and the price cycle.

The observation has to be seen in the light of our earlier observation that the price instability of Black Pepper has increased in the post reform period. The cycles in global production are much wider than the cycles in domestic price. Thus, the global market integration of Black Pepper has resulted in raising the price instability of Black Pepper by aligning the domestic price cycle exactly the opposite of the wide cycles in the global production of Black Pepper.

Figure 4.5: Comparison of Production Cycles (Global and Domestic) and Domestic Price Cycles of Natural Rubber
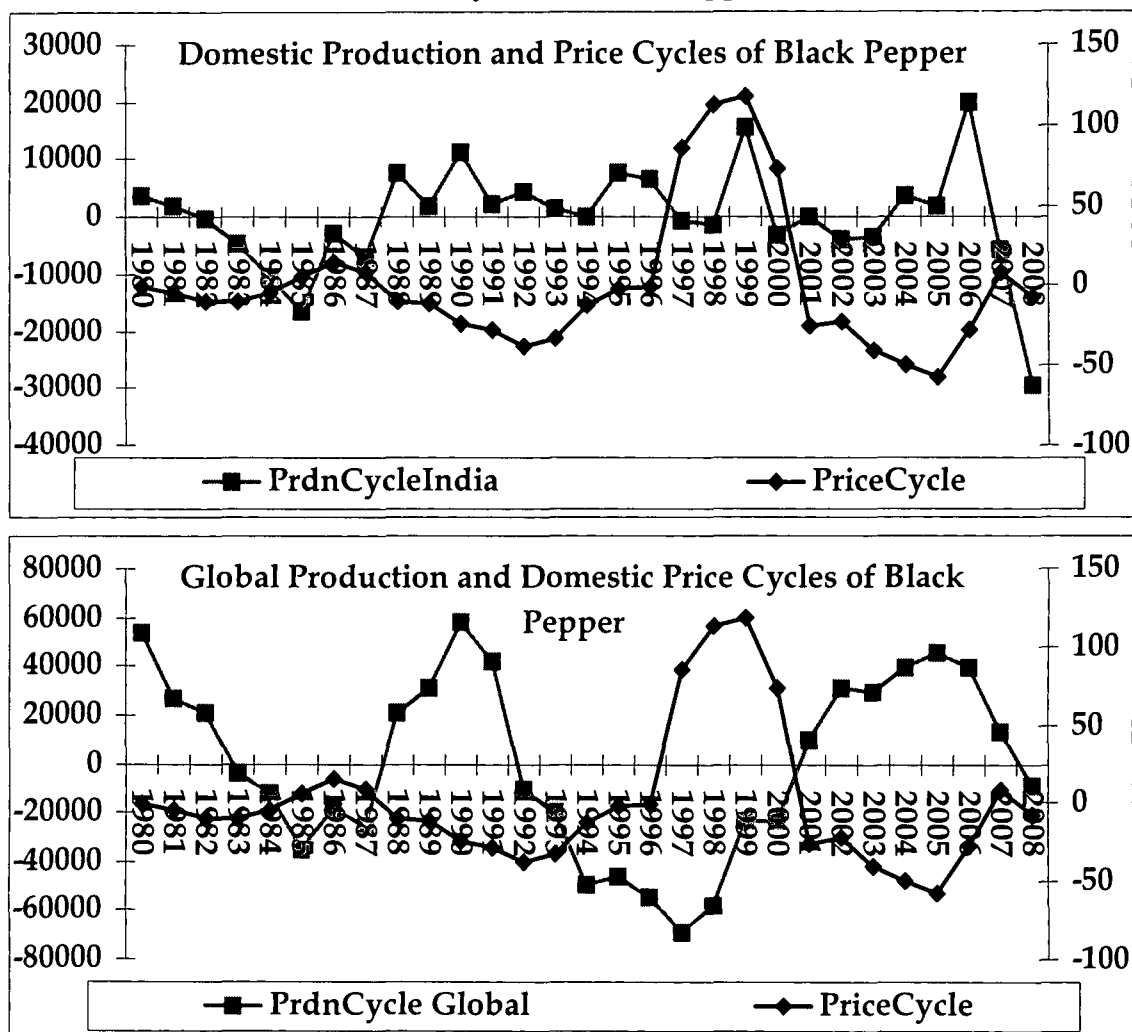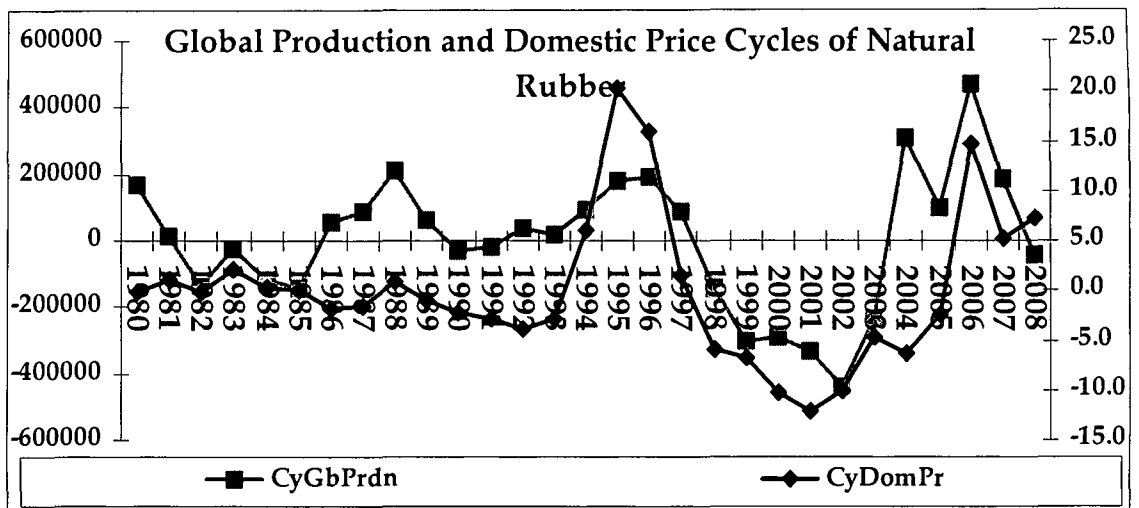
Source: *Derived using Price and domestic Production Data from Rubber Board and Global Production Data from Agricultural Statistics of FAO, Various Issues*

In the pre-reform period the domestic price cycles of Natural Rubber is driven mainly by the cycles in the domestic production it self as it could be observed from the figure 5 with some exceptional years. The period from 1980 to 1983 was a period of contraction in domestic production and expansion in domestic price. The period from 1983 to 1986 was a period of contraction in domestic production and domestic price. This shows the extent of irregularities in Natural Rubber price. The period from 1986 to 1988 shows a period of contraction in domestic production and expansion in domestic price of Natural Rubber. The period from 1988 to 1992 was a period of expansion in domestic production and contraction in domestic price. The period from 1992 to 1994 was a period of contraction in domestic production and expansion in domestic price. One thing, which could be observed from the panel one of the figure 5, is that the price was more stable than the domestic production. This needs to be read along with the kind of interventions in the market. For Natural Rubber the domestic market was highly insulated from the fluctuations in the international market through a lot of interventions like monopoly procurement of Natural Rubber from 1942 to 1946, notification of minimum and maximum price, buffer stock mechanism and control on imports through tariff and non-tariff barriers (quantitative restrictions on imports till March 31, 2001). The period after that the domestic price and domestic production cycle of Natural Rubber do not display any close association either and the domestic price cycle moves along with global

production most of the time and became the opposite of the global production cycles for some periods such as 1999 to 2002 and 2003 to 2005 and 2007 to 2008. Domestic price for a longer period from 1994 to 1999 has been moving along with the global production cycle, which is an instance of irregularities in natural rubber price. Natural Rubber being an industrial raw material, cycles in its price are influenced by the cycles in global industrial demand as well. Here also we could observe that the greater integration with the world market might have resulted in aligning the domestic price cycles of natural rubber with the cycles in global supply to some extent and the cycles in global industrial demand to a larger extent.

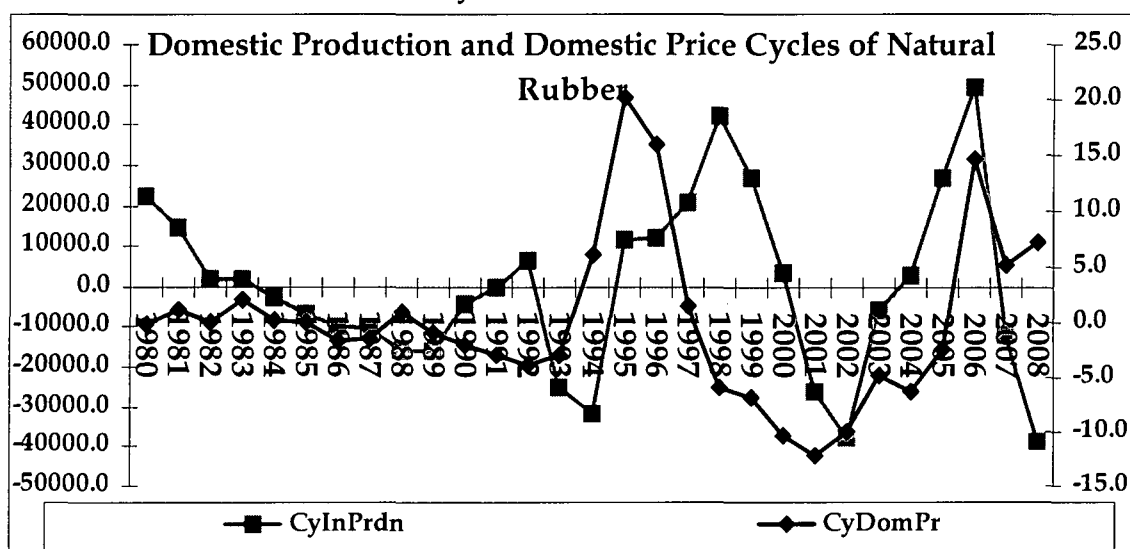Figure 4.6: Comparison of Production Cycles (Global and Domestic) and Domestic Price Cycles of Tea
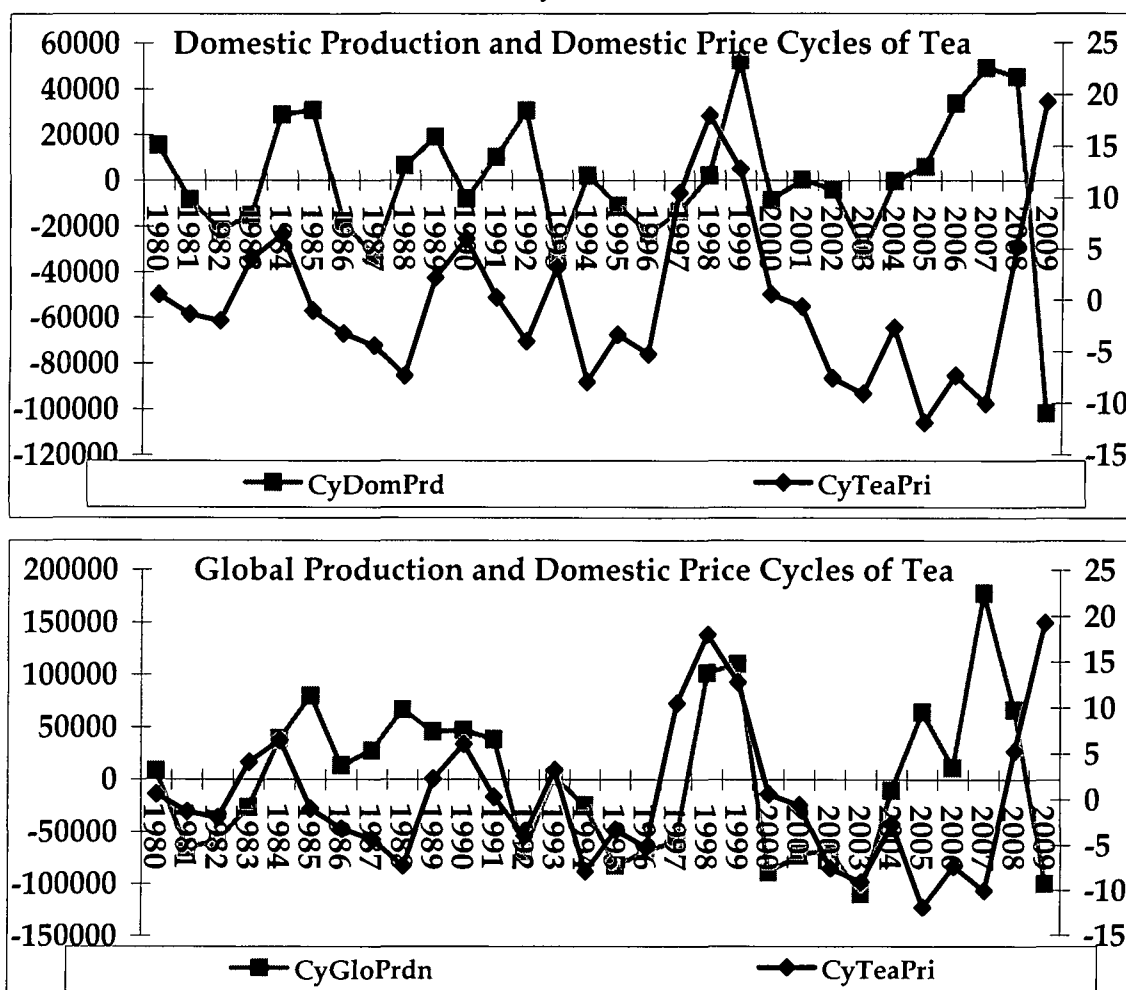
Source: Derived using Price and domestic Production Data from Tea Board and Global Production Data from Agricultural Statistics of FAO, Various Issues

Tea is also one commodity where we could observe so much of irregularities in price and production cycles. During the period from 1980 to 1988 the domestic production and domestic price moves in the same direction as production increases or decreases price also behaves accordingly. The period from 1988 to 1995 forms three short duration cycles of three years in annual price and production of Tea. The period from 1995 to 2003 both domestic and global production cycle do not hold any association with the domestic price cycle implying the extent of irregularities in domestic price of Tea. Tea includes both leaf and dust and so much of quality difference is expected for Tea. Based on the physical appearance, there are two major varieties of Tea namely, Black Tea and Green Tea. There are two varieties of Black Tea namely Orthodox Tea and CTC (Crush, Tear and Curl) Tea. There are a lot of regional variations in quality with Tea produced in north Indian states (Assam Valley, Cachar, Darjeeling, Dooars and Terai) being more qualitative than that of their southern counter parts. Price is the average of around seven auction centers spread through out the main centers of Tea production. Thus, the presence of irregularities in the price of Tea may be attributed partly to the high quality difference and partly due to the geographical spread of production. During the period from 2004 to 2009 the domestic price of Tea is found to have some association with the global production cycle with an increase in production of Tea at the global level resulting in lowering of price and vice versa. Thus during these periods the amplitudes in domestic price of Tea was much higher. Thus, the marginal decline in instability of Tea in the post reform period may be due to the lack of integration with the global market for a longer period of time in the post reform period of early 1990's and 2000's. This was the period in which price amplitudes were low and domestic price does not respond to the global production.

