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SETTING THE PRICES RIGHT? AN EMPIRICAL ANALYSIS OF E-AUCTION IN CARDAMOM

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ABSTRACT

Towards addressing the equity and efficiency deficit associated with the conventional auction system, the Spices Board introduced the e-auction for cardamom in 2007. How effective has been this intervention? This is the central issue being addressed by this paper. To begin with the study finds that the e-auction has been able to address to a great extent the efficiency and equity deficit that prevailed, as there has been a significant decline in the extent of concentration at the level of bidders and reduction in the price variation across different lots sold through e-auctions. Higher concentration at the level of auctioneers in 2018 is found to have a dampening effect on price. This tends to suggest the need for removing entry barriers, especially for the small farmers' associations to act as auctioneers and increasing the number of auctions per day. Secondly, though e-auctions ensured anonymity of buyers and sellers, human interventions appear to remain because the lots are not always auctioned at random, instead, for various reasons, as decided by the auctioneer. We are inclined to infer that the observed pattern wherein the last 50 lots auctioned in general recording significantly lower price as compared to the first 50 lots cannot be deinked with the existing human intervention. Hence the study makes the case for getting rid of human interventions in auctions by random auctioning of lots so that the observed variations in price could be done away with. Thirdly, there is an increasing incidence of re-pooling wherein the lots once sold are getting re-auctioned in subsequent auctions at the instance of dealers and auctioneers, which is found to have an adverse impact on prices. Hence the study underlines the need for doing away with re-pooling such that auctioneers and traders do not make use of e-auction as a platform for arbitraging and thus defeating the very purpose of Cardamom (Marketing and Regulation) Act. Finally, Going by the available empirical evidence, increase in the bid rate seems to have had no significant effect on price realization.

Introduction

There is hardly any issue in economics, which is more central to economic theory and policy than price formation (Cason and Friedman 1996). In case of agricultural commodities, the instability in their prices (Cashin et al 1999; Maizels 1994; UNCTAD 2008; Jacks et al 2008) with its bearing on the livelihood of the farmers, especially the small farmers, engaged therein has been attracting the attention of policymakers and multilateral organisations. No wonder, the issue as to how do the profit-motivated traders with private information arrive at the so-called equilibrium prices for agricultural commodities, that in turn govern the fortunes of the farming community, has engaged the economists and policy makers for a long time *inter alia* on account of its efficiency and equity considerations. In India given the importance that plantation crops in export earning accounting for nearly 20.8% of total exports (Manmohan Singh 1964) state has been actively involved, at the instance of commodity Boards, in all aspects of plantation agriculture, including marketing. Though the state intervention has traditionally been considered as a means of addressing these issues within the market-based price-setting process (Harris 1981), liberalised economic policies have brought a historic reduction in government intervention in agricultural markets in the developing world (Barrett 1996).

However, there are exceptions. In the case of cardamom in India, the state has not shown any signs of significant withdrawal. Liberalisation notwithstanding, marketing of cardamom has been governed by the Cardamom (Licensing and Marketing) Rules of 1977 amended from time to time. The declared objective of such regulations has been to ensure a fair price to all the growers and timely payment of sale proceeds (Nair et al. 1989, Narayana 1994, Joseph 1985). The proactive role of State is further evident from the introduction of e-auctions in 2007 at the instance of the Spices Board within the framework of Cardamom Rules. The e-auction system has been introduced in a context wherein, the conventional auction system (open outcry method) has been characterized by a highly concentrated market structure along with interlocking of the role of growers, auctioneers and exporters. This, in turn, has had its adverse effect on efficiency and equity on account of the significant price variation across different lots sold in auction regardless of the quality of the product indicating the prevalence of price discrimination

(Joseph 1985). Here it may be noted that viewed from the perspective of social exclusion (AmartyaSen2000; Silver 1999) the marketing system has been characterized by the prevalence of active exclusion (Joseph 2014).