Figure 4.7: Comparison of Production Cycles (Global and Domestic) and Domestic Price Cycles of Coffee
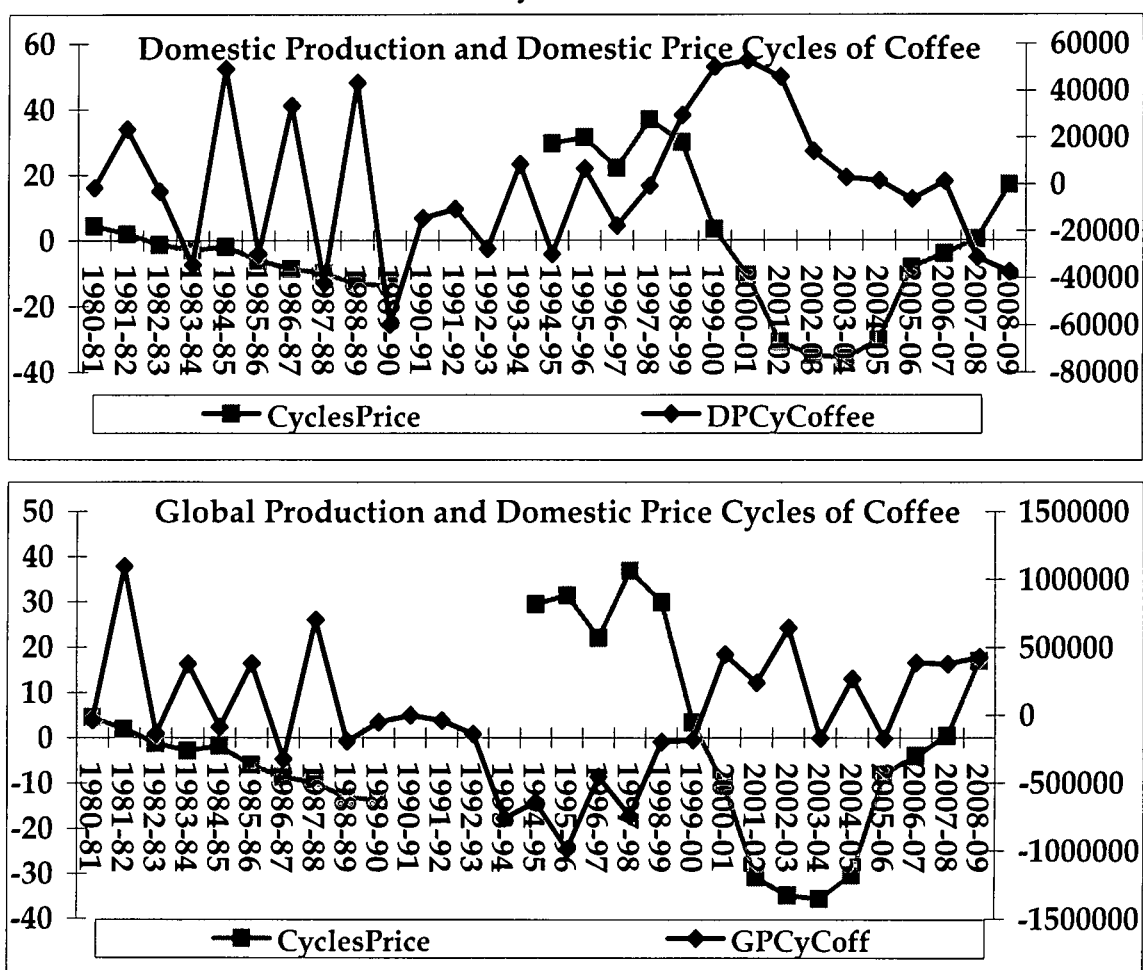
Domestic Production and Domestic Price Cycles of Coffee

Legend: CyclesPrice, DPCyCoffee

Global Production and Domestic Price Cycles of Coffee

Legend: CyclesPrice, GPCyCoff

In the pre reform period the domestic price of Coffee is not showing any association either with the domestic or with the global production. While price remains more or less stable production has been fluctuating widely both at the domestic and global level. This may be due to the efficient supply management by the commodity board through the centralized pooled marketing system. With the liberalization of the commodity markets since 1991 domestic price of Coffee is found to be responding more to the wide global production cycles and less to the domestic production cycle. From 1994-95 to 2000-01 every increase or decrease in global production has been followed by a decline or increase in domestic price. But, with respect to the domestic production the relationship has been observed only in few years (1995-96 to 1997-98

are exceptional years). But from 2000-01 to 2008-09 many exceptional years could be seen in both global and domestic production. While only from 2001-02 to 2002-03, 2004-05 to 2005-06, 2006-07 to 2007-08 an increase in global production has resulted in decline in domestic price and vice versa. Whereas in the case of domestic production after continuous exceptional years from 2000-01 to 2003-04 some association could be seen from 2003-04 to 2008-09 with an exceptional year in between from 2005-06 to 2006-07. Thus, it could be argued that the instability in Coffee price has increased with the liberalization of commodity markets and increased response of domestic price to changes in global production.

We have seen that for Tea and Small Cardamom the domestic price cycle is associated more with the domestic production cycle, except for the last few years' domestic price responses to the cycles in global production. Domestic price is responding to the domestic production cycles in the pre-reform period for Black Pepper and Natural Rubber and to the global production cycles in the post reform period for Black Pepper to a larger extent and Natural Rubber to some extent. For Coffee domestic price in the protected regime is not responding to the domestic and global production either and in the post reform era the domestic price is responding more to the global production than the domestic production. We have also seen that the price instability got reduced for Small Cardamom and Tea and increased for Black Pepper, Coffee and Natural Rubber in the post-reform period as compared to the pre-reform period.

In nutshell, in general the domestic price cycles of selected plantation commodities are much better explained by the cycles in either domestic or global production it self. For Small Cardamom domestic price cycle is found to be associated more with the domestic production cycle in the pre reform period and some years especially during the 1990's in the post reform period. During the 2000's the domestic price responds to the production cycles in the competing country. This is an indication of the lack of international integration of Small Cardamom market in the 1990's and integration in the 2000's. For Black Pepper the domestic price cycle is associated with

the less wide domestic production cycle in the pre reform period and in the post reform period the domestic price is associated with more wide global production cycle. For Tea domestic price cycle in the pre reform period is associated more with the domestic production cycle and in the post reform period only for the last few years (2004 -2009) the domestic price is associated with the wide global production cycles even though there are wide irregularities in price and production cycles. In the case of Natural Rubber domestic production cycle explains the cycles in price in the pre reform period and global production cycles and global cycles in demand explains the price cycles even though there are large irregularities in the price cycles. In the case of Coffee the domestic price in the post reform era is associated more with the global production cycles while in the pre reform era price is more stabilized and does not respond to the supply conditions. Thus, we would argue that the reduced instability in the price of Small Cardamom and Tea in the post reform period is due to reduced international integration of the market in the 1990's and the response of domestic price to the less wide domestic production cycles in those years. It could also be inferred very clearly in the case of Black Pepper and Coffee and to some extent in the case of Natural Rubber that the increase in price instability in the post-reform period is due to the international integration of Black Pepper, Coffee and Natural Rubber market and the response of domestic price to the wide global production cycles.

4.5 Time Varying Price Instability

We have so far made an attempt to understand the instability characteristics in annual average prices by looking at their long run movement and medium term cyclicality. For analyzing the long run movement a log linear growth rate estimation model has been adopted. For answering the fluctuations initially we have constructed an appropriate instability index and tried to explain the variation in price instability across commodities and across time periods (pre and post reform periods) by looking at their medium term cyclicality aspects. For reasoning out medium term cyclicality aspects price cycles have been compared with production

cycles. The analysis so far made is silent with respect to the time varying aspects of instability, which is helpful to understand contribution of specific years to the over all instability. Time varying instability analysis helps to understand the nature of fluctuations in price – whether upwards a trend or downwards- and in a way supports the analysis of medium term cyclicality.

One simple way of looking at the time varying instability in prices could be to find the price differences from the common trend in the data. This will enable us to understand to what extent price is deviating from a common trend, which can be a measure of instability for that particular year. Price difference from the linear trend is not suitable in the case of price data, as the involvement of cycles in prices linear trend is not always expected. We adopt a simple technique of finding price deviations from a common trend with 5 year moving average, which will smooth the series. This can be a good method since this is also the basis of the Mc-Bean Index of Instability. Deviations of price from common trend (Five-year Moving Average) for the four plantation crops are reported in Table 4.6.

For all the four commodities the number of times price raises above the trend was lower than the number of times price is below the trend. Thus, for more than fifty percent of the times price is below the trend for all the commodities under consideration (see Table 4.7).

Table 4.6: Deviations of Price from the Trend (5 Year MA) for Tea, Small Cardamom, Black Pepper and Natural Rubber

Year	Tea	Small Cardamom	Black Pepper	Natural Rubber	All Coffee
1982-83	-3.53	-28.20	-3.62	-0.09	-1.3
1983-84	2.83	174.43	-5.51	0.82	-0.9
1984-85	5.61	3.39	-4.18	0.49	2.3
1985-86	-1.44	-59.63	3.01	-0.04	-0.2
1986-87	-1.44	-26.79	11.83	-0.56	-0.7
1987-88	-1.82	-17.86	7.11	-0.30	0.4
1988-89	-6.10	-48.34	-5.78	-0.76	-
1989-90	2.78	54.56	1.96	0.62	-
1990-91	6.55	-25.45	-1.85	0.29	-
1991-92	-1.28	-50.43	-1.35	-1.37	-
1992-93	-3.51	149.29	-10.66	-0.15	-
1993-94	5.59	34.00	-10.29	-5.15	-
1994-95	-4.43	-70.26	4.83	-5.52	-
1995-96	-2.65	-86.25	-9.87	10.95	-
1996-97	-7.37	32.50	-36.87	10.64	-
1997-98	4.32	-103.44	22.37	-0.48	-7.9
1998-99	11.10	114.16	35.54	-6.36	12.1
1999-00	4.88	-17.35	45.20	-2.49	13.6
2000-01	-3.94	8.07	21.44	-0.48	-2.4
2001-02	0.01	102.48	-46.03	-4.24	-2.0
2002-03	-4.04	78.29	-8.91	-4.27	-9.2
2003-04	-3.22	-50.64	-1.56	1.77	-6.4
2004-05	4.42	-52.00	-10.61	-2.00	-7.7
2005-06	-4.33	-123.19	-23.66	-7.80	-7.7
2006-07	-2.56	-58.76	-0.64	7.42	7.4
2007-08	-9.51	18.64	25.77	1.28	1.0

Source: *Derived using Price Data from Various Commodity Boards*

Table 4.7: Proportion of time Price is below the Trend

Commodities	Number of Times Above the Trend	Number of Times Below The trend	Total Time Period	Number of Times Below The trend (%)
1. Tea	10	16	26	61.5
2. Small Cardamom	11	15	26	57.7
3. Black Pepper	10	16	26	61.5
4. Natural Rubber	9	17	26	65.4
5. All Coffee	6	12	18	66.7

Source: *Derived using Price Data from Various Commodity Boards*

This goes along with our earlier observation that in price cycles proportion of time price was in the expansion phase of the cycles was less than the proportion of time price was in the slump or contraction phase (see Table 4.4). For Small Cardamom while for 15 times price was below the trend only for 11 times it was above the trend.

For Tea the number of times price was above the trend and below the trend was 10 and 16 times respectively. For Black pepper it is 10 and 16 times and for Natural Rubber it is 9 and 17 times respectively. For Coffee it is 6 and 12 respectively. This analysis does not take in to account the first two and last two observations since trend is a five-year moving average and this limits the analysis across pre and post-reform periods since observations are small in numbers.

A more appropriate analysis of price movements across common trend in the data in the pre and post-reform periods separately has been done by the Hodrick-Prescott trend filtering method. After filtering the trend the summary results are displayed in Table 4.8.

Table 4.8: Number of Years Price is below the Trend (HP Filtered)

Commodities	Whole Period			Pre-Reform Period			Post-Reform Period		
	Total	NTBT	%	Total	NTBT	%	Total	NTBT	%
1. Small Cardamom	30	18	60	10	6	60	20	12	60
2. Black Pepper	30	18	60	10	5	50	20	13	65
3. Natural Rubber	30	17	57	10	5	50	20	12	65
4. Tea	30	17	57	10	6	60	20	11	55
5. Coffee	26	14	54	10	7	70	16	9	56

Note: Common Trend in the Data is the HP Trend fixed by the Hodrick-Prescott Filtering Method
NTBT= Number of Times Price is Below the Trend
Source: *Derived using Price Data from Various Commodity Boards*

It could be observed from the table 4.8 that the prices of all commodities lie most of the time below the common trend in the data. While Small Cardamom and Black Pepper prices show 60 per cent of the time below the trend, Natural Rubber and Tea prices show 57 per cent of the time below the trend. For 54 per cent of the time Coffee price has been below the trend. The implication of the observation is that in the annual average prices, instability in general for the tropical commodities is downward biased. Whether this downward bias in the selected tropical commodity prices has anything to do with the policy regime change will be of worthwhile to investigate. It is interesting to see that for Black Pepper and Natural Rubber the proportion of time price lying below the trend has increased in the open trade regime as compared to the closed regime, remained the same for Small Cardamom and declined for Tea and Coffee. The observation becomes important when we read

this along with our earlier finding that for Black Pepper and Natural Rubber instability has increased in the post-reform period and reduced for Tea and Small Cardamom as compared to the pre-reform period. What does it convey? Except Coffee, for Black Pepper and Natural Rubber increased integration of the domestic market with the world market has been followed by increased instability with more downward fluctuations and for Small Cardamom and Tea greater domestic market orientation has been followed by a reduction in price instability with less downward fluctuations.

While Small Cardamom and Tea are not showing any clear cut trend in time varying instability in the post-reform period in comparison with the pre-reform period, Black Pepper, Coffee and Natural Rubber are a clear case of increase in instability in the post-reform period (see the Figure 4.8). In the case of Black Pepper the increased instability has been contributed mainly by the period ranging from 1996-97 to 2002-03 and the last three years and the years before are almost comparable to the pre-reform period. In the case of Natural Rubber the increased instability in the post-reform is contributed by years from 1993 onwards while the three years before are almost comparable to the pre-reform period (see the Figure 4.8). For Coffee the increased instability has been contributed by years from 1996 onwards. The inference is that the increased instability in prices for some crops have been contributed much by some periods in the post reform and the developments in those periods will be very much helpful in explaining the increased instability.

Figure 4.8: Absolute Price Differentials of Small Cardamom, Tea, Black Pepper and Natural Rubber from Trend (5 Year MA)

Absolute Price Differentials (from Trend) of Natural Rubber

Absolute Price Differentials (from Trend) of Coffee
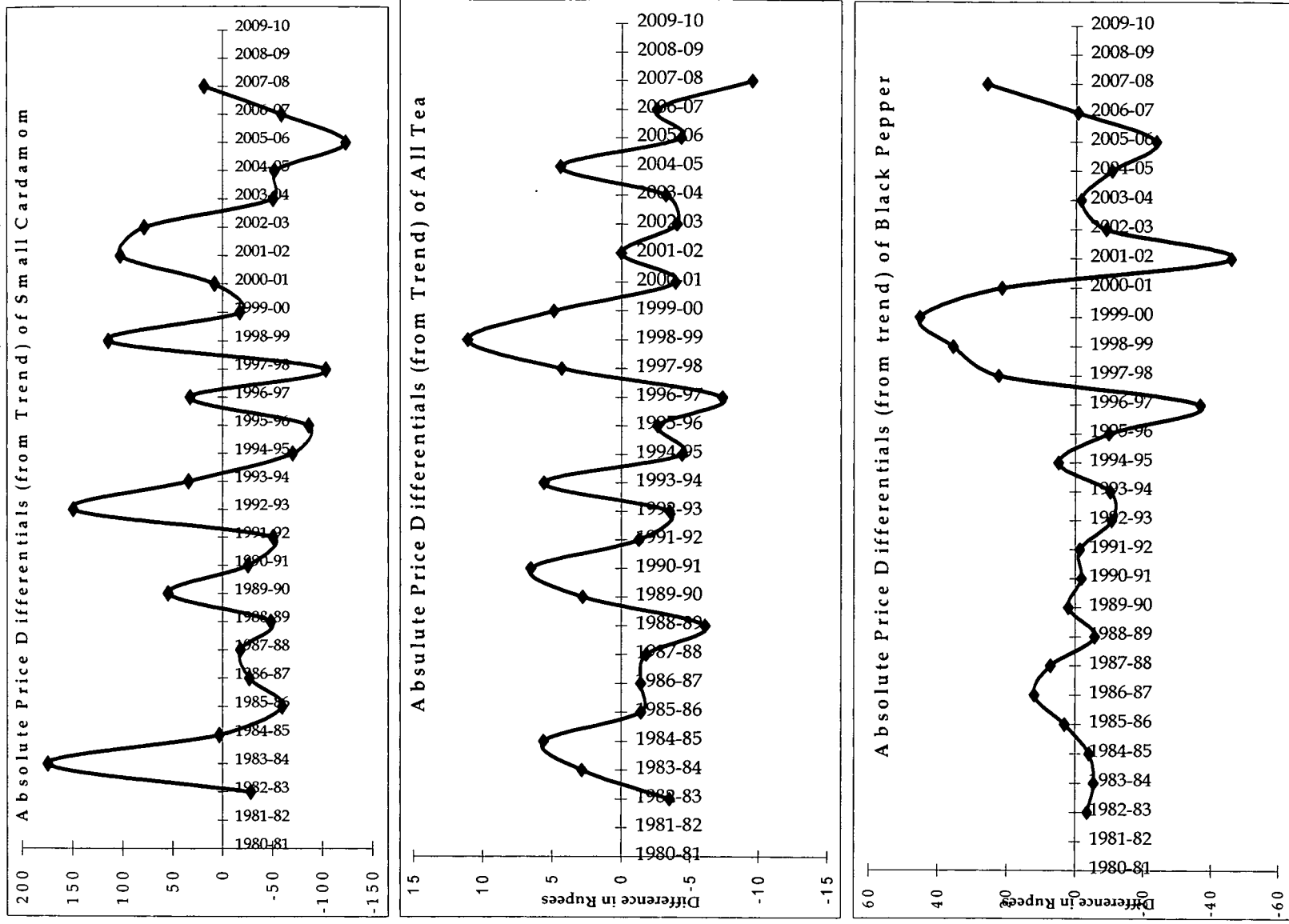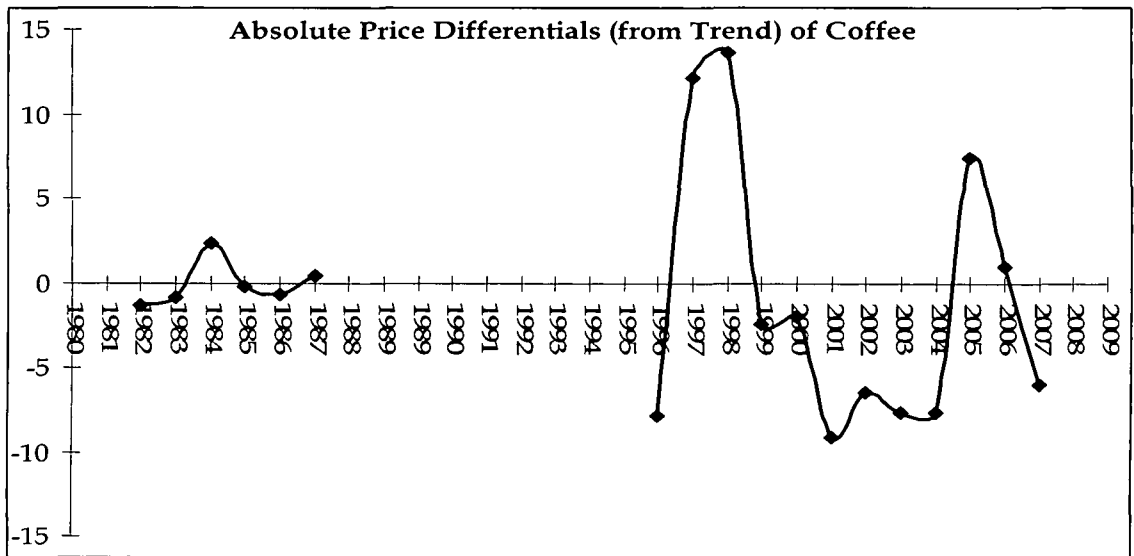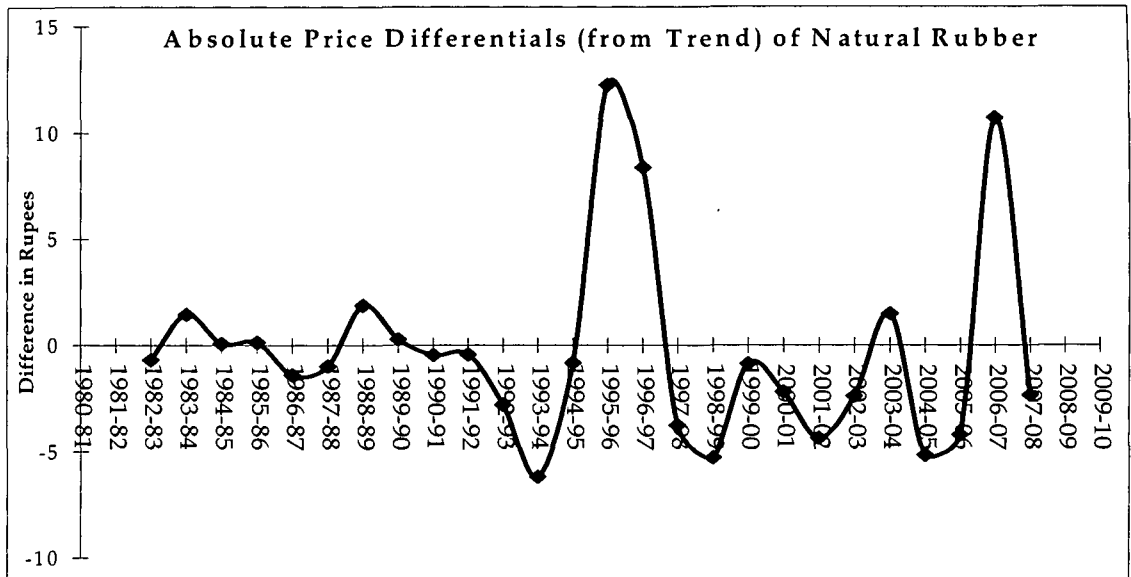
Note: 1) Trend in the data is the five year moving average
Source: *Derived using Price Data from Various Commodity Boards*