In a context of increasing recognition of the role of ICT in addressing varied developmental issues(UNDP 1999) DOI 2001: Juma et al, 2005; Indjikian et al 2005 among others)including those relating to agricultural commodity market and India's capability in ICT and software (Arora et al 2001, Joseph 2002 among others), the spices board made an initiative to harness ICT in cardamom auctions leading to the introduction of e-auctions in cardamom. Unlike the open cry method of auctions followed earlier the e-auctions ensured the anonymity of buyers and sellers. Yet, human interventions appear to remain in the e-auction process because, the lots are not auctioned at random, instead, as decided by the auctioneer[1]. There is also evidence suggesting the incidence of re-pooling wherein the lots once sold are getting re-auctioned in subsequent auctions at the instance of dealers and auctioneers. Further, there has been an increase in the bid rate after the introduction of e-auctions. In this context, this study is an attempt to analyze the equity and efficiency implications of the process of price formation under e-auctions and influence of higher bid rate, prevalence of re-pooling and auctioneers' interventions in e-auctions.

Analytically, the issue of price formation could be approached at least from two different perspectives; a) game-theoretic approach and b) market structure-based approach. In the present study, we make use of the market structure approach that perceives price formation as a process governed by the structure of the market in conjunction with the conduct of the various actors involved within the existing regulatory framework. Being a regulated market, both the structure of the market as well as the behaviour of actors is governed by the Cardamom (Licensing and Marketing) Rules 1977 laid down by the Spices Board and as amended from time to time.

The remainder of the paper is organised as follows. Section two deals with the database of the study and method of analysis. Since the auction-based marketing of cardamom has

[1] Such interventions are often justified on the ground that the requirement of bidders varies from one another.

been in existence for sometime, the third section, drawing from the earlier studies, examines the market structure and performance with respect to price formation during the pre-e-auction period. Section four, against the backdrop of changes in the cardamom economy with respect to production, productivity and export intensity along with other developments, undertakes an analysis of the factors that govern the price formation under e-auction. Section five concludes and highlights the policy pointers.

2. Data and Method

This study makes use of a unique dataset called e-auction reports, generated during the e-auction process and needed secondary data published by the Spices Board. Secondary data relating to the area, production, productivity, exports and prices are gathered from various publications of the Spices Board. The major source of the data for this study is the e-auction reports which is a system-generated data during e-auctions held in two auction centres; Puttady (in Kerala) and Bodinayakanur (in Tamilnadu). All the registered auctioneers are assigned a day in a week to conduct the sale of the product registered with them through auctions held in these two auction centres. For each auction this data provides following information about each lot (quantity placed for auction by a seller) sold; identity of the seller, size of the lot, quality of the lot (weight per litre), total number of bidding (iterations) made, name of the buyer. This enables us to carry out the analysis of prices formation and the underlying factors. The published auction reports of the Spices Board, however, report only total number of lots, total quantity placed and sold, highest price, lowest price and the average price. Such aggregate information about e-auction systems conceals more than what it reveals; hence, we made use of the lot-wise information. For a previous study, under NRPPD (Joseph 2011), we received the data from 2009 through 2011. The data contained a fairly representative number of auctions for carrying out any empirical analysis. In order to conduct the present study, we approached the Spices Board for the data for the subsequent years. Unfortunately, we were told that the server crashed, and the data could not be maintained systematically for the period since 2011. We, however, could manage to get the data for the select months of 2015, 2016 and 2018. Data for the year 2015 and 2016 could be used only selectively

as it was not found, representative of both peak season and lean season. We could, however, make use of the data for 2018 as it covered both seasons.

In the pre-e-auction period, the Spices Board did not maintain comparable data systematically to be able to compare the lot wise price realised for pre-e-auction period. In this paper, we have drawn from the results of an earlier study (Joseph 1985) during 1980s. For the analysis in the present study, we made use of both descriptive analysis and regression method.

3. Market Structure and Price Formation: Pre e-auction Period[2]

Cardamom is a plantation crop historically grown in the evergreen forests of Kerala mainly for export. Like many other agricultural commodities price of cardamom is governed to a great extent by its quality, indicated by the colour, aroma, size and boldness of the capsule. The quality of the product with respect to the above attributes, in turn, is governed inter-alia by the variety of cultivar used, timely implementation of cultural operations especially spraying of pesticides to protect the capsules from insects and pests, timing and efficacy in harvesting (which is a highly skilled and women labour-intensive task) and the curing method adopted (sun drying or in curing houses). The growers indeed vary with respect to the use of cultivar, cultural operations, harvesting and processing method used giving rise to lack of standardisation in their output. This implies that the quality of the output obtained from one pinnacle of a plant will be different from another pinnacle of the same plant and not to speak of the output from one grower to another. Hence, there could be a significant inter-lot (lot means quantity offered for sale by a grower) and intra-lot variation in quality, which in turn presumably led to the emergence of auction as a preferred system of marketing for cardamom. Studies (Joseph 1985) have shown that the auction system was prevalent even in the days of cardamom monopoly at the export level and the same system of marketing continued at the primary level, even after the abolition of state monopoly in 1896.