It can be seen that the increased time varying instability in the post reform for Black Pepper is contributed by years from 1996-97 to 2001-02 and partly by years from 2005-06 to 2007-08 (see Figure 4.8). These are the same periods in which the cyclical amplitudes were quite high. The last expansion phase showed less amplitude in cycles since the phase may still not be complete and the price showed a deceleration for the last two years. For Natural Rubber and Coffee the same kind of observations could be made. It could be observed that for Natural Rubber the instability has been quite high during 1993-94 to 1998-99 and from 2004-05 to 2007-08. During the same

periods cyclical amplitudes were quite high. Coffee's instability in the post reform period has been primarily contributed by the last two cycles ranging from 1997-98 to 2003-04 and 2003-04 to 2009-10. Thus, inference is that the time varying instability analysis highlights the role of increased amplitudes of price cycles in the post reform for Black Pepper, Coffee and Natural Rubber in raising their instability. Thus, the variability in instability can be explained in terms of the variability in cyclical amplitudes.

4.6 Summary

The present chapter was an attempt to understand the dynamics of inter-year price instability of selected plantation commodities-Black Pepper, Natural Rubber, Small Cardamom, Coffee and Tea- by looking at annual average price. After providing a background of the price formation of the selected commodities and carefully considering the methodological issues regarding the measurement, price instability has been measured for the whole period, pre reform period and post-reform period. Analysis of two aspects of inter-year price instability– long run movement and the multi-year cyclicality has yielded the following findings (summarized in Table 4.9).

Annual average real price of plantation crops in general remained either stagnant (Black Pepper, Natural Rubber) or showed secularly declining trend (Small Cardamom and Tea), except Coffee. After separating out the long run movement in the data, inter-year instability has been explained mainly by the multi-year price cyclicality arising as a response to the cycles in production. However, given crop characteristics, there are significant inter-crop variations. In general the study has observed higher inter-year instability in the post reform period as compared to the pre reform period. While three crops showed increase in instability (Black Pepper, Coffee and Natural Rubber) two crops showed a decline in instability (Small Cardamom and Tea) in the post-reform period as compared to the pre-reform period.

The crops (Black Pepper, Coffee and Natural Rubber) for which domestic market is highly integrated with the global market are found to be showing greater price instability in the open trade regime as compared to the closed and protected regime. The crops (Small Cardamom and Tea), which are highly domestic market oriented are showing decline in instability in the open trade regime as compared to the protected regime. The crops, which have shown an increase in instability in the open trade regime (Black Pepper and Natural Rubber), also show clear widening of cycles (in duration as well as in amplitudes) in the open trade regime as compared to the protected regime. On the other hand the crops, which have shown a decline in instability in the open trade regime (Small Cardamom and Tea), show low cyclical duration and amplitude in the 1990's as compared to the 1980's.

Since Small Cardamom and Tea are highly domestic market oriented, the domestic price has been responding more to the cycles in domestic production rather than that of global production, with the domestic price responding to the global production/competing country's production only in the 2000's. Since the markets for Black Pepper, Coffee and Natural Rubber are highly globally integrated domestic price has been responding more to the wide global production cycles in the open trade regime as compared to the closed regime, in which case domestic price is found to be responding to the less wide domestic production cycles (came out clearly for Black Pepper and ambiguously for Natural Rubber).

Annul average prices of all the selected crops have been mostly turned out to be in the declining phase of the cycle indicating long duration slumps than booms. It is also observed that the annual average price has been mostly below the trend for all the selected commodities implying that the price of the selected commodities in general is downward biased. The number of times price lying below the trend has increased in the open trade regime for Black Pepper and Natural Rubber (higher inter-year instability with more downward fluctuations) and decreased for Small Cardamom, Tea (low inter-year instability with less downward fluctuations) and Coffee.

Table 4.9: Inter-Year Price Instability: Summary

Characteristics	Black Pepper	Natural Rubber	Coffee	Tea	Small Cardamom
I. Order of Instability (Annual Data)	1	4	3	5	2
II. Change in Instability across Regimes	Increased in the Post R	Increased in the Post R	Increased in the Post R	Declined in the Post R	Declined in the Post R
III. Commodity Characteristics	Integrated Markets	Integrated Markets	Integrated Markets	Home Market Oriented	Home Market Oriented
IV. long Run Movement (Whole Period)					
Nominal Price	Secular increase	Secular increase	Secular increase	Secular increase	Secular increase
Real Price	Stagnant	Stagnant	Secular increase	Secular decrease	Secular decrease
IV.1. Pre Reform Period					
Nominal Price	Secular increase	Secular increase	Secular increase	Secular increase	Stagnant
Real Price	Secular increase	Secular decrease	Secular increase	Stagnant	Stagnant
IV.2. Post Reform Period					
Nominal Price	Secular increase	Secular increase	Stagnant	Secular increase	Secular increase
Real Price	Stagnant	Stagnant	Secular decrease	Secular decrease	Secular decrease
V. Multiyear Cyclicality					
V.1. Average Cyclical Duration***	9.75	7.25	7.25	5.80	5.80
V.2. Nature of Cyclicality	Mostly in slump phase	Mostly in slump phase	Mostly in slump phase	Mostly in slump phase	Mostly in slump phase
V.3. Changes in Cyclical Duration in Post R	Widened	Widened	Widened	Low in the 1990's+	Low in the 1990's+
V.4. Changes in Cyclical Amplitudes in Post R	Widened	Widened	Widened	Low in the 1990's+	Low in the 1990's+
VI. Price Response to Production					
VI.1 Pre Reform Period	Domestic production	Domestic production	No response	Domestic production	Domestic production
VI.2 Post Reform Period	Global production	Global production	Global production	Both*	Both*
VII. Nature of Fluctuations	Downward biased	Downward biased	Downward biased	Downward biased	Downward biased

Note: (i) Post R = Post Reform period, + = low in the 1990's as compared to the pre reform period in the 2000's.

(ii) * = price responds to domestic production in the 1990's and global production in the 2000's

(iii)***= confronts the time required for the supply of the commodity to adjust

CHAPTER V

DYNAMICS OF INTRA-YEAR COMMODITY PRICE INSTABILITY

In the previous chapter we have analyzed the long-term and medium-term price instabilities by focusing our attention on annual average price data. By taking annual average price data, the analysis abstracted from the short-term dynamics of price instability. The aim of the present chapter is to explore the short-term dynamics of price instability for the selected commodities by taking the case of monthly average price data. Here, we take up the intra-year instability in price or 'within year variations in price across months'. For measuring the intra-year instability in price two measures are used- 1) the Coefficient of Variation and 2) the percentage difference of the highest monthly price from the lowest monthly price observed in a year.

The chapter is organised in four sections. The first two sections aim at giving a background of short-term price instability with the first section dealing with price instability comparison of pre-reform period with the post-reform period and the second section dealing with the nature of monthly price fluctuations whether upward or downward about a common trend. The third section deals with the exploration of intra-year instability and the last section concludes the chapter.

5.1 Monthly Price Instability of Plantation Commodities- A Comparison of Pre and Post-Reform Periods

As a background for our analysis of short-term price instability of plantation commodities, we have tried to measure the instability in monthly price by adopting the methodology of instability indices as done in chapter 4. Since Mc-Bean index of instability is an unpopular method of measuring instability in long duration monthly data since Mc Been index will be an underestimation of instability in long duration data, only coefficient of variation and Cuddy-Valle instability index are used. The extent of instability in monthly price for the

selected commodities for the whole, pre and post-reform periods separately is reported in Table 5.1.

Table 5.1: Monthly Nominal Price Instability Comparison for Plantation Commodities- Pre-Reform Vs Post-Reform Period

Commodities	Instability Indices	1980-2010	1980-1990	1991-2010	% Change
1. Tea	Observations	360	120	240	-
	CV	49.78	31.89	29.99	-5.96
	Cuddy-Valle Index	21.70	20.19	20.15	-0.16
2. Natural Rubber	Observations	360	120	240	-
	CV	73.09	18.02	58.36	223.86
	Cuddy-Valle Index	41.79	10.60	34.84	228.74
3.Small Cardamom	Observations	358	120	238	-
	CV	59.89	48.43	46.36	-4.27
	Cuddy-Valle Index	44.70	47.60	41.60	-12.61
4.Black Pepper	Observations	360	120	240	-
	CV	75.72	53.26	57.94	8.79
	Cuddy-Valle Index	57.46	31.14	53.65	72.29
5. Coffee**	Observations	-	-	162	-
	CV	-	-	37.88	-
	Cuddy-Valle Index	-	-	32.67	-

Note: CV = Coefficient of Variation
Source: *Derived using Price Data from Various Commodity Boards*

Cuddy-Valle instability index shows that monthly price instability in the whole period is the highest for Black Pepper (with an index value of 57.46), followed by Small Cardamom (with an index value of 44.7), Natural Rubber (with an index value of 41.76), Coffee (with an index value of 32.67)[1] and Tea (with an index value of 21.70). This is also in the same order of annual average price seen in the Chapter 4. It could be observed that the instability in monthly price has declined for Small Cardamom and Tea and increased for Black Pepper and Natural Rubber in the post-reform period as compared to the pre-reform period. While the decline of monthly price instability is only marginal to the extent of - 0.16 per cent in the case of Tea, the decline has been substantial in the case of Small Cardamom to the extent of 12.61 per cent. The increase in short-term price instability has been quite remarkable in the case of Natural Rubber and Black Pepper with 228.74 per cent and 72.29 per cent respectively. The results obtained here are also in conformity with what we have found in the case of annual average price of the selected commodities.

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[1] Monthly data of Coffee is available only from 1997, July onwards. Hence the whole period instability is post reform instability as well.

5.2 Nature of Monthly Price Fluctuations

In the previous section we have seen that the instability in monthly price has increased for Black Pepper and Natural Rubber and reduced considerably for Small Cardamom and marginally for Tea. Now, it will be worthwhile to investigate the nature of the short-term fluctuations implying whether the price fluctuations are downward or upward from a common trend. For this purpose we have observed the number of times price goes below a common trend in the monthly data, which is set by the Hodrik-Prescott filtering method for the whole period and pre-reform and post-reform periods separately.

Table 5.2: Number of Months Price is below the Trend: A Comparison of Pre and Post-Reform Periods

Commodities	Whole Period			Pre-Reform Period			Post-Reform Period		
	Total	NMBT	%	Total	NMBT	%	Total	NMBT	%
1. Small Cardamom	358	213	59	132	83	63	226	130	58
2. Black Pepper	360	175	49	132	62	47	228	113	50
3. Natural Rubber	360	188	52	132	63	48	228	125	55
4. Tea	360	188	52	132	71	54	228	117	51
5. All Coffee**	162	81	50	-	-	-	162	81	50

Note: 1) Common Trend in the Data is the HP Trend fixed by the Hodrick-Prescott Filtering Method, 2) NMBT = number of months below the trend, ** = for Coffee monthly data is from 1996 April onwards.
Source: *Derived using Price Data from Various Commodity Boards*

In the monthly data fluctuations in price are not that downward biased as we have seen in the case of annual average price data, except in the case of Small Cardamom for which around 60 per cent of the time monthly price is below the trend. Even though the proportion of time price goes below the trend in the monthly data is greater than fifty per cent for all the commodities except Black Pepper and Coffee, the proportion does not look statistically different from 50 per cent for Black Pepper, Natural Rubber and Tea. But, it is interesting to see that the downward fluctuations in monthly price have declined in the post-reform period as compared to the pre-reform period for Small Cardamom and Tea and increased for commodities like Black Pepper and Natural Rubber as we have seen in the case of annual average price data. While for Small Cardamom the decline has been from 63 to 58 per cent, for Tea the decline has been marginal from 54 to 51 per cent. For Black Pepper and Natural Rubber the increase has been from 47 to 50 per cent and 48 to 55 per cent respectively. The commodities for which a

decline in the proportion of time monthly price found to be below the trend are also the commodities for which the price instability is found to have declined (Small Cardamom and Tea) and the commodities for which an increase in proportion of time monthly price found to be below the trend are also the commodities for which the monthly price instability is found to have increased (Black Pepper and Natural Rubber) in the post-reform period as compared to the pre-reform period. Thus, the inference is that in the monthly data as well the increased instability has been with more downward fluctuations and the decline in instability has been with less downward fluctuations.

5.3 Intra-Year Price Instability- An Exposition

In the previous sections we have looked at the extent of instability in monthly price for the whole period, pre-reform period and post-reform period and the nature of monthly price fluctuations, whether above or below a common trend in the monthly data for the selected commodities. The instability in monthly price is found to be of the same order of the instability in annual average prices. Monthly price instability is found to have declined in the post-reform period as compared to the pre-reform period substantially for Small Cardamom and marginally for Tea and increased for Black Pepper and Natural Rubber (case of Coffee is not shown since monthly price in the pre reform is not available) as we have seen in the case of annual average price in Chapter 4. It has also been noted that even though the proportion of times monthly price going below the common trend is not significantly different from fifty per cent, it has increased in the post-reform period for Natural Rubber and Black Pepper and declined for Small Cardamom and Tea as we have seen in the case of annual average price data in Chapter 4. Now, the present section moves on to explore a new dimension of short-term instability- i.e. the dynamics of intra-year price instability or "within year variation in price across months".

The general factors that determine agricultural commodity prices are variability in supply and demand, marketing cost, time and also the place of sale (whether the market is in the vicinity of the production center or far from it). In general the

intra-year price instability is due to the seasonal nature of production and demand. Seasonality in price is defined as the twelve-month cyclical fluctuations in price arising from changes in demand and supply across seasons of the same crop year [Vaughn et al, 1981]. When the supply is seasonal price of the commodity touches the lowest level immediately after the harvest (peak availability) when the marketing season reaches its peak and price is normally observed to be high during the off-season months (minimal availability). This is the so-called seasonality of production and marketing leading to variability in prices across months in the same crop year. Thus, for agricultural commodities seasonal price fluctuations vary inversely with the normal pattern of monthly production cycle.

Theoretically, for a storable commodity, in a perfectly competitive market with perfect information and full inter-temporal commodity arbitrage the seasonal difference in prices will be equal to the storage cost only, since the arbitrage will equate the price efficiently between times with price just exceeding only up to the extent of storage cost [Lloyd, 2002]. If the market is imperfect the storage by the producer depends up on the expectation regarding demand and supply in that year. For instance, if during a particular season the achieved production is less than the expected level (crop failure) price will increase in the off-season at a higher rate (since there wont be any storage for the off-season which will raise the off-season price proportionately higher than a normally expected supply realization will offer). Thus, in this case the difference between the season price and off-season price will be high. This 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 the less than expected realization of supply.