[2] This sections draws heavily from Joseph (1985; 2011 and 2019)

Key Actors and the Market Structure

The key actors involved in cardamom marketing are the growers, both large and small, the auctioneers, the dealers and the exporters. The marketing system for cardamom has been characterized by large number of growers (both large and small), a small number of exporters – many of them are dealers and few of them, in addition to being dealers, are growers as well and a large number of dealers and a few auctioneers. Auctioneers, mostly associations of large growers, were one of the major actors in the marketing of cardamom who brought together the buyers and sellers of the product. During the 1980s when the auctions were conducted in the conventional outcry manner and held in the premises of the auctioneer, there were 14 auctioneers in India spread over the cardamom growing States, viz. 5 in Kerala, 2 in Tamil Nadu and 7 in Karnataka. Vandanmettu in Kerala, Pattiveeranpatty in Tamil Nadu and Sakalespur in Karnataka were the major auction centres in India.

The auctioneers bring together the producers holding cardamom registration certificate and the dealers holding a license issued by the Spices Board to deal in cardamom. As per the Cardamom (Licensing and Marketing) Rules of 1977, the dealers shall not purchase cardamom from an estate owner who has not registered his estate or from an auctioneer who has not been licensed by the Spices Board (formerly Cardamom Board). Further, no dealer shall solicit or accept any amount in cash or in kind from cardamom producers or auctioneers whether by way of discount or commission. A dealer participating in the auction shall pay full value for the entire quantity of cardamom in the lot purchased by him.

The cardamom exporters are another important link in the marketing system of cardamom. According to the Cardamom (Licensing and Marketing) Rules of 1977, the exporters shall not procure cardamom directly from a grower or from an auctioneer unless he is in possession of a license as a dealer. The number of exporters varied from year to year as the license is issued for a year after which it should be renewed to carry on business.

Cardamom market has been characterized by a high level of concentration at all levels (Joseph 1985; 2011). During the 1980s though there were five auctioneers in Kerala, one of them (CMC Vandamettu) accounted for more than 70 percent of the product sold through auctions. It was further observed that during 1971- 85 only two auctioneers remained permanently in business, and together they accounted for nearly 90 percent of the total sales in Kerala. In 1983-84 there were 528 licensed dealers in India. On an average 29 dealers bought cardamom from the major auction centre (that accounted for over 60 per cent of the output sold in Kerala) during 1979-80 to 1983-84. Out of this, the share of top 5 dealers was found to be 58 percent in 1979-80 and it increased to 65 percent in 1983-84. Similarly, the share of top 2 dealers also increased during the same period. It was 34 percent in 1979-80 and it increased to 39 percent in 1983-84. All the top 5 bidders were found to be exporters. Of these five, one dealer is found to be dominating in all the years (Joseph 1985).

At a time when cardamom was a highly export-oriented crop,[3] the price realized in the internal market depended to a great extent on the market strategy adopted by the exporters. This was more so because a few exporters controlled the trade. While the average share of an exporter was nearly one percent, the top 10 exporters accounted for more than 60 percent of the total and some of these leading exporters are found to be the dominant buyers in certain important auction centres. Even though the export was subjected to yearly fluctuations, the share of top 5 exporters was reasonably stable at 50 percent during the early 1980s (Joseph 1985).

Functioning of the Market

The functioning of the market was governed by the marketing rules that prevailed. According to the Cardamom (Licensing and Marketing) rules (1977), the growers register their produce with the auction centre, sufficiently before the auction, and may get an advance from the auctioneer, which will be deducted from the sale proceeds. The auctioneer maintains a warehouse where the produce is kept till the auction. If the

[3] During 1970s and 1980s on an average 60 to 70 percent of the domestic production used to be exported.

product is withdrawn from the auction, (the seller can withdraw the product if the price quoted is unsatisfactory) the seller is liable to pay the warehouse charges at the rate of 15 paise per kg per day.