On the contrary, if the production is more than the expected level during some season (bumper crop), the prices in the off-season will remain at a lower level since the increased output is going to be dumped in the off-season than a normally expected supply realization will bring in. Thus, the difference between the season price and off-season price will be low. This 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 decline in the off-season. What is its implication for intra-year instability if seasonality is the main factor behind intra-year instability theoretically? The implication is that the intra-year instability will be high in the first case (crop failure) as compared to the second case (bumper crop) since the season and off-season price vary much in the first case as compared to the second case. The general inferences we made so far for the storable commodities has been with two assumptions:

1) A higher extent of inter temporal commodity arbitraging
2) Seasonal price will either remain the same or change to a lesser extent as compared to the off season price when ever there is an unexpected change in supply

On the other hand, for a non-storable commodity expectation regarding supply is less since the storability and chance of inter-temporal arbitraging is less possible. If the supply is excess (bumper crop) the seasonal price will be more depressed than a normal supply realization will lead to, and the off-season price may or may not remain as such. This will lead to more difference between the peak season and off-season price and higher intra-year instability. If the supply is lower (crop failure) the peak season price will increase at a faster rate than a normal supply realization by keeping the off-season price remaining the same. In this case the difference between the peak season price and off-season price will be low and hence intra year instability will also be low.

Hence, the inference is that the intra-year instability can vary from year to year and intra-year price instability due to seasonality is also subject to a lot of crop specific characteristics such as:

1) Whether the crop is storable or non-storable
2) The number of times the crop is grown in a year
3) The geographical concentration of production of the crop and
4) The nature of production- whether large holders dominated or small holders dominated.

For a non-storable commodity the extent of seasonal difference in prices will be quite high compared to a storable one, in which case inter-temporal arbitraging of commodities by keeping in stock is not possible. The geographical concentration of production will amplify price variations if there are any shocks to supply or demand. If the crop were grown in more than one season we would expect less seasonal difference in prices since the seasonal difference in prices will be met by spreading the supply through out the year.

Why do we expect seasonal differences in prices for the selected plantation crops? 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's delay. Thus, we would expect the marketing season to be from December to April and the off-season from May to November.

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 depends on its green colour, hence Cardamom needs to be properly cured and marketed as soon as possible before loosing its green colour.

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 January and from February to September the production will be comparatively low. Even then the crop is available through out the year with some seasonal variations.

Coffee is also a perennial crop which takes around 3 to 4 years from the days of its planting to harvest and reaches its production within 6 to 7 years. The production of Coffee peaks mainly during the months of December to March, and the availability will be quite lower during the months of April to November.

Tea on the other hand is continuous crop. Even then, Tea production peaks during June to October and Tea availability will be comparatively low during November to May. Hence, the seasonal difference in production is expected to be quite low for Tea and to some extent Natural Rubber as compared to the other three crops. Thus, we would expect a higher extent of seasonal difference in price for Small Cardamom and quite lower for Tea.

To understand the seasonality effect of supply in prices we have tried to see the month in which price peaks and the month in which price reaches the bottom for each individual commodity separately. This has the obvious limitation that the month in which price peaks or reaches the bottom does not imply a season. Thus, this has been followed by seasonal price difference calculations as well. This has been carried out by identifying the particular season for the commodity and by arriving at the difference between the season and off-season average prices.

5.3.1 Black Pepper

Intra-year instability of Black Pepper generally is found to be fluctuating over the years (see Figure 5.1). Both the indices- CV and the percentage difference between the lowest price and the highest price show the same kind of explanation as it could be seen from the figure 5.1. An increase/decrease in CV is always followed by an increase/decrease in percentage difference of the highest monthly price from the lowest monthly price. The average intra-year instability in the post-reform and pre-reform periods does not show any clear-cut difference. But it could be observed that the range of prices in the same year is found to have widened clearly in the post-reform era compared to the pre-reform era.

Table 5.3: Intra-Year Price Instability of Black Pepper

Period	CV (%)	% Deviation Of the Lowest Price from The Highest Price	Price Range
Pre Reform Period (1980-1990)	11.80	29.92	11.37
Post Reform Period (1991-2010)	11.71	28.31	35.16
Whole Period (1980-2010)	11.74	28.85	27.24

Note: CV = Coefficient of Variation
Source: Derived using Price Data from Spices Board.

The seasonality effect on price is prevalent in the case of Black Pepper as it could be seen from the month in which the price peaks and the month in which the price reaches its bottom level (Appendix II, Table A2.1). Normally 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 in abundance in the market. Black Pepper price is found to be peaking normally in May (1995-96, 2001-02, 2008-09), June (2003-04) July (1982-83, 1991-92), August (1987-88, 1998-99), September (2006-07), October (1986-87, 1994-95, 2002-03) and November (1980-81, 1981-82, 1985-86, 1990-91, 1992-93, 1997-98, 1999-00, 2009-10). Thus, in twenty out of thirty cases (67 per cent) the highest price is turned out to be in conformity with our theoretical expectations. There are exceptions to this rule as well. There were years (1983-84, 1984-85, 1988-89, 1989-90, 1993-94, 1996-97, 2000-01, 2004-05, 2005-06 and 2007-08) in which the highest price was observed during the peak season it self. These are highlighting the irregularities in prices.

The lowest price is found to be mostly during harvest: December (2008-09), January (1995-96), February (1981-82, 1982-83, 1991-92, 1998-99, 2001-02), March (1980-81, 1987-88, 1989-90, 2000-01) and April (1983-84, 1984-85, 1986-87, 1993-94, 1997-98, 2009-10). Thus, in 17 out of 30 instances (57 per cent) the lowest price has been observed in tune with our theoretical expectations. There are also exceptions to this observation as well. There were also years (1985-86, 1988-89, 1990-91, 1992-93, 1994-95, 1996-97, 1999-00, 2002-03, 2003-04, 2004-05, 2005-06, 206-07 and 2007-08) in which the lowest price was observed during the off-season months.

Nevertheless, it could be observed that mostly Black Pepper price is peaking in off-season, especially the month (November) just before the arrival of the next marketing season when there is the least availability in the market. It could also be observed that the lowest price is mostly observed during the month (April) just before the next off-marketing season, when there is comparatively more availability in the market. Theoretically, for a storable commodity traders expecting a high price in the off-marketing season and low price in the season

will keep the surplus under storage and sell in the off-marketing season. Thus, for a storable commodity the regularity of seasonal impact should be less as compared to a non-storable commodity. Even though Black Pepper is a storable commodity with all the possibility of inter-temporal arbitraging, why for Black Pepper the highest price is coming mostly in the month before the next marketing season and lowest price is coming mostly in the month before the next off-marketing season? This throws light on the low extent of inter-temporal arbitraging in Black Pepper, even though it is storable.

Putting both these sides (the highest price occurring and lowest price occurring months) together the real exceptions to this seasonality factor are years such as 1988-89, 1996-97, 2004-05, 2005-06 and 2007-08 which are the years in which both highest price and lowest price came against our theoretical expectations. Thus, in general seasonality effect on price for Black Pepper comes in 25 out of 30 cases (83 per cent). It could also be noted that the occurrence of both the highest price during off season months and the lowest price during season months together comes only in 12 out of 30 cases, i.e. in 40 per cent of the cases (1980-81, 1981-82, 1982-83, 1986-87, 1987-88, 1991-92, 1995-96, 1997-98, 1998-99, 2001-02, 2008-09 and 2009-10). One thing could be observed that the exceptional cases come mostly in the post-reform period. This may be due to the reason that the domestic annual price in the open trade regime responds more to the cycles in annual global production and the domestic seasonal impact in monthly price may not repeat regularly as seasons in the competing countries may create irregularities in it.

Thus, we could infer that the seasonal impact in price is prevalent in the case of Black Pepper. Nevertheless, the seasonality effect is not coming regularly every year. Rather there are exceptional years in which the price observed is higher in the season itself or lower in the off-season itself as against our theoretical expectations. All these show that even though a larger part of intra-year differences in price of Black Pepper is explained by seasonality effect, a part is due to the irregularities. It could be seen from the figure 5.1 that the intra-year variations in price itself is fluctuating widely. Higher intra year instability in price of one year is followed by a lower instability in the next year. Does it have

any thing to do with the unexpected changes in supply as it is theoretically expected? This requires further investigation.

Figure 5.1: Intra-Year Price Instability of Black Pepper
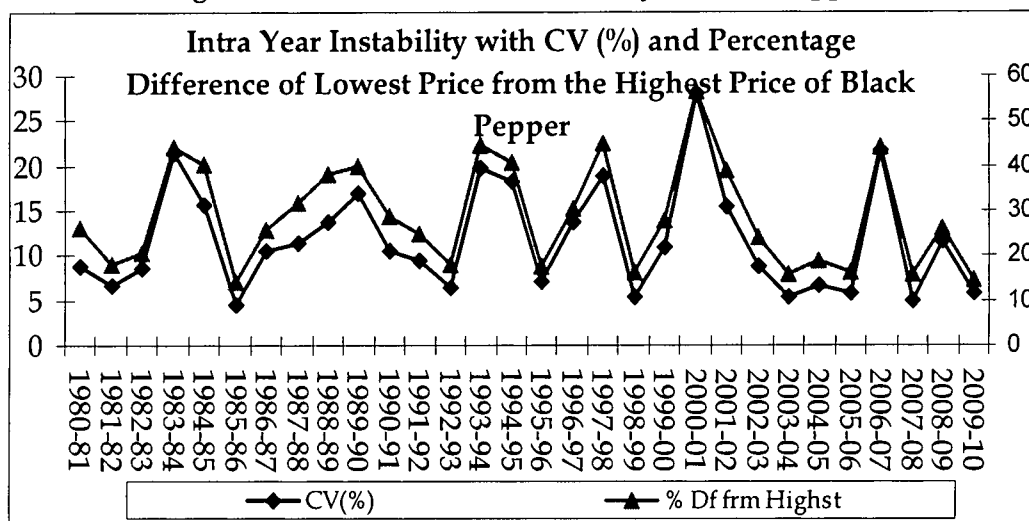
Source: *Derived using Price Data from Spices Board.*

The above explanation regarding the seasonal nature of prices is subject to the limitation that we have used only one particular month (the month in which the price peaks and the month in which the price reaches its bottom) for understanding seasonal differences in prices. The above analysis does not show clearly the extent of seasonal difference in price. It could also be possible that the price might have been comparatively high in the off-season but due to some abnormal reasons the lowest price might have come in the off-season. Thus, for avoiding such a possibility if we know the peak season and off-season of these crops approximately, the seasonal difference in prices can be calculated. The seasonal difference in price of Black Pepper is reported in Table 5.4.

Table 5.4: Seasonal Price Differentials of Black Pepper

Year	Peak Seasonal Average	Off Season Average	Seasonal Difference
1980-81	12.7	13.6	-0.9
1981-82	12.2	13.5	-1.3
1982-83	11.5	13.2	-1.7
1983-84	18.5	14.5	4.0
1984-85	27.9	24.3	3.6
1985-86	42.3	40.1	2.2
1986-87	55.5	53.4	2.1
1987-88	47.6	56.5	-8.9
1988-89	41.9	35.9	6.0
1989-90	36.9	45.7	-8.8
1990-91	34.7	32.4	2.3
1991-92	31.6	35.3	-3.7
1992-93	28.8	28.4	0.3
1993-94	39.9	36.1	3.8
1994-95	65.9	60.6	5.3
1995-96	72.6	80.3	-7.6
1996-97	91.3	78.4	12.9
1997-98	170.6	175.4	-4.8
1998-99	198.4	211.5	-13.1
1999-00	216.1	214.2	1.9
2000-01	144.5	195.5	-51.1
2001-02	73.2	85.5	-12.2
2002-03	85.2	90.5	-5.4
2003-04	73.5	74.5	-1.0
2004-05	69.4	68.8	0.5
2005-06	70.2	63.7	6.5
2006-07	105.9	96.6	9.3
2007-08	142.9	138.6	4.4
2008-09	118.8	136.8	-18.0
2009-10	135.0	137.4	-2.4
Average Seasonal Difference (Absolute) .			6.87
Average Seasonal Difference (Normalized)			0.10

Note: 1) Season is from December to April (5 Months) and Off-Season from May to November (7 Months), 2) Years in italics are Slump phases, 3) Average seasonal difference (absolute) is the average of the modulus of the seasonal differences across years, 4) Average seasonal difference (normalized) is the average of absolute differences normalized by the corresponding annual average prices. This is done mainly to avoid the influence of level factor in seasonal differences.

Source: *Derived using Price Data from Spices Board*

Seasonal differences in prices also highlight more or less the same pattern but more exceptional years (years against the theoretical expectations) could be seen. Seasonal difference in price is turned out to be in conformity with our theoretical expectation in 15 out of 30 cases (50 per cent). The exceptional cases are mainly the years we have already highlighted above- mainly the exact opposite cases against theoretical expectations and a few years in which either the highest price

or lowest price is against our theoretical expectations. One probable explanation to this could be the possibility of irregular factors in influencing monthly prices.

One more thing, which comes out of the above analysis, is that the nature of seasonal difference in price has much to do with the multi-year cycles in commodity prices. It is found in general that a downward trend or contraction phase of the commodity price cycle is often associated with a lower seasonal average price than off-season average and vice versa. It could be visible from the table 5.4 that the periods during 1980-81 to 1982-83; 1987-88 to 1992-93; 2000-01 to 2003-04 and 2008-09 to 2009-10 in which cyclical slumps associated with seasonal average is less than the off-season average and vice versa with a very few exceptional years. Hence, we can infer that commodity slumps result in by depressing the seasonal average price at a faster rate than the off-season average price and boom results in pulling up the season average price at a faster rate than the off-season average price.

One possible explanation to this could be given in terms of the availability factor in the market. As we have seen earlier, commodity price slumps are periods with greater availability and booms are periods with lesser availability in the market. Greater availability in the market suppresses the season price at a faster rate than the off-season price and lesser availability pulls up the season price at a faster rate than the off-season price. This is against our theoretical expectation regarding a storable commodity like Black Pepper, wherein if there is a surplus in the season a part of the excess production is expected to spread in the off-season by storing them. Thus, we would expect a lesser extent of fall in the season average price when production is more than the expected level. The probable reason to this could be the lesser extent of inter-temporal arbitraging in the case of Black Pepper. This finding goes along with our earlier finding that the inter-temporal arbitraging in the case of Black Pepper is very less even though it is a storable commodity. All these throw light on the inadequate response of actors in the market to the changes in price signals in the short run.

5.3.2 Small Cardamom

For agricultural commodities in general, the seasonal nature of price implies the co-existence of high price during the slack season and a low price during the peak season. This is subject to the assumption that given the demand a more availability in the market normally depresses the price and a less availability will raise the price. This often results for most of the agricultural commodities- a coincidence of peak price during the slack seasons and the lowest price during the peak seasons.

Small Cardamom has been historically an exception to this rule and for Small Cardamom the peak price is observed during the Peak season it self. This 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 quality Small Cardamom (the green colour cardamom) is available more in the peak season and less during the slack season since storage will deteriorate the green colour (Joseph, 1985). Thus, this is due to the high export demand for green Cardamom, which is available mostly in the peak season, actually results in peak price during peak seasons.

But now, Small Cardamom almost has become a home market oriented crop and only a negligible proportion of it is being exported now. Even then the same nature of peak price during peak season can be expected given the demand (either export or domestic) since 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). Thus, in this changed scenario it is of our interest to revisit and see whether price is peaking in the peak season or not and understand its implications on intra-year price differences.

The season for Small Cardamom is identified to be from September to January in which a sizable supply of Small Cardamom is available and off-season consists of the remaining months. If the same 'peak price during peak season' is to hold, the

price should peak during months from September to January and price should be low in the off season- months from February to August.

Table 5.5: Intra-Year Price Instability of Small Cardamom

Period	CV (%)	% Deviation Of the Lowest Price from The Highest Price	Price Range
Pre Reform (1980-1990)	17.98	42.23	104.50
Post Reform (1991-2010)	15.93	37.63	208.60
Whole Period (1980-2010)	16.62	39.16	173.90

Note: CV = Coefficient of Variation
Source: *Derived using Price Data from Spices Board*

The intra-year instability in general is found to be fluctuating for Small Cardamom as well over the years (see the figure 5.2). Both the measures of intra-year instability show a sign of a slight decline in average intra-year instability in the post-reform era as compared to the pre-reform era. But the average range of price, which is not exactly a measure of intra-year instability, shows an increase in the post reform period.

It could be seen from the table that the peak price during peak season has not disappeared almost (see Appendix II, Table A2.2). It is found that the highest price is observed mostly in both season and off-season months. Off season months in which price peaks are February (2000-01), April (1999-00, 2001-02), May (1989-90, 1992-93, 1995-96, 1998-99, June (1982-83, 1988-89, 1997-98, 2009-10), July (1981-82, 1986-87, 1991-92, 2008-09) and August (1987-88, 1990-91, 2004-05). And peak season months with peak price are September (1985-86, 1993-94, 1994-95, 2002-03, 2003-04, 2005-06, 2006-07), October (1984-85), November (1980-81) and January (1983-84, 1996-97, 2007-08). We could also see in most of the months lowest prices are observed in the off-season months it self. Thus, only in 12 out of 30 cases (40 per cent) peak price during peak season has come out. The lowest price during slack seasons has come out in 21 out of 30 cases (70 per cent). Putting both the cases together the normal seasonality impact with at least any one of the two (highest price during peak season and lowest price during off season months) has come in 22 out of 30 cases (73 per cent). But seasonality impact of both the highest price during peak season and the lowest price during

off season months together is turned out to be only in 11 out of 30 cases, i.e. in 36 per cent of the cases (1980-81, 1983-84, 1984-85, 1985-86, 1993-94, 1994-95, 1996-97, 2002-03, 2003-04, 2005-06 and 2007-08).

Again, this may also be subject to the limitation that only one month is considered here and a season for a crop is not a month alone. Thus the same analysis has been supported by the following seasonal differences in prices-difference in seasonal average and off-season average price.

Figure 5.2: Intra-Year Price Instability of Small Cardamom
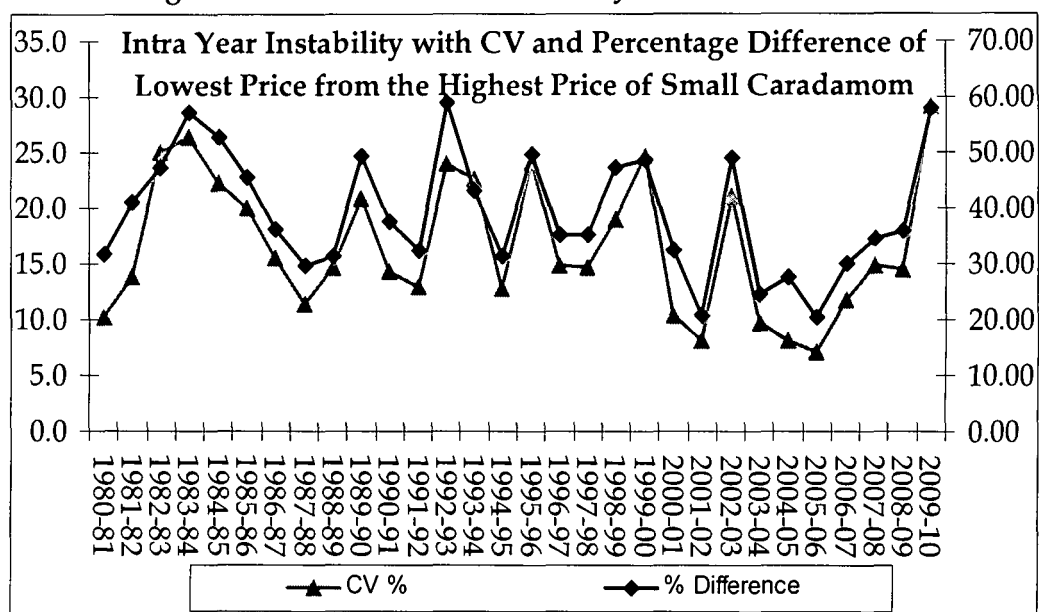
It could be clearly observed from the table 5.6 that the seasonal average being higher than the off-season average regularly come in the 1980's as well as in the recent years (2002-03 to 2005-06). The seasonal regularity is found to be in 15 out of 30 cases (50 per cent). What does it imply? Even though the crop has become home market oriented the peak price during the peak season and the lowest price during the slack season still holds.

Table 5.6: Seasonal Price Differentials of Small Cardamom

Year	Season Average	Off-Season Average	Seasonal Difference
1980-81	101.1	86.6	14.5
1981-82	115.2	127.4	-12.2
1982-83	155.8	214.0	-58.1
1983-84	381.0	307.3	73.7
1984-85	225.8	163.5	62.3
1985-86	139.3	113.2	26.1
1986-87	125.9	122.1	3.8
1987-88	134.3	150.4	-16.2
1988-89	127.5	157.5	-30.0
1989-90	249.2	306.1	-56.9
1990-91	256.3	255.4	0.9
1991-92	256.9	285.3	-28.4
1992-93	435.9	492.6	-56.6
1993-94	364.9	340.3	24.6
1994-95	274.0	235.4	38.6
1995-96	179.6	237.2	-57.6
1996-97	400.3	319.6	80.7
1997-98	260.8	262.6	-1.8
1998-99	542.3	529.6	12.8
1999-00	399.7	543.6	-143.9
2000-01	562.3	555.1	7.2
2001-02	599.2	639.1	-39.9
2002-03	598.1	510.4	87.8
2003-04	381.1	346.2	34.9
2004-05	302.9	300.8	2.1
2005-06	221.1	209.9	11.2
2006-07	298.0	344.6	-46.5
2007-08	483.5	532.1	-48.6
2008-09	516.9	593.8	-76.9
2009-10	780.8	944.3	-163.6
Average Seasonal Difference (Absolute)			43.95
Average Seasonal Difference (Normalized)			0.14

Note: 1) Season is from September to January (5 Months) and Off-Season from February to August (7 Months), 2) Years in italics are Slump phases.

Source: *Derived using Price Data from Spices Board*

Does it have any thing to do with the market behavior in general? One observation, which we could make out, in this case, is that the peak price during the peak season (seasonal average is greater than the off-season average price) is occurring mainly in the contraction phase of the multi-year price cycle. This is just the opposite of the observation we have made in the case of Black Pepper. This could be well understood by super imposing these numbers on the annual average price date. The years marked in bold are expansion phases and years in italics are the contraction phases (the same could be read from the annual

average price data). Years from 1980-81 to 1982-83 and years from 1983-84 to 1986-87 are continuous expansion and contraction phases respectively. The years from 1987-88 to 1992-93 and 1995-96 to 2001-02 are expansion phases with some spikes in between. The last expansion and contraction phases are continuous expansion and contraction phases. It could be read from the table that the peak price during peak season is observed mostly in the contraction phases of the price cycle.

The inference is that for Small Cardamom price slumps results in by depressing the off-season price at a faster rate than the peak season price and boom results in by enhancing the off-season price at a faster rate than the season price. One possible explanation to this could be given in terms of the availability factor in the market as we have given in the case of Black Pepper. During the contraction phase quantity available in the market is high (it could be read clearly from the quantity data) and the greater availability leads to demand for quality cardamom in the season only and off-season prices are hence depressed. Availability in general being low compared to the demand during the expansion phase of the cycle quantity in the off-season is also demanded. Given the increased demand off-season prices will be increased at a faster rate as compared to the season price. Thus, the peak price during peak season is observed during the contraction phase of the multi year price cycle.

5.3.3 Natural Rubber

As we have seen earlier, the production of Natural Rubber peaks during October to January and from February to September the production will be comparatively low. Even then the crop is available through out the year with some seasonal variations. We would expect a less seasonal variation in price and intra-year instability for Natural Rubber. This is mainly because of the reason that being an industrial raw material with continuous demand and the storability of Rubber to some extent compared to the other two commodities, supply can be inter-temporarily adjusted. Also it needs to be noted that the demand emanates from large industrial monopolies with sufficient market power to influence the price

albeit with low intensity with an open market. (This issue, however, calls for a separate inquiry)

Table 5.7: Intra-Year Price Instability of Natural Rubber

Period	CV (%)	% Deviation Of the Lowest Price from The Highest Price	Price Range
Pre Reform (1980-1990)	6.63	16.62	3.20
Post Reform (1991-2010)	11.14	26.94	17.30
Whole Period (1980-2010)	9.64	23.50	12.63

Note: CV = Coefficient of Variation
Source: *Derived using Price Data from Rubber Board*

Intra-year instability (both CV and the Percentage difference of the lowest price from the highest price) of Natural Rubber also is found to be fluctuating in general and declining from 1980-81 to 1987-88 and an increased fluctuation from 1987-88 to 1999-00 and moderated intra-year instability till 2007-08 and widened again after that. Intra-year instability in general is fond to have increased in the post-reform era. The price range is found to have increased quite high in the post-reform era as compared to the pre-reform era. The average Co efficient of variation has increased from 6.63 per cent during the pre reform period to 11.14 percent during the post reform period.

It is found that the price is peaking in majority of the years in the off-season months with only a very few exceptions of years like 1985-86, 1988-89, and 2009-10 (Appendix II, Table A2.3). Thus, the highest price of Natural Rubber has come in favor of our theoretical expectations in 27 out of 30 cases (90 per cent). The price peaks normally during February (1991-92), March (1980-81, 1981-82, 1994-95, 2002-03, 2003-04, 2005-06, 2007-08), May (1983-84, 1986-87, 1995-96, 2000-01), June (1990-91, 1996-97, 1998-99, 1999-00, 2004 – 05, 2006-07), July (1987-88, 1993-94) and August (1982-83, 1984-85, 1989-90, 1992-93, 1997-98, 2001-02, 2008-09). This does not imply that the Natural Rubber has very high seasonal price effects. Even though the seasonality is quite regular the seasonal difference may be very low as compared to the other crops.

On the other hand, the lowest price is observed mostly in the off-season it self and a very few years (1982-83, 1984-85, 1986-87, 1987-88, 1990-91, 1993-94, 1995-

96, 2006-07 and 2008-09) show a lower price during seasons. Thus the lowest price has come in favor of our theoretical expectations only in 9 out of 30 cases (30 per cent). The lowest price observed was observed mainly in the months of April (1980-81, 1983-84, 1985-86, 1988-89, 1989-90, 1994-95, 1999-00, 2001-02, 2002-03, 2005-06 and 2009-10). Why this is happening in the case of Natural Rubber? One possible explanation for the low price in the off-seasons for the storable commodities could be that by expecting a high price in the off-seasons more supply is injected in the market that depresses the price in those months. This throws light on the possible irregularities and the stock holding behavior of producers and traders of Natural Rubber.

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 in 27 out of 30 cases (90 per cent). But the seasonal regularity with both the cases appearing together has been turned out to be only in 9 out of 30 cases (30 per cent). Thus, even though the price of Natural Rubber is peaking in the off-season months the lowest price is also observed during the off-season months. 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. This also is not sufficient to reach a definite conclusion regarding the seasonal effect of prices.

Figure 5.3: Intra-Year Price Instability of Natural Rubber

Source: *Derived using Price Data from Rubber Boar*

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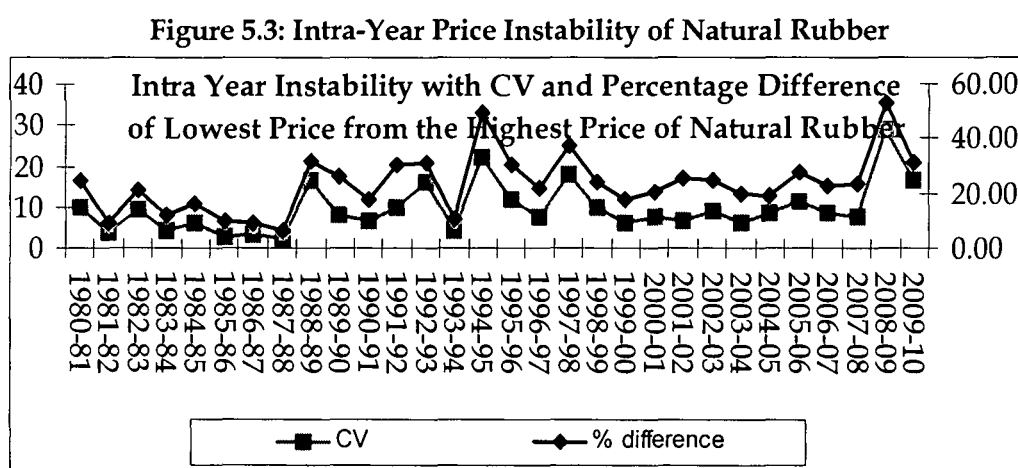
Even though the price comes low exceptionally during off-season months, but price may be comparatively high during other off-season months. Thus, now we move on to see the seasonal difference in price.

Table 5.8: Seasonal Price Differentials of Natural Rubber

Year	Seasonal Average	Off Season Average	Seasonal Difference
1980-81	12.86	12.20	0.66
1981-82	14.31	14.75	-0.44
1982-83	12.81	15.20	-2.39
1983-84	17.39	17.58	-0.19
1984-85	15.74	16.95	-1.21
1985-86	17.51	17.23	0.27
1986-87	16.02	16.90	-0.88
1987-88	17.49	18.17	-0.67
1988-89	21.01	21.91	-0.90
1989-90	20.17	21.65	-1.48
1990-91	20.15	22.05	-1.89
1991-92	21.24	22.77	-1.53
1992-93	23.20	22.82	0.38
1993-94	24.58	26.25	-1.67
1994-95	37.20	35.97	1.24
1995-96	52.01	52.05	-0.03
1996-97	48.65	49.18	-0.53
1997-98	31.86	37.77	-5.91
1998-99	30.73	29.54	1.18
1999-00	29.90	31.53	-1.64
2000-01	29.23	30.92	-1.70
2001-02	32.09	32.37	-0.28
2002-03	39.60	38.98	0.62
2003-04	52.42	49.39	3.04
2004-05	52.46	57.34	-4.88
2005-06	68.42	66.28	2.14
2006-07	88.25	93.94	-5.69
2007-08	94.20	89.17	5.03
2008-09	75.69	113.83	-38.14
2009-10	123.51	110.72	12.79
Average Seasonal Difference (Absolute)			3.31
Average Seasonal Difference (Normalized)			0.07

Note: 1) Season is from October to January (4 months) and Off-Season from February to September (8 months)
Source: *Derived using Price Data from Rubber Board*

In general the seasonal difference in price of Natural Rubber is found to be in support of the theoretical explanations. Even though there are stock holding behavior and irregularities in Natural Rubber price the seasonality effect comes in 20 out of 30 cases (67 per cent). The seasonal differences in prices are quite low for Natural Rubber compared to Small Cardamom and Black Pepper. It could

also be noted that the seasonal average being higher than the off-season average (due to irregular reasons) is found to be higher during the post-reform period as compared to the pre-reform period. The connection of seasonal difference with the multi year cyclicality as we have seen in the case of Black Pepper and Small Cardamom has not come out clearly in the case of Natural Rubber. This probably is due to the existence of greater irregularities in Natural Rubber price. '

5.3.4 Tea

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

Table 5.9: Intra-Year Price Instability of Tea

Period	CV (%)	% Deviation Of the Lowest Price from The Highest Price	Price Range
Pre Reform (1980-1990)	9.20	23.80	6.40
Post Reform (1991-2010)	9.30	25.20	18.00
Whole Period (1980-2010)	9.26	24.74	14.16

Note: CV = Coefficient of Variation
Source: Derived using Price Data from Tea Board.

The intra-year instability in general is quite low and fluctuating (see Figure 5.4) for Tea as compared to the other crops as it is expected. The CV was always less than twenty per cent. Using both the indices intra-year instability has not shown any substantial change in the post-reform period as compared to the pre-reform period. Price range on an average has shown some increase from 6.4 rupees to 18 rupees.

It could be observed that the highest price is coming mostly in the months in which tea is comparatively less available like January (1980-81, 1985-86, 1994-95, 1998-99, 2001-02), February (1993-94, 2003-04), April (1984-85, 1987-88, 1990-91, 1996-97), May (1992-93, 1999-00, 2009-10), November (1983-84, 1995-96) and December (1988-89, 1997-98, 2005-06, 2007-08) (Appendix II, Table 4). Thus, the highest price of Tea has come in conformity with our theoretical expectations in 20 out of 30 cases (67 per cent). There are exception to this that the price is

peaking in the months in which tea is relatively available like June, July, September, October and November.

On the contrary the lowest price is rarely observed during the seasons and mostly the lowest price comes when the tea is relatively less available like January (1983-84, 1988-89, 1989-90, 1997-98), February (1981-82, 2007-08, 2008-09, 2009-10), and March (1982-83, 1986-87, 1991-92, 1992-93, 1994-95, 1995-96, 1996-97, 1999-00, 2002-03, 2004-05, 2005-06, 2006-07). Thus the lowest price has come in conformity with our theoretical expectations only in 10 out of 30 cases (23 per cent). Putting both the cases together the normal seasonality impact of at least any of the two (either the highest price or the lowest price) occurring is turned out be in 19 out of 30 cases (63 per cent) in favor of our theoretical expectations. But both highest and lowest price coming together turned out to be in favor of our theoretical expectations only in 8 out of 30 cases (26 per cent). This leads us to the inference that the seasonality effect is quite low for Tea as it is available more or less through out the year and there are wide irregularities in the price of Tea.

Figure 5.4: Intra-Year Price Instability of Tea
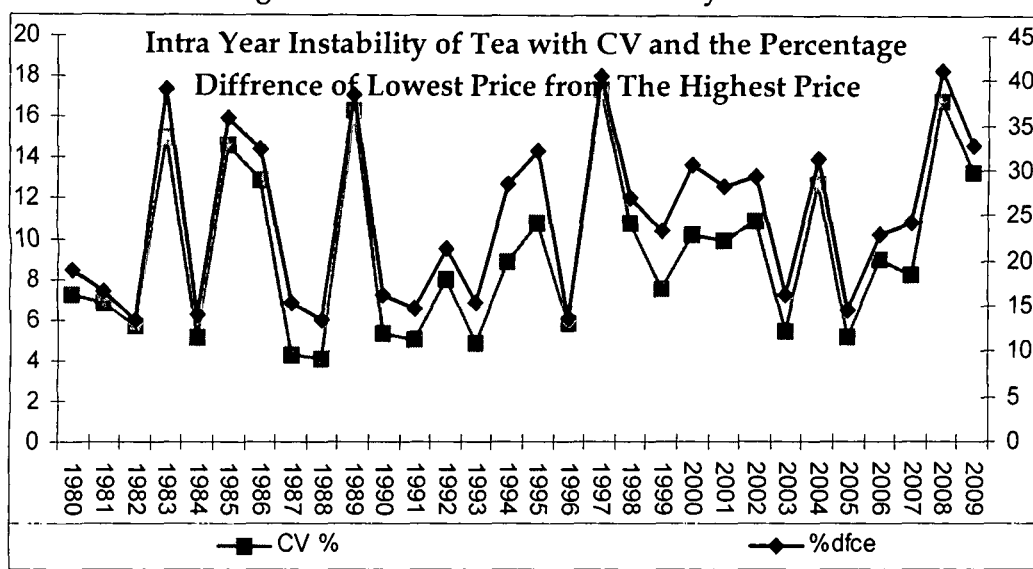
Source: *Derived using Price Data from Tea Board.*

Since the above analysis is subject to the limitation that only one month is taken for assessing a season and a season is not a month alone. Hence we have gone for

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the calculation of seasonal price differentials as well as a follow up. Seasonal price differentials for Tea are reported in Table 5.10.