At the time of registering the produce for auction, the auctioneer mixes the produce thoroughly and takes a sample from each lot. The Cardamom (Licensing and Marketing) rules (1977) describe the procedure of taking the sample as follows:

"The auctioneer shall draw 500 grammes out of each lot of cardamom offered for sale as a sample. Expose 350 grammes out of it for bidders to examine at the place of auction four hours before the commencement of the auction and circulate a list indicating quantity of each lot, weight in grammes per litre[4] and the reserve price[5]. The 100 grammes out of the sample shall be given to the highest bidder and the auctioneer shall keep, in a sealed polythene bag, the balance of 50 grammes for a period of seven days for verification in case of any dispute. On expiry of the said period or on settlement of the dispute, as the case may be, the owner of the cardamom shall be entitled to receive back 50 grammes of cardamom from the auctioneer."

But the actual procedure of taking a sample and auctioning was stated to be different from what is stipulated by the rules. The auctioneers in Kerala take a sample of 750 grammes of which, 500 grammes is paid at the rate at which the rest of the quantity is sold. Out of the 250 grammes, 100 grammes is given to the highest bidder and the rest 150 grammes is appropriated by the auctioneer, in addition to the one per cent of value of sales as commission. Further, the auction report showed that 8 percent of the sales tax is taken from the seller as handling charges. Thus from each lot, whatever may be its size, 250 grammes is lost by the seller in addition to 8 percent of the sales tax as handling charges. The practice of deducting fixed quantity from each lot as sample irrespective of the lot size makes the effective price (the price that the sellers get per kg after all deductions) much less than the actual price (the price quoted in auction). This discrepancy between actual price and the effective price reduces as the lot size increases. Thus the registered sellers with a lot size below a certain minimum quantity may not find it profitable to sell their produce through the auction centres because of the institutionally set rules

[4] This is an indicator of the quality of the product. It is often observed the product with green colour and bold in size has higher weight per litre.
[5] This refers to the price below which the seller would not sell the product.

In the conventional auctions, which used to take place in the premises of the auctioneers, the auction procedure, as per the Cardamom (Licencing and Marketing) rules (1977), used to be as follows. The dealers (bidders) will be seated around a round table, and a small tray kept in front of each of them. Out of the 750 grammes of cardamom taken as a sample from each lot, 500 grammes will be spread in all the trays for examining the lot. Then the intending buyers bid upwards for individual lots, and the highest bidder gets the lot. The process of bidding starts with the announcement of the lot number and lot size. It is a quick process, and each lot took hardly a minute to get auctioned. If the quoted price is not satisfactory the sellers reserve the right to withdraw the product. Once the price is determined through bidding, the seller loses his right over the produce.

Once the bidding is completed, grower (seller) receives an auction slip from the auctioneer indicating the weight of the lot and the agreed price. The slip also shows all the deductions and charges to be paid by the seller. The payment is made later, usually after 20 to 45 days as the case may be. There has thus been an in-built credit facility extended by the growers, which inturn is guaranteed by the auctioneers. The delay in payment often kept away those growers without the holding power (presumably the small holders) from the auction system.

Price Formation and Variation across Different Lots

The cardamom growers, both the large and small, naturally will be interested in obtaining the highest possible price. The auctioneers, who were also the growers of cardamom, are also interested in higher prices because higher the price realized, higher the commission accruing to them. Further, higher price quotation in certain auction centres would attract more sellers to that centre thereby increasing the total revenue accruing to the auctioneers by way of taking sample and also by way of commission (1% of the sale proceeds). Since the profit of the dealers and exporters depends on the margin between the export price and the auction price, the dealers and exporters would try to depress the auction price with a view to increase their margin. This is because the export price has been exogenously determined and therefore the exporters may not be able to manipulate the export price. Hence, in the bidding process in the auction centres, the exporters quote the price in accordance with their price agreements with the importers.

Under these conditions one could postulate the process of price formation in auctions in the following way: In the bidding process the bidders (the exporters and dealers)with a view to add to their margin would endeavour to reduce the price whereas the auctioneers and growers would be interested in obtaining the maximum possible price. The sellers have the option to withdraw the product from auction if the price quoted is unsatisfactory. The moot question is, which category of sellers will be able to withdraw the product? Obviously, only those with adequate holding power and good storage facility could withdraw the product because unless stored properly, the quality of the product will deteriorate. On the other hand, those sellers without adequate holding power and who have already received an advance from the auctioneer will be forced to sell the product at the price quoted in the auction.This, in turn, led to price discrimination across different lots sold through auctions wherein the smaller lots (read as output of smaller growers) realising a lower price as compared to the larger lots (output of larger holders).

In this context, the pertinent question is to what extent the bidders could discriminate across different lots? This depends on the supply and demand conditions in the market. Since the product was highly export-oriented, given the export demand, if the domestic production is higher than what the export demand warrants (excess supply) the price quoted in the auction centres will be low and the price variation across lots (price discrimination) tends to be high. On the contrary, in a situation of lower production (excess demand) the price quoted in the auction centres would be relatively high and the price and price variation (price discrimination) across different lots may be low.Going the same logic it could also be inferred that the price variation is higher during the peak season with as compared to the lean season.

Empirical evidence for the above argument is presented in Table 1 which shows average price realized by different lot-size and with variation between the smallest (<20kg) and largest (>250 kgs) estimated as the percentage price received by the smallest class of lots (<20kgs) to the highest size class of lots (>250 kgs) during five years beginning with 1979-80. Here it may be noted that the first three years considered were marked by higher

production (more than 4000MT) and the production during the last two years was substantially less (2900MT and 1600 MT respectively).In sync with what has been argued above, from the table it is evident that there existed a positive relationship between lot size and average price. That is, as we move upwards from the smaller size class, the average price obtained also increased. Secondly, as we move from a year with higher production to a year with lower production, the extent of price variation across different lots got reduced.

Table 1: Average price realized by different lot sizes during the peak season and lean season

Size Class	1979-80		1980-81		1981-82		1982-83		1983-84	
	Peak Season	Lean Season	Peak Season	Lean Season	Peak Season	Lean Season	Peak Season	Lean Season	Peak Season	Lean Season
0-20	145.01	86.45	80.17	69.15	106.07	101.82	137.23	187.04	362.1	346.28
20-40	159.93	88.77	91.89	76.79	109.74	112.82	140.83	174.87	346.98	363.46
40-60	169.23	96.31	100.5	94.81	118.6	119.79	143.61	182.7	353.12	375.75
60-100	174.25	100.39	108.26	89.84	124.45	122.45	149.5	185.21	351.89	385.26
100-150	178.87	116.3	120.76	109.23	134.02	132.12	148.73	213.99	372.68	412.41
150-200	179.51	135.8	127.76	111.38	135.07	135.42	152.84	202.85	363.88	408.72
200-250	185.76	136.5	132.87	113.59	136.35	138.6	153.81	187.58	359.06	421.08
250+	187.49	142.63	133.56	129.61	132.84	158.44	168.49	202.67	387.65	426.99
Price of lowest class as % largest class	77.34	60.61	60.03	53.35	79.85	64.26	81.45	92.29	93.41	81.10
Production (MT)	4500		4400		4100		2900		1600	

Source: based on Joseph (1985)
Note: Peak season: September and October and lean season: February and March

On the whole, it has been observed that during the pre-e-auction period high concentration of market power led to a situation of price discrimination across different lots sold in the auction centres. The extent of price variation was found to be higher during the lean season than in the peak season and as we move from a year with higher production to lower production the extent of price variation across different lots reduced. The analysis of price variation by taking the lot size and the quality of the lot revealed that during the peak season the price has been mainly determined by the quality of the lot whereas during the lean season it is the differences in the lot size that determined the price variation (Joseph 1985). The different considerations of quality and quantity of the lot during the peak season and slack season made the sale of smaller lots (read as out of small holders) through auction unprofitable with its implications on efficiency and equity.