Table 5.10: Seasonal Price Differentials of Tea

Year	Seasonal Average	Off Season Average	Seasonal Difference
1980-81	11.7	13.0	-1.3
1981-82	13.2	12.7	0.5
1982-83	15.7	14.7	1.0
1983-84	23.6	22.2	1.4
1984-85	27.2	27.4	-0.2
1985-86	19.8	23.3	-3.5
1986-87	22.1	20.9	1.2
1987-88	24.1	23.9	0.2
1988-89	22.8	22.9	-0.1
1989-90	37.9	31.8	6.1
1990-91	41.0	42.4	-1.4
1991-92	38.4	36.9	1.5
1992-93	37.2	36.0	1.1
1993-94	46.5	47.6	-1.1
1994-95	36.1	38.3	-2.2
1995-96	48.0	43.9	4.1
1996-97	47.7	46.5	1.1
1997-98	68.0	61.3	6.7
1998-99	69.7	79.5	-9.7
1999-00	72.3	67.6	4.7
2000-01	64.5	59.1	5.4
2001-02	61.5	62.1	-0.6
2002-03	60.3	52.0	8.2
2003-04	55.8	56.4	-0.6
2004-05	68.2	58.6	9.6
2005-06	58.2	57.7	0.5
2006-07	70.6	61.1	9.5
2007-08	67.7	65.3	2.4
2008-09	94.0	75.7	18.3
2009-10	111.4	98.5	12.9
Average Seasonal Difference (Absolute)			3.90
Average Seasonal Difference (Normalized)			0.07

Note: 1) Season is from June to October (5 months) and Off-Season from November to May (7 months)
Source: *Derived using Price Data from Tea Board.*

The same kind of observations could be made from the table 5.10 as well. The seasonal difference is found to be very low for Tea through out the year and the seasonal regularity is coming only in very few years i.e. only in 10 out of 30 cases (33 per cent), implying greater extent of irregularities in price movements of Tea.

5.3.5 Coffee

The production of Coffee peaks mainly during the months of December to March, and the availability will be quite lower during the months of April to November. Thus we would expect the price of coffee to be comparatively high during the months of April to November and comparatively low during the months of December to March.

Table 5.11: Intra-Year Price Instability of Coffee

Period	CV (%)	% Deviation Of the Lowest Price from The Highest Price	Price Range
Pre Reform (1980-1990)	-	-	-
Post Reform (1991-2010)	12.00	32.37	32.35
Whole Period (1980-2010)	12.00	32.37	32.35

Note: CV = Coefficient of Variation
Source: Derived using Price Data from Coffee Board.

The average intra year instability of Coffee has been found to be quite high and less fluctuating as compared to the other crops except for the last few years (2008-09 to 2010-11) where it has been quite high and fluctuating (see Figure). Seasonality effect is found to be quite high for Coffee. The highest price of Coffee has been turned out to be mostly in the off-season months of September (2006-07, 2008-09, 2009-10 and 2010-11), October (2007-08), November (2002-03) and May (2005-06) (Appendix II, Table A2.5). Thus the highest price is turned out to be in conformity with our theoretical expectation in 7 out of 13 cases (54 per cent). However there are exceptions to this as well. However there are exceptions to this as well. Price is found to be peaking in the season months like December (2004-05), January (1998-99, 1999-00, 2000-01 and 2001-02) and February (2003-04).

The lowest price has been observed mainly in the harvesting season. The lowest price has been turned out to be in the season months of December (2000-01, 2001-02, 2002-03 and 2003-04), January (2004-05 and 2007-08), February (2005-06) and March (2008-09 and 2010-11). Thus, the lowest price has been turned out to be in 9 out of 13 cases (69 per cent) in favor of our theoretical expectations. Putting both the cases together the normal seasonality impact of either the highest price

or the lowest price for Coffee has been turned out to be in 11 out of 13 cases (84 per cent). The seasonality impact of both the highest price and the lowest price coming together is observed in 5 out of 13 cases (38 per cent). The seasonal price difference for Coffee is reported in the table 5.12 (2002-03, 2005-06, 2007-08, 2008-09 and 2010-11).

Figure 5.5: Intra-Year Price Instability of Coffee
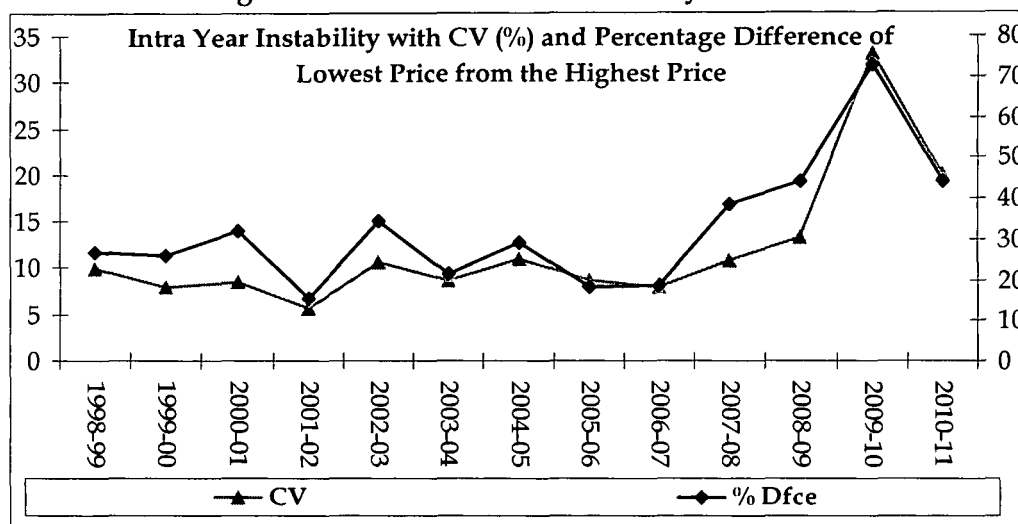
Source: *Derived using Price Data from Coffee Board.*

Table 5.12: Seasonal Price Differentials of Coffee

Year	Seasonal Average	Off Season Average	Seasonal Difference
1998-99	100.7	90.5	10.1
1999-00	75.3	68.2	7.2
2000-01	60.1	60.0	0.1
2001-02	43.5	42.7	0.8
2002-03	38.2	42.7	-4.5
2003-04	46.3	44.2	2.2
2004-05	52.1	54.3	-2.2
2005-06	76.6	80.2	-3.6
2006-07	86.7	86.3	0.4
2007-08	85.8	93.7	-7.9
2008-09	98.2	115.9	-17.7
2009-10	84.1	118.4	-34.3
2010-11	91.1	117.2	-26.0
Average Seasonal Difference (Absolute)			7.58
Average Seasonal Difference (Normalized)			0.08

Note: 1) Season is from December to March (4 months) and Off-Season from April to November (8 months)
Source: *Derived using Price Data from Coffee Board.*

Seasonal difference in price is found to be low in the initial year and found to be widening recently. The seasonal regularity is observed in 7 out of 13 cases (38 per

cent). It could be observed that the seasonal difference and multi-year cycles are associated as we have seen in the case of Black Pepper and Small Cardamom. The normal seasonality impact of seasonal average price less than the off season average price comes mainly in the expansion phase of the cycle. The implication hence is that the boom phase of the cycle results in by pulling up the off season price at a faster rate than the season price and vice versa. It could be explained in terms of the availability factor in the market. Boom implies lesser availability in the market. Assuming that the demand for Coffee is throughout the year, during the expansion phase, lesser availability pulls the off season price at a faster rate than the season price as much of the off season demand is not met by the available supply in the market.

5.4 Summary

The present chapter sought to explore the dynamics of short-term price instability by focusing our attention on the monthly average price. Before directly entering into the analysis of intra-year price instability, extent of monthly price instability has been estimated and the nature of short-term fluctuations explored. The main findings of the present chapter are the following.

Intra-year instability is found to be the lowest for Tea (with an average CV of 9.26) and the highest for Small Cardamom (with an average CV of 16.62) as quality of Small Cardamom deteriorates in storage (less possibility of inter-temporal arbitraging) and Tea is a continuous crop available through out the year. Intra year instability has been explained mainly by the seasonality of production. While for Black Pepper the normal seasonality impact (peak price during slack season and vice versa) has been observed in 83 per cent of the cases, for Natural Rubber, Small Cardamom (peak price during peak seasons), Coffee and Tea seasonality effect is turned out to be in 90, 73, 84 and 63 per cent of the cases respectively in the thirty year data. Even then, seasonal difference in price (both absolute and normalized) is found to be the highest for Small Cardamom and the lowest for Tea as it is theoretically expected.

It has also been observed that the seasonal difference in price and multi year cyclicality are associated for Black Pepper, coffee and Small Cardamom and no such association has been observed for Natural Rubber and Tea. The normal seasonality effect for Black Pepper (seasonal average less than the off-season average) and Small Cardamom (seasonal average greater than the off-season average) comes mainly in the contraction phase of the annual price cycle. For Coffee, the normal seasonality effect is coming in the expansion phase of the cycle. Hence, it could be argued that for Black Pepper price slump results in by suppressing the season average price at a faster rate than the off-season average price (due to greater availability) and price boom results in by pulling up the season average price at a faster rate than the off-season average price (due to lesser availability). On the contrary, for Small Cardamom price slump results in by suppressing the off-season average price at a faster rate than the season average price (greater availability and demand for quality cardamom in the season only), hence peak price during peak seasons and price boom results in by pulling up the off-season average price at a faster rate than the season average price (due to lesser availability, what ever is available in the off season is also demanded). For Coffee, boom (due to lesser availability) results in by pulling up the off season price at a faster rate than the season price and slump (due to grater availability) results in by pulling down the off season price at a faster rate than season price.

Table 5.13: Intra-Year Price Instability: Summary and Conclusion

Characteristics	Black Pepper	Natural Rubber	Coffee	Tea	Small Cardamom
I. Order of Instability (Monthly Data)	1	4	3	5	2
II. Change in Instability across Regimes	Increased in the Post R	Increased in the Post R	-	Declined in the Post R	Declined in the Post R
III. Nature of Fluctuations	Neutral	Neutral	Neutral	Neutral	Downward biased
IV. Intra Year Instability					
1. Order of Average Intra Year Instability	3	4	2	5	1
2. Commodity Characteristics					
-- Availability	Seasonal	Continuous crop	Seasonal	Continuous crop	Seasonal
-- Storability	Storable	Storable	Storable	Less storable	Less storable
3. HP Favorable to Theoretical Expectations	67 per cent	90 per cent	54 per cent	67 per cent	37 per cent
4. LP Favorable to Theoretical Expectations	57 per cent	30 per cent	69 per cent	23 per cent	40 per cent
5. Seasonality Effect in General (HP & LP Together)#	83 per cent	90 per cent	84 per cent	63 per cent	73 per cent
6. Association of Seasonality with Cyclicality	Prevails	Ambiguous	Prevails	Ambiguous	Prevails
7. Phase of Cycle where Seasonality Effect is Coming	Contraction phase	-	Expansion phase	-	Contraction phase

Note:# = At least any of highest price or lowest price coming in the thirty year data
HP & LP stand for highest price and lowest price respectively

APPENDIX II

Table A2.1: Intra-Year Price Instability of Black Pepper

Year	Highest Price (RS per Kg)	Month	Lowest Price(RS per Kg	Month	CV (%)	% Deviation Of the Lowest Price from The Highest Price	Price Range
1980-81	15.49	November	11.42	March	8.75	26.28	4.1
1981-82	14.16	November	11.59	February	6.68	18.15	2.6
1982-83	13.93	July	11.04	February	8.64	20.75	2.9
1983-84	21.84	December	12.19	April	21.52	44.18	9.7
1984-85	34.40	March	20.53	April	15.63	40.32	13.9
1985-86	43.35	November	37.27	August	4.47	14.03	6.1
1986-87	62.98	October	46.67	April	10.45	25.90	16.3
1987-88	57.69	August	39.41	March	11.26	31.69	18.3
1988-89	50.71	March	31.43	September	13.73	38.02	19.3
1989-90	51.93	April	31.23	March	16.87	39.86	20.7
Pre-Reform					*11.80*	*29.92*	*11.37*
1990-91	40.22	November	28.75	July	10.43	28.52	11.5
1991-92	37.35	July	28.00	February	9.48	25.03	9.4
1992-93	32.06	November	26.25	August	6.42	18.12	5.8
1993-94	48.94	March	27.03	April	19.61	44.77	21.9
1994-95	78.00	October	46.19	May	18.14	40.78	31.8
1995-96	83.69	May	68.83	January	7.11	17.76	14.9
1996-97	101.45	March	70.38	May-June	13.64	30.63	31.1
1997-98	207.30	November	113.81	April	18.84	45.10	93.5
1998-99	219.75	August	183.95	February	5.34	16.29	35.8
1999-00	254.17	November	182.83	May	11.03	28.07	71.3
2000-01	237.55	April	103.00	March	28.04	56.64	134.6
2001-02	103.44	May	63.19	February	15.41	38.91	40.3
2002-03	104.75	October	79.44	July	8.85	24.16	25.3
2003-04	79.76	June	67.18	November	5.46	15.77	12.6
2004-05	75.96	April	61.50	November	6.58	19.04	14.5
2005-06	72.69	December	60.90	July	5.75	16.22	11.8
2006-07	124.64	September	69.54	June	21.71	44.21	55.1
2007-08	148.71	March	125.38	September	4.96	15.69	23.3
2008-09	143.96	May	106.60	December	11.60	25.95	37.4
2009-10	147.61	November	126.09	April	5.87	14.58	21.5
Post-Reform					*11.71*	*28.31*	*35.16*

Note: 1) Season is from December to April (5 Months) and Off-Season from May to November (7 Months),
Source: *Derived using Price Data from Spices Board.*

Table A2.2: Intra-Year Price Instability of Small Cardamom

Year	Highest Price(RS per Kg)	Month	Lowest Price(RS per Kg)	Month	CV (%)	% Deviation Of the Lowest Price from The Highest	Price Range
1980-81	108.60	November	73.98	April	10.2	31.88	34.6
1981-82	152.09	July	89.70	August	13.8	41.02	62.4
1982-83	270.22	June	142.67	September	24.9	47.20	127.6
1983-84	468.14	January	199.55	July	26.5	57.37	268.6
1984-85	258.59	October	122.48	July	22.2	52.64	136.1
1985-86	168.50	September	91.56	May	19.9	45.66	76.9
1986-87	154.22	July	98.19	August	15.4	36.33	56.0
1987-88	168.78	August	118.92	October	11.3	29.54	49.9
1988-89	178.93	June	122.85	November	14.6	31.34	56.1
1989-90	358.67	May	181.75	August	20.9	49.33	176.9
Pre-Reform					*17.98*	*42.23*	*104.5*
1990-91	350.20	August	218.80	January	14.3	37.52	104.5
1991-92	328.83	July	221.76	August	13.0	32.56	131.4
1992-93	656.13	May	268.32	August	24.0	59.11	107.1
1993-94	507.64	September	288.56	July	22.6	43.16	219.1
1994-95	305.77	September	210.03	July	12.7	31.31	95.7
1995-96	320.87	May	161.56	February	24.1	49.65	159.3
1996-97	437.80	January	283.34	June	14.8	35.28	154.5
1997-98	354.95	June	230.29	December	14.7	35.12	124.7
1998-99	617.14	May	324.94	August	19.0	47.35	292.2
1999-00	703.37	April	360.79	December	24.7	48.71	342.6
2000-01	628.47	February	424.41	July	10.4	32.47	204.1
2001-02	719.84	April	569.78	June	8.1	20.85	150.1
2002-03	746.79	September	381.00	July	21.1	48.98	365.8
2003-04	434.33	September	328.00	February	9.7	24.48	106.3
2004-05	355.52	August	257.89	July	8.2	27.46	97.6
2005-06	239.71	September	190.57	March	7.1	20.50	49.1
2006-07	369.39	September	258.04	December	11.8	30.14	111.4
2007-08	601.83	January	395.07	August	14.8	34.36	206.8
2008-09	684.45	July	440.10	December	14.5	35.70	244.4
2009-10	1564.37	June	659.15	October	29.2	57.86	905.2
Post-Reform					*15.93*	*37.63*	*208.6*

Note: 1) Season is from September to January (5 Months) and Off-Season from February to August (7 Months)

Source: *Derived using Price Data from Spices Board.*

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Table A2.3: Intra Year Price Instability of Natural Rubber – RSS 4

Year	Highest Price(RS per Kg)	Month	Lowest Price(RS per Kg)	Month	CV (%)	% Deviation Of the Lowest Price from The Highest	Price Range
1980-81	13.95	March	10.49	April	9.84	24.80	3.46
1981-82	15.33	March	13.90	July	3.60	9.33	1.43
1982-83	15.94	August	12.58	October	9.21	21.08	3.36
1983-84	18.26	May	16.08	April	4.36	11.94	2.18
1984-85	18.48	August	15.48	November	6.19	16.23	3.00
1985-86	17.85	October	16.08	April	2.82	9.92	1.77
1986-87	17.38	May	15.84	October	3.44	8.86	1.54
1987-88	18.60	July	17.43	December	2.41	6.29	1.17
1988-89	25.83	November	17.62	April	16.42	31.78	8.21
1989-90	25.09	August	18.58	April	8.04	25.95	6.51
Pre Reform					*6.63*	*16.62*	*3.20*
1990-91	24.08	June	19.80	November	6.56	17.77	4.28
1991-92	25.62	February	17.76	May	10.01	30.68	7.86
1992-93	25.77	August	17.76	May	16.17	31.08	8.01
1993-94	26.81	July	23.90	October	4.03	10.85	2.91
1994-95	51.95	March	26.21	April	22.16	49.55	25.74
1995-96	60.47	May	41.97	September	11.91	30.59	18.5
1996-97	53.85	June	41.99	March	7.38	22.02	11.86
1997-98	42.98	August	27.00	March	18.01	37.18	15.98
1998-99	34.57	June	26.25	February	9.79	24.07	8.32
1999-00	34.08	June	28.18	April	6.18	17.31	5.90
2000-01	33.56	May	26.67	March	7.61	20.53	6.89
2001-02	36.01	August	26.79	April	6.57	25.60	9.22
2002-03	45.17	March	33.89	April	9.03	24.97	11.28
2003-04	55.67	March	44.53	July	6.21	20.01	11.14
2004-05	63.43	June	51.49	February	8.54	18.82	11.94
2005-06	80.69	March	58.40	April	11.29	27.62	22.29
2006-07	106.92	June	82.60	November	8.33	22.75	24.32
2007-08	103.54	March	79.43	July	7.51	23.29	24.11
2008-09	137.82	August	64.88	December	28.90	52.92	72.94
2009-10	137.72	January	94.88	April	16.70	31.11	42.84
Post Reform					*11.14*	*26.94*	*17.30*