3. Marketing and Price Formation Under E-Auction

With a view to addressing the issues associated with the traditional auction system and ensuring remunerative prices for all the growers by harnessing ICT, the Spices Board introduced e-auction in place of conventional auctions in 2007. As already noted, prior to the introduction of e-auctions the Cardamom (Licensing and Marketing) rules (1977), were amended twice (1987 and 2006 [6]) before the introduction of e-auctions and once (2014) after the introduction of e-auctions. These amendments involved increase in the amount of sample taken from 500 grammes to 1.5 kg from each lot and license fee for the dealers/exporters. Further delay in payment was reduced from 45days to 10 days. Unlike in the earlier system, auctions do not take place in the premises of the auctioneer, instead of in a state of the art e-auction centre established by the Spices Board with 70 computer terminals in Puttadi and 40 terminals in Bodinayakanur. The computers are networked to a server and a few large display boards that display the details regarding the lots being auctioned (like reserve price, lot number, quantity put for auction, number of bags and

[6] Amendment in 2006 stipulated that the dealers shall not purchase cardamom from an auctioneer who has not been licensed by the Spices Board.

current highest bid).[7] In the new system, licensed dealers are provided with a user Id and password. They are also provided with the details regarding each lot offered for sale like the lot size, weight per litre (an indicator of quality) and reserve price. The dealers have to login to the system to participate in an auction. In each week a particular day is assigned for auctioneers to auction the product registered with them. The auction starts with the reserve price and a bid for a particular lot by a dealer is made with key depressions (each depression indicates an addition of a fixed amount). As in the previous system, the grower has the freedom to withdraw the product if the price is not satisfactory. The identity of bidders is protected during the auction process. Highest bidder's name is displayed only on the Auction Masters' terminal. The auctioneer assigns a lot number to each lot and the auction takes place as per the auction number in the ascending order.

By the time e-auction was introduced in 2007, significant changes had taken place in terms of total production, productivity and export intensity of the crop (Table 2). There has been more than four-fold increase in

Table 2: Trend in production, productivity, export and export intensity of cardamom

Year	Production (MT)	Export (MT)	Export intensity (%)	Productivity Kg/hectare
1975-76	3000	1941	64.7	44
1980-81	4400	2345	53.3	55
1985-86	4700	3272	69.6	56
1990-91	4750	400	8.42	79
1995-96	7900	527	6.67	122
2000-01	10480	1545	14.74	247
2005-06	12540	650	5.18	318
2009-10	10075	1975	19.6	269
2015-16	21503	5500	25.58	341
2017-18	18340	5680	30.97	298

[7] Readers may like to look at the following linkhttps://www.youtube.com/watch?v=6VF5FcKRgOc

Growth rates 1975-76 to 2005-06	4.88%	-3.58%		7.06%
2005-06 to 2017-18	3.22%	19.80%		-0.41%
1975-76 to 2017-18	4.40%	2.59%		4.78%

Source: Estimates based on the data obtained from the different Annual Reports of Spices Board, Cochin.

the production of cardamom from the early 1980s to the present; about 4400 MT in the mid-1980s to over 10,000 MT in 2009-10 and around 20000 MT in 2017-18. Similarly, productivity increased from about 55 kg per hectare in 1980-81 to 269 Kg per hectare in 2009-10 and further to 341 kg in 2015-16 and 298 kg in 2017-18. The productivity increase in Kerala was at a much higher level; from 209 kgs in 2008-09 to542 Kgs in 2015-16 and declined marginally thereafter to reach 469 in 2017-18. More importantly, the share of export in production (export intensity), notwithstanding the increase recorded in the last two years, is only about 50% of what prevailed during the early 1980s.

Market Structure under E-Auction

Along with changes in production and productivity, there have also been changes in the market structure. The market structure and the extent of competition could be examined at the level of auctioneer and dealer/exporter. During the pre-auction period (1980s), one among the total five auctioneers accounted for nearly 70 percent of the output sold through auctions. It is evident from table 3, which is based

Table 3: Distribution of the total output sold through different auctioneers

Auctioneer name	2009	2010	2011	2018
Cardamom Planters Association	0.3	0.48	0.67	
The Cardamom Planters Marketing Co				21.57
Cardamom Planters Association	7.7	5.65	6.68	
Cardamom Growers Forever Private Limited				2.64
Greenhouse Cardamom Mktg.IndiaPvt.Ltd	NIL	4.16	8.94	6.14
Header Systems (India) Ltd.	16.4	14.87	14.14	2.55
Idukki Dist. Traditional Cardamom Producer Company Ltd				2.77