Note: 1) Season is from October to January (4 months) and Off-Season from February to September (8 months)
Source: *Derived using Price Data from Rubber Board.*

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Table A2.4: Intra-Year Price Instability of Tea

Year	Highest Price(RS per Kg)	Month	Lowest Price(RS per Kg)	Month	CV (%)	% Deviation Of the Lowest Price from The Highest	Price Range
1980-81	13.94	January	11.29	October	7.27	19.0	2.7
1981-82	14.26	October	11.89	February	6.84	16.6	2.4
1982-83	15.88	October	13.74	March	5.72	13.5	2.1
1983-84	27.95	November	17.06	January	14.93	39.0	10.9
1984-85	28.91	April	24.82	September	5.14	14.1	4.1
1985-86	27.23	January	17.47	September	14.56	35.8	9.8
1986-87	25.48	October	17.26	March	12.84	32.3	8.2
1987-88	26.11	April	22.09	December	4.30	15.4	4.0
1988-89	24.66	December	21.33	January	4.09	13.5	3.3
1989-90	43.96	September	27.10	January	16.29	38.4	16.9
Pre Reform					*9.2*	*23.8*	*6.4*
1990-91	46.27	April	38.74	August	5.32	16.3	7.5
1991-92	40.31	July	34.35	March	5.09	14.8	6.0
1992-93	40.92	May	32.17	March	7.98	21.4	8.8
1993-94	52.63	February	44.53	October	4.87	15.4	8.1
1994-95	45.49	January	32.55	March	8.90	28.4	12.9
1995-96	52.80	November	35.82	March	10.72	32.2	17.0
1996-97	51.30	April	44.28	March	5.85	13.7	7.0
1997-98	82.08	December	48.75	January	17.38	40.6	33.3
1998-99	89.96	January	65.59	September	10.75	27.1	24.4
1999-00	76.49	May	58.65	March	7.57	23.3	17.8
2000-01	70.37	July	48.85	April	10.17	30.6	21.5
2001-02	73.91	January	52.97	October	9.89	28.3	20.9
2002-03	62.50	June	44.10	March	10.88	29.4	18.4
2003-04	62.28	February	52.20	September	5.43	16.2	10.1
2004-05	70.76	September	48.59	March	12.63	31.3	22.2
2005-06	61.56	December	52.65	March	5.15	14.5	8.9
2006-07	71.84	June	55.30	March	8.99	23.0	16.5
2007-08	75.67	December	57.30	February	8.18	24.3	18.4
2008-09	101.54	September	59.82	February	16.74	41.1	41.7
2009-10	119.12	May	80.18	February	13.27	32.7	38.9
Post Reform					*9.3*	*25.2*	*18.0*

Note: 1) Season is from June to October (5 months) and Off-Season from November to May (7 months)

Source: *Derived using Price Data from Tea Board.*

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Table A2.5: Intra-Year Price Instability of Coffee

Year	Highest Price(RS per Kg)	Month	Lowest Price(RS per Kg)	Month	CV (%)	% Deviation Of the Lowest Price from The Highest	Price Range
1998-99	114.4	January	83.7	July	9.9	26.8	30.7
1999-00	84.9	January	62.9	September	8.0	25.9	22.0
2000-01	70.3	January	47.9	December	8.4	31.9	22.4
2001-02	48.3	January	40.8	December	5.6	15.5	7.5
2002-03	52.5	November	34.5	December	10.6	34.3	18.0
2003-04	50.5	February	39.7	December	8.6	21.4	10.8
2004-05	65.9	December	46.6	January	11.0	29.3	19.3
2005-06	89.6	May	73.3	February	8.7	18.2	16.3
2006-07	96.4	September	78.4	June	7.9	18.7	18.0
2007-08	97.5	October	60.2	January	10.9	38.3	37.3
2008-09	121.8	September	68.1	March	13.3	44.1	53.7
2009-10	145.8	September	39.9	October	33.1	72.6	105.9
2010-11	133.8	September	75.1	March	20.0	43.9	58.7
Average					*12.00*	*32.37*	*32.35*

Note: 1) Season is from December to March (4 months) and Off-Season from April to November (8 months)
Source: *Derived using Price Data from Coffee Board.*

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CHAPTER VI

SUMMARY AND CONCLUSIONS

The present study was an attempt to understand the dynamics of inter-year and intra-year price instability of plantation crops specifically looking at the case of five major crops: Natural Rubber, Tea, Coffee, Black Pepper and Small Cardamom. The study also made an attempt to locate the factors involved in price instability of the selected crops. Inter-year instability captures the long-term and medium-term dimensions of instability given its bearing on the long term planning and development of the sector. Intra-year instability, on the other hand, captures the short-run variations in price, which has crucial bearing on the uncertainties in producer returns in general and the livelihood of growers (especially small) and workers involved in particular. The study specifically looked at three main aspects of price instability- long run movement, medium term cyclicality involving fluctuations of more than one year duration (inter-year instability) and within year variations in price across months representing the short term instability dimension (intra-year instability). Our analysis of price instability of plantation crops has come out with the following findings.

6.1 Inter Year Instability

Annual average real price of plantation crops in general remains either stagnant (Black Pepper, Natural rubber) or secularly declining (Small Cardamom and Tea) except for Coffee. While inter-year instability has been explained mainly by the multi-year price cyclicality arising in response to the cycles in production, intra-year instability has been explained mainly by the seasonality of production. However, given crop characteristics, there are significant inter-crop variations. In general the study has observed higher inter-year instability in the post reform era as compared to the pre reform era. While three crops showed increase in instability (Black Pepper, Coffee and Natural Rubber) two crops showed a decline in instability (Small Cardamom and Tea) in the post-reform era as compared to the pre-reform era. The crops (Black Pepper, Coffee and Natural Rubber) for which domestic market is highly integrated with the global market are found to be showing greater price instability in the open trade regime as

compared to the closed and protected regime. The crops (Small Cardamom and Tea), which are highly domestic market oriented are showing decline in instability in the open trade regime as compared to the protected regime. The crops, which have shown an increase in instability in the open trade regime (Black Pepper and Natural Rubber), also show clear widening of cycles (in duration as well as in amplitudes) in the open trade regime as compared to the protected regime. On the other hand the crops, which have shown a decline in instability in the open trade regime (Small Cardamom and Tea), show low cyclical duration and amplitude in the 1990s as compared to the 1980s.

Since crops like Small Cardamom and Tea are highly domestic market oriented, the domestic price has been responding more to the cycles in domestic production rather than that of global production, with the domestic price responding to the global production only in the last few years in the 2000s. Since the markets for Black Pepper, Coffee and Natural Rubber are highly globally integrated domestic price has been responding more to the global production cycles in the open trade regime as compared to the closed regime, in which case domestic price is found to be responding to the less to the domestic production cycles (came out clearly for Black Pepper and ambiguously for Natural Rubber). While increased international integration of commodity markets for Natural Rubber, Coffee and Black Pepper might have resulted in an increase in their instability, greater domestic market orientation of Small Cardamom and Tea might have resulted in reducing their instability in the open trade regime as compared to the closed and protected regime.

Annul average prices of all the selected crops have been mostly turned out to be in the contraction phase of the cycle indicating long duration slumps than booms. It is also observed that the annual price has been mostly below the trend for all the selected commodities implying that the price of the selected commodities in general is downward biased. The number of times price lying below the trend has increased in the open trade regime for Black Pepper and Natural Rubber (higher inter-year instability with more downward fluctuations) and decreased

for Small Cardamom, Tea (low inter-year instability with less downward fluctuations) and Coffee.

6.2. Intra Year Instability

Given the difference in crop characteristics, the intra-year instability also varies across crops. Intra year instability is found to be the lowest for Tea (with an average CV of 9.26) and the highest for Small Cardamom (with an average CV of 16.62) as quality of Small Cardamom deteriorates in storing (less possibility of inter-temporal arbitraging) and Tea being a continuous crop available through out the year. While for Black Pepper the normal seasonality impact (peak price during slack season and vice versa) has been observed in 83 per cent of the cases, for Natural Rubber, Small Cardamom (peak price during peak seasons), Coffee and Tea seasonality effect is turned out to be in 90, 73, 84 and 63 per cent of the cases respectively in the thirty year data. Even then, seasonal difference in price (both absolute and normalized) is found to be the highest for Small Cardamom and the lowest for Tea.

It has also been observed that the seasonal difference in price and multi year cyclicality are associated for Black Pepper, coffee and Small Cardamom and no such association has been observed for Natural Rubber and Tea. The normal seasonality effect for Black Pepper (peak season average less than the off-season average) and Small Cardamom (peak season average greater than the off-season average) comes mainly in the contraction phase of the annual price cycle. For Coffee, the normal seasonality effect is coming in the expansion phase of the cycle. Hence, it could be argued that for Black Pepper price slump results in by suppressing the peak season average price at a faster rate than the off-season average price (due to greater availability) and price boom results in by pulling up the peak season average price at a faster rate than the off-season average price (due to lesser availability). On the contrary, for Small Cardamom price slump results in by suppressing the off-season average price at a faster rate than the peak season average price (greater availability and demand for quality cardamom in the season only), hence peak price during peak seasons and price

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boom results in by pulling up the off-season average price at a faster rate than the peak season average price (due to lesser availability, what ever is available in the off season is also demanded). For Coffee, boom (due to lesser availability) results in by pulling up the off season price at a faster rate than the peak season price and slump (due to grater availability) results in by pulling down the off season price at a faster rate than season price.

6.3 Issues for Further Research

We have tried to explore the dynamics of commodity price instability by exploring some ground level realities and we have also made an attempt to locate the factors involved in commodity price instability specifically focusing on supply and demand forces. There are still issues to be looked at in an internationally integrated commodity market setting. Two major developments relevant for the commodity price instability in the post reform period are the adoption of flexible exchange rate system (expected to aggravate instability) and the introduction of futures trade (expected to mitigate instability). Thus, it is worthwhile to investigate in detail the influence of exchange rate fluctuations and the futures trade in commodity price instability in the internationally integrated market setting.

BIBLIOGRAPHY

A. C. Zwart and K. D. Meilke (1979) The Influence of Domestic Pricing Policies and Buffer Stocks on Price Stability in the World Wheat Industry, *American Journal of Agricultural Economics*, Vol. 61, No. 3 (Aug., 1979), pp. 434-447.

Adebusuyi1, B. S (2004) Stabilization of Commodity Market of Interest to Africa, *Paper Presented at the Workshop on Constraints to Growth in Sub-Saharan Africa*, organized by the Intergovernmental Group of Twenty-Four in Pretoria, South Africa, November, 2004.

Angus, Deaton and Guy, Laroque (1996) Competitive Storage and Commodity Price Dynamics, *The Journal of Political Economy*, Vol. 104, No. 5 (Oct., 1996), pp. 896-923.

Anthony, C. Zwart and Blandford, David (1989) Market Intervention and International Price Stability, *American Journal of Agricultural Economics*, Vol. 71, No. 2 (May, 1989), pp. 379-388.

Arango, Santiago (2006) Asymmetric Commodity Cycles: Evidence from an Experimental Market, *Decisions Science Group Studies*, University of Columbia.

Ardeni, P. Giorgio and Wright, Brian (1990) The Long-Term Behavior of Commodity Prices, *Working Paper Number WPS 358*, Policy Research on External Affairs, The World Bank.

Balakrishnan, Pulapre (2008) Agricultural Growth in India since 1991, *DRG Study Number 27*, Development Research Group, Department of Economic Analysis and Policy, reserve Bank of India, Mumbai.

Barrett, B. Christopher and Mutambatsere, Emelly (2005) Agricultural markets in developing countries, *The New Palgrave Dictionary of Economics*, 2nd Edition, Cornell University, London.

Basheer, K.P.M. (2006) Brewing Discontent in the High Ranges, *Hindu*, April 18, 2006.

Bastine, C. Latha; Kuruvila, Anil and Sandini, K.P (2010) Trade Performance and Transmission of Price Volatility: The Case of Indian Pepper, *National Research Programme on Plantation Development Discussion Paper 7*, NRPPD, CDS.

Beck Stacie (2001) Autoregressive Conditional Heteroscedasticity in Commodity Spot Prices, *Journal of Applied Econometrics*, Vol. 16, Number 2 (Mar. - Apr., 2001), pp. 115-132.

Bleaney, Michael and Greenaway, David (1993) Long-Run Trends in the Relative Price of Primary Commodities and in the Terms of Trade of Developing Countries, *Oxford Economic Papers*, New Series, Vol. 45, No. 3 (Jul., 1993), pp. 349-363.

Borensztein, Eduardo and. Reinhart, Carmen M (1994) The Macroeconomic Determinants of Commodity Prices, *Staff Papers*, International Monetary Fund, Vol. 41, No. 2 (Jun., 1994), pp. 236-261.

Caine, Sydney (1958) Stabilizing Commodity Prices, *Foreign Affairs*, Volume 37, Number 1 (Oct., 1958), pp. 131-143.

Calvo-Gonzalez, Oscar; Shankar, Rashmi and Trezzi, Riccardo (2010) Are World Commodity Prices More Volatile now? A long run perspective, *Policy Research Working Paper 5460*, World Bank.

Cashin, Paul; Liang, Hong and McDermott, C. John (1999) How Persistent are Shocks to World Commodity Prices?, *IMF Working Paper WP/99-80*, International Monitory Fund.

Cashin, Paul; Liang, Hong and McDermott, C. John (1999) The Myth of Co-moving Commodity Prices, *IMF Working Paper WP/99/169*, International Monitory Fund.

Cashin, Paul; McDermott, C. John (2002) Long Run Behavior of Commodity Prices: Small Trends and Big Variability, *IMF Staff Papers*, Volume 46, Number 2.

Cashin, Paul; McDermott, C. John and Scott, Alasdair (1999b) Booms and Slumps in World Commodity Prices, *IMF Working Paper 99/155*, International Monitory Fund.

Clem, Andrew (1985) Commodity Price Volatility: Trends during 1975-84, *Monthly Labour Review*, pp. 17-21.

Cuddington, John T and Liang, Hong (2003) Commodity Price volatility across Exchange Rate Regimes available at: *http://inside.mines.edu/~jcudding/papers/Comm_Price_Volatility/CuddingtonLiangCommodity%20Price%20Volatility%2803.10.2003%29.pdf*.

Cuddington, John T; Ludema, Rodney and Jayasuriya, A Shamila (2002) Prebisch-Singer Redux, available at *http://inside.mines.edu/~jcudding/papers/Prebisch Singer/Cuddingtonet%20alPSRedux -short10.30.02.pdf*.

Cuddy J. D. A and Valle Della P. A. (2009) Measuring the Instability of Time Series Data, *Oxford Bulletin of Economics and Statistics*, Volume 40, Issue 1, pages 79–85, February 1978.

Currie, Jeffrey; Nathan, Allison; Greely, David and Courvalin, Damien (2010) Commodity Prices and Volatility: Old Answers to New Questions, *Global Economics Paper No: 194*, Goldman Sachs Global Economics, Commodities and Strategy Research.

Data Base on Coffee, Data Base Archives, *Coffee Board of India*, Ministry of Commerce and Industry, Government of India, available at: *http://www.indiacoffee.org/indiacoffee.php?page=CoffeeData*.

Deaton, Angus (1999) Commodity Prices and Growth in Africa, *The Journal of Economic Perspectives*, Vol. 13, No. 3 (Summer, 1999), pp. 23-40.

Deaton, Angus and Guy, Laroque (1990) On the Behavior of Commodity Prices, *NBER Working Paper Series*, Working Paper Number 3439, National Bureau of Economic Research.

Dehn, Jan (2000) Commodity Price Uncertainty and Shocks: Implications for Economic Growth, *Working Paper Series WPS/2000-10*, Centre for the Study of African Economies.

Devadoss, S (1992) Market Interventions, International Price Stabilization, and Welfare Implications, *American Journal of Agricultural Economics*, Vol. 74, No. 2 (May, 1992), pp. 281-290.

Dorosh, Paul; Shahabudhin, Quasi and Farid, Naser (2001) Price Stabilization and the Cost of Food Stocks, *FMRSP Synthesis Report No. 1*, Food Management & Research Support Project, Ministry of Food, Government of the People's Republic of Bangladesh.

Eastham, J. K (1939) Commodity Stocks and Prices, *The Review of Economic Studies*, Vol. 6, No. 2 (Feb., 1939), pp. 100-110.

FAO (2002) Consultation on Agricultural Commodity Price Problems, *Commodities and Trade Division*, Food and Agriculture Organization of the United Nations, 25-26 March 2002.

FAO, Agricultural Statistics, Various Issues, Food and Agricultural Organization.

Findlay, Ronald and Rourke, H. O Kevin (2001) Commodity market integration, 1500-2000, *Conference on Globalization in Historical Perspective*, NBER, Santa Barbara, May 2001.

Finkelshtain, Israel and Chalfant, A James (1997) Commodity Price Stabilization in a Peasant Economy, *American Journal of Agricultural Economics*, Vol. 79, No. 4 (Nov., 1997), pp. 1208-1217.

Frankel, A. Jeffrey (1986) Expectations and Commodity Price Dynamics: The Overshooting Model, *American Journal of Agricultural Economics*, Vol. 68, No. 2 (May, 1986), pp. 344-348.

George, K. T and Tharakan, P.K.M (1985) Development of Tea Plantations in Kerala: A Historical Perspective, *Working Paper Number 204*, Centre for Development Studies Trivandrum.

George, K. Tharian (1987) International Commodity Agreements: The Case of Natural Rubber, *Social Scientist*, Vol. 15, No. 4/5 (Apr. - May, 1987), pp. 77-86.

George, K. Tharian; Joseph, Toms and Joseph, Joby (2002) Natural Rubber in Post-QRs Regime, *Economic and Political Weekly*, Vol. 37, No. 32 (Aug. 10-16, 2002), pp. 3319-3321.

Ghosh, Arun (1992) State Intervention versus Free Market, *Economic and Political Weekly*, Vol. 27, No. 27 (Jul. 4, 1992), pp. 1365+1367-1368.

Gillson, Ian; Green, Duncan and Wiggins, Steve (2004) *Rethinking tropical Commodities, Working Paper for the Renewable Natural Resources and Agriculture Team*, DFID Policy Division.

Government of Kerala (2009) Kerala Economic Review, *Chapter IV*, Agriculture and Allied Sectors, pp 36-102.

Govindan, A (2009) Coffee Annual, *GAIN Report Number IN9061*, Global Agricultural Information Network (2009), USDA Foreign Agricultural Service.

Haque, Ul. Irfan (2004) Commodities as a Development Issue, *Discussion Paper series*, Friedrich Ebert Foundation, Global Finance Coalition.

Haque, Ul. Irfan (2004a) Commodities under Neo-liberalism: The Case of Cocoa, *G 24 Discussion Paper Series*, United Nations.

Hart, D. Oliver and Kreps, M. David (1986) Price Destabilizing Speculation, *The Journal of Political Economy*, Vol. 94, No. 5 (Oct., 1986), pp. 927-952.

Harvey I. David, Kellard, M. Neil, Madsen, B. Jakob and Wohar, E. Mark (2008) The Prebisch - Singer Hypothesis: Four Centuries of Evidence, available at *http://www.africametrics.org/documents/conference08/day2/session6/harvey_kellard_madsen_wohar.pdf.*

Hazarika, Kakali. Tea Auction Market: with a special reference to Guwahati Auction Centre, available at: *www.nits.ac.in/department/Humanities %20new/new_hum/.../9.doc.*

Hema, M; Kumar, Ranjit and Singh, N.P (2007) Volatile Price and Declining Profitability of Black Pepper in India: Disquieting Future, *Agricultural Economics Research Review*, Vol. 20 January-June 2007 pp 61-76.

Hiebert, L. Dean (1984) Producer Preference for Price Stability, *American Journal of Agricultural Economics*, Vol. 66, No. 1 (Feb., 1984), pp. 88-90.

Hoffman, G. Wright (1931) Factors Affecting Prices on Organized Commodity Markets, *Annals of the American Academy of Political and Social Science*, Vol. 155 in Part 1: Organized Commodity Markets (May, 1931), pp. 91-99.

Indira, M. (1988) An Economic Analysis of Coffee Marketing in India, *Doctor of Philosophy Thesis*, Institute for Social and Economic change, Mysore University

International Institute for Sustainable Development (2008) Boom or Bust: How commodity price volatility impedes poverty reduction, and what to do about it, available at *http://www.iisd.org/markets/policy/price.asp.*

Jacks, S. David (2009) What Drove Nineteenth Century Commodity Market Integration, available at *http://www.iisg.nl/hpw/conference.html*

Jain, K. Arvind (1981) International Integration of Commodity Markets, *Journal of International Business Studies*, Volume 12, No. 3 (winter, 1981), pp. 65-88

Joseph, Brigit (2004) Trade Liberalization and Primary Commodity Prices: Empirical Evidence from Select Tropical Crops in Kerala, *GTAP#1537*, available at *www.gtap.agecon.purdue.edu.*

Joseph, K. J. (1985) An Analysis of Marketing and Price Formation of Small Cardamom in Kerala, M.Phil Dissertation, Submitted to the Jawaharlal Nehru University, Centre for Development Studies.

Joseph, K. J. (2010) Towards a New Paradigm for Plantation Development in India: An Analysis of the System of Production and Innovation from an Inclusive Growth Perspective, *National Research Programme on Plantation Development Discussion Paper 1*, NRPPD, CDS.

Joseph, K. J. and George P. S (2010) Structural Infirmities in India's Plantation Sector: Natural Rubber and Spices, *NRPPD Report*, Prepared for the Ministry of Commerce and Industry, Government of India.

Kawai, Masahiro (1983) Price Volatility of Storable Commodities under Rational Expectations in Spot and Futures Markets, *International Economic Review*, Vol. 24, No. 2 (Jun., 1983), pp. 435-459.

Kooten, G. C. Van and Schmitz, Andrew (1985) Commodity Price Stabilization: The Price Uncertainty Case, *The Canadian Journal of Economics / Revue canadienne d'Economique*, Vol. 18, No. 2 (May, 1985), pp. 426-434.

Koren, Miklo's and Tenreyro, Silvana (2007) Volatility and Development, *The Quarterly Journal of Economics*, February 2007, pp. 243-287.

Kuchiki, Akifumi (1990) Pricing Mechanism of Primary Commodities since the 1970's, *The Developing Economies*, Volume XXVIII-1, March 1990.

Kuznets, Simon (1966) Modern Economic Growth, *New Haven, CT*: Yale University Press.

Lai, Ching – chong; Shih-wen Hu, Vey Wang (1996) Commodity Price Dynamics and Anticipated Shocks, *American Journal of Agricultural Economics*, Vol. 78, No. 4 (Nov., 1996), pp. 982-990.

Lapp, S. John and Smith, H. Vincent (1992) Aggregate Sources of Relative Price Variability among Agricultural Commodities, *American Journal of Agricultural Economics*, Vol. 74, No. 1 (Feb., 1992), pp. 1-9.

Lloyd, G. Alen (1956) Inter Governmental Commodity Agreements, *Review of Marketing and Agricultural Economics*, Australian Agricultural and Resource Economics Society, volume 20, pp 122-140.

Maizels, Alfred (1992) Commodities in Crisis: The Commodity Crisis of the 1980s and the Political Economy of International Commodity Policies, *A study prepared for the World Institute for Development Economics Research (WIDER) of the United Nations University*, Clarendon Press.

Maizels, Alfred (1999) Commodity Instability and the Developing Countries, *Winter Working Papers WP 34*, World Institute for Development Economics Research, United Nations university.

Maizels, Alfred (2000) Economic Dependence on Commodities, *Paper Prepared for the High-level Round Table on Trade and Development: Directions for the Twenty-first Century*, TD(X)/RT.1/6, UNCTAD X.

Margaret, E. Slad (1991) Market Structure, Marketing Method, and Price Instability, *The Quarterly Journal of Economics*, Vol. 106, No. 4 (Nov., 1991), pp. 1309-134.

Mc-Bean, A. (1966) Export instability and Economic Development, Harvard University Press, Cambridge, MA.

Muthuswamy, Jayaram (2008) What Drives Commodity Prices?, *Academic Key-Note Address, Fourth Annual FIA Asia Derivatives Conference*, Kent State University, Kent, Ohio, September 19, 2008.

Nagoor, B.H. (2010) Trade Aspect of Plantation Sector of India, *National Research Programme on Plantation Development Discussion Paper 8*, NRPPD, CDS.

Narayana, D. (1994) Government Intervention in Commodity Trade: An Analysis of the Coffee Trade in India, *Working Paper Number 256*, Centre for Development Studies, Trivandrum.

National Multi Commodity Exchange of India Limited (2008) Report on Black Pepper, available at: http://www.nmce.com/files/study/rubber.pdf.

National Multi Commodity Exchange of India Limited (2008) Report on Black Pepper, available at: http://www.nmce.com/files/study/pepper.pdf.

National Multi Commodity Exchange of India Limited (2008) Report on Cardamom, available at: http://www.nmce.com/files/study/cardamom.pdf.

Newberry, D.M.G and Stiglitz, E. Joseph (1981) Theory of Commodity Price Stabilization: A Study in the Economics of Risk, *Clarendon University Press*, Oxford, Volume I.

Ostensson, Olle (2007) Agricultural Trade, Development Problems and Poverty in the Least Developed Countries: An Overview, in *Koning, N. and P. Pinstrup-Andersen (eds.), Agricultural Trade Liberalization and the Least Developed Countries*, pp. 13-24, 2007 Springer, the Netherlands.

Page, Sheila and Hewitt, Adrian (2001) World commodity Prices: Still a Problem for Developing Countries?, *Overseas Development Institute Review*, ISBN 0 85003 521 X, London, 2001.

Parimal, Jayant (2006) Rethinking Policy Options for Export Earnings, *Research Papers 5*, South Centre, March 2006.

Pindyck, S. Robert (2004) Volatility and Commodity Price Dynamics, *The Journal of Futures Markets*, Volume 24, Number 11, 1029-1047 (2004).

Puri, Lakshmi (2007) Commodities and Development, *Discussion Paper 4*, Division of International Trade in Goods and Services, and Commodities, Commission on Trade in Goods and Services, and Commodities, 11th Session, March 21 2007.

Radetzki, Marian (2010) Primary Commodities: Historical Perspectives and Prospects, *Seminar paper presented in Natural resources, finance, and development: Confronting Old and New Challenges*, organized by the Central Bank of Algeria and the IMF Institute in Algiers, on 4-5 November 2010.

Rangachary, C (2006) Report of the Task Force on Plantation Sector, *Department of Commerce, Ministry of Commerce and Industry, Government of India* available at: http://commerce.nic.in/publications/PlantationReport.pdf?id=12.

Rao, J. Mohan (1989) Agricultural supply Response: A Survey, *Agricultural Economics*, pp. 3 (1989) 1-22.

Rapsomanikis, George and Sarris, Alexander (2006) The Impact of Domestic and International Commodity Price Volatility on Agricultural Income Instability, *Discussion Paper No. 2006/04*, UNU WIDER, United Nations University.

Reinhart, Carmen and Wickham, Peter (1994) Commodity Prices Cyclical Weakness or Secular Decline?, *IMF Staff Papers No 2*, International Monetary Fund, Vol. 41, No. 2 (Jun., 1994), pp. 175-213.

Reinhart, Carmen; Borenzstein, Eduardo; Khan, Mohsin and Wickham, Peter (2008) The Behavior of Non-Oil Commodity Prices, *MPRA Paper No. 8198*, Online at: *http://mpra.ub.uni-muenchen.de/8198/.pdf*

Robert D. Weaver and William C. Natcher (2000) Commodity Price Volatility under New Market Orientations, *Paper Presented at the AES Annual Meeting 2000*, Department of Agricultural Economics and Rural Sociology, Penn State University, Manchester, U.K.

Robinson, Joan (1962) The Basic Theory of Normal Prices, *The Quarterly Journal of Economics*, Vol. 76, No. 1 (Feb., 1962), pp. 1-19.

Roger, W. Babson (1911) Factors Affecting Commodity Prices, *Annals of the American Academy of Political and Social Science*, Vol. 38, No. 2, American Produce Exchange Markets (Sep., 1911), pp. 155-188.

Rubber Board (2010) Indian Rubber Statistics, Volume 33, 2010, *Rubber Board*, Ministry of Commerce and Industry.

Sean, Turnell (2002) The Quest for Commodity Price Stability: Australian Economists and 'buffer stocks', available at: *http://www.econ.mq.edu. au/Econ_docs/research__papers/10-1998_Aug98.pdf*

Sekhar, C.S.C (2004) Agricultural Price Volatility in International and Indian Markets, *Economic and Political Weekly*, Volume 39, No 43, pp. 4729-4736.

Sen, Abhijit (2008) Report of the Expert Committee to Study the Impact of Futures Trading on Agricultural commodity Prices, Ministry of Consumer Affairs, Food and Public Distribution, Government of India

Sharma, Anil and Kumar, Pramod (2001) An Analysis of the Price Behavior of the Selected Commodities, *A Study for the planning Commission*, National Council for Applied Economics Research.

Shepherd S, Geoffrey (1963) Agricultural Price Analysis, *Sixth Edition*, Lowa State University Press, Ames, Lowa, USA.

Singh, Jithendra (2008) Spices and Plantation Crops, *Avishkar Publishers and Distributors*, Jaipur 30200 (Rajasthan) India.

Sinharoy, Saikat and Nair, R. Sanjth (1994) International Trade and Pepper Price Variations: A Co-integration Approach, *Indian Journal of Agricultural Economics*, Volume 49, Number 3, July-September 1994, pp 417-425.

South Centre (2005) Problems and Policy Challenges faced by Commodity Dependent Developing Countries, *Trade Analysis Paper*, SC/TADP/TA/COM/1, South Centre.

Spices Board (2004), Spices Statistics, *fifth Edition*, Spices Board, Ministry of Commerce and industry.

Stanley, S. Tsou and John, D. Black (1944) International Commodity Arrangements, *The Quarterly Journal of Economics*, Vol. 58, No. 4 (Aug., 1944), pp. 521-552.

Stirling, P. Alagidede (2009) Trends, Cycles and Seasonal Components in Primary Commodities: State Space Modeling and the Kalman Filter, available at: *https://editorialexpress.com/cgibin/conferencedownload.cgi?db_name=res2010&p aper_id=74*.

Tea Statistics, Various Issues, Tea Board of India, Ministry of Commerce and Industry, Government of India, available at: *http://www.teaboard. gov.in/ inner2.asp?param_link_id=410*.

The World Bank (1999) Using markets to deal with commodity price volatility: What can governments and donors do to develop markets that ameliorate commodity Price volatility?, *Economic Policy Paper Number 13*, January 1999.

Theodore, W. Schultz (1949) Agricultural Price Policy, *Proceedings of the Academy of Political Science*, Vol. 23, No. 2, Food (Jan., 1949), pp. 12-21.

Thomas, Geer (1971) Price Formation on the World Coffee Market and Its Implications for the International Coffee Agreement, *Weltwirtschaftliches Archive*, Bd. 106 (1971), pp. 128-152.

Thomson, L. Frederick and Foote, J. Richard (1952) Agricultural Prices, *Second Edition*, McGraw-Hill Book Company, New York.

Timmer, C. Peter (1995) Getting agriculture Moving: do markets provide the right signals?, *Food Policy*, Vol. 20, No. 5, pp. 455-472.

Timmer, C. Peter (2009) Rice Price Formation in the Short Run and the Long Run: The Role of Market Structure in Explaining Volatility, *Working Paper Number 172*, Centre for Global Development.

Tomek, G. William and Myers, J. Robert (1993) Empirical Analysis of Agricultural Commodity Prices: A View Point, *Review of Agricultural Economics*, Volume 15, No 1, pp. 181-202.

Turnovsky, J. Stephen (1974) Price Expectations and the Welfare Gains from Price Stabilization, *American Journal of Agricultural Economics*, Vol. 56, No. 4 (Nov., 1974), pp. 706-716.

UNCTAD (2008) Commodity Price Hikes and Instability, Chapter 2, *Trade and Development Report*, UNCTAD.

UNCTAD (2008) The Changing Face of Commodities in the Twenty first Century, *Secretariat Note*, UNCTAD.

UNCTAD (2010) Addressing the Commodity Problematique through Trade-related Policies, *Note by the UNCTAD secretariat*, TD/B/C.I/MEM.2/9, United Nations Conference on Trade and Development.

Vaughn, Richard; Kelly, Mervin and Hochieimer, Frank (1981) Identifying Seasonality in Futures Prices Using X-11, *Journal of Futures Markets*, Volume I, Issue I, pp. 93-101

Veeramani, C. and Saini, K. Gordhan (2011) Impact of ASEAN-India Preferential Trade Agreement on Plantation Commodities: A Simulation Analysis, *Economic & Political Weekly*, Volume XIVI number 10, pp 83-92.

Wang, Jingjing; Chen, Yongfu; Wang, Xiuqing; Zheng, Xiaoping; Zhao, Jing (2010) Cycle Phase Identification and Factors Influencing the Agricultural Commodity Price Cycle in China: Evidence from Cereal Prices, *International Conference on Agricultural Risk and Food Security 2010*, Agriculture and Agricultural Science Procedia 1 (2010) 439–448.

William G. Tomek and Robert J. Myers (1993) Empirical Analysis of Agricultural Commodity Prices: A Viewpoint, *Review of Agricultural Economics*, Vol. 15, No. 1 (Jan., 1993), pp. 181-202.

World Development Report (2008) Agriculture for Development, *The International Bank for Reconstruction and Development/ The World Bank*, Washington DC.

Wright, Brian (2009) International Grain Reserves and Other Instruments to Address Volatility in Grain Markets, *Policy Research Working Paper 5028*, t Development Research Group, the World Bank.

Yuliando, Henry and Akira Nakayasu (2006) Supply Management Options for Tea Producing Countries: A Case Study of Indonesian Tea Product and its Competitors, *Journal of Applied Sciences*, pp. 6 (15):3170-3173.

Zapoleon, L. B. (1931) International and Domestic Commodities and the Theory of Prices, *The Quarterly Journal of Economics*, Vol. 45, No. 3 (May, 1931), pp. 409-459.