Ismpcs Ltd No I	7.5	2.81	NIL	
Mas Enterprises Limited	11.8	12.31	12.72	14.71
South Indian Green Cardamom Co.Ltd	8.0	15.82	17.62	23.31
STC Limited	6.2	3.40	6.80	
The Cardamom Processing &Marketing Co Ltd	20.4	19.09	14.27	
The Kerala Cardamom Processing & Marketing CoLtd	21.65	21.41	18.15	14.59
Spice More Trading Company				2.07
Sugandhagiri Spices Promoters & Traders Pvt Ltd				2.61
Vandanmedu Green Gold Cardamom Producer Co Ltd	4.33			4.33
Share of top 4	**70.30**	**71.20**	**64.18**	**76.88**

Source: E- auction reports for the relevant years.

on the e-auction data obtained for the years, 2009 through 2011 and 2018 from two auction centres (Puttadi in Kerala and Bodinaikanur in Tamil Nadu) that accounted for nearly 90 per cent of the total output sold. Though there are 16 auctioneers in business, bulk of the output is handled by four of the auctioneers with their share being as high as over 70 percent. The concentration at the auctioneer level, need not necessarily have any dampening effect on price because as already indicated, the returns to the auctioneer by way of commission (1% of turnover) depends on the total turnover. This, in turn, is governed by the quantity of cardamom pooled for auction but also the price fetched. Further, higher price realization would attract more growers, which also will add to the turnover in the future.A preliminary examination of the price realized across different auctioneers, however, tends to suggest that the average price recorded by the market leaders are not always higher. To illustrate, in 2018 auctioneers with relatively lower share (table 4) were found to have the highest average price as compared to those with higher market share. At the same time, in 2010 auctioneers with higher market share were able to record higher price realization. Hence, a definite conclusion is not warranted in the absence of more detailed empirical analysis, which we shall undertake in the next section.

Table 4: Share of cardamom sold through different Auctioneers and the Average price

Name of auctioneer	Average Price		Market Share	
	2010	2018	2010	2018
Cardamom Growersforever Private Limited		1188		3.0
Cardamom Planters Association-Bodi	953.5		0.83	
Cardamom Planters Association-Santhanparai	1002.5		6.55	
Greenhouse Cardamom Mktg.IndiaPvt.Ltd	1035.5	924.0	5.3	8.97
Header Systems (India) Ltd.	1052.5	1153.0	14.66	2.2
Idukki Dist.Traditional Cardamom Producer Company Ltd		1240.0		2.86
Ismpcs Ltd No I-580	1007.0		4.01	
Mas Enterprises Limited	1063.0	936.0	13.16	18.22
South Indian Green Cardamom Company Limited	1101.41	942.0	14.92	21.74
Spice More Trading Company		1216.3		2.3
State Trading Corporation				
Stcl Limited-Kumily	1000.0		3.84	
Sugandhagiri Spices Promoters & Traders Pvt Ltd		1208.0		2.78
South Indian Green Cardamom Co.Ltd	1060.0	972.48	14.92	21.74
The Cardamom Planters Marketing Co-op.Society Ltd		950.0		20.03
The Cardamom Processing& Marketing Co-op.Society Ltd	1028.5		17.16	
The Kerala Cardamom Processing and Marketing Company Ltd	1030.0	917.0	19.57	14.21
Vandanmedu Green Gold Cardamom Producer Co Ltd		1228.0		3.7
Total	1071.60	1008.49	100.00	100.00

Source: Same as Table 3.

As already seen, during the pre-auction period, concentration at the dealer/exporter level remained high. The recent empirical evidence from the auction reports (table 5)however, tends to suggest that there has been a marked decline in the extent of market concentration at the dealer level, which cannot be de-linked from the policy of the Spices Board to relax the entry barriers for exporters/dealers. It is evident from the table that the number of dealers/exporters participating in 2010 was 195 and the share of the top four dealers/exporters was only 16.5%. As we move to 2018 the number of dealers/exporters who participated in the auction increased to 260 and the share of top four for the available sample is only about 15% indicating a marginal decline in market concentration as compared 2010. Based on the above discussion it is hypothesized that increased competition has a positive influence on the price realized which will be subjected to empirical verification later in this section.

Table 5: Share of top four dealers/exporters in the sale of cardamom through e-auctions

Names top 4 dealers in 2010	Share	Names of top 4dealers in 2018	Share
Gugan Traders	4.91	Name Unknown	4.58
Chakra Traders	4.16	The Kerala Cardamom Processing &Mktg.Co.Ltd	3.95
Mas Enterprises Limited	4.09	Reliance Cardamom Company	3.31
Bhima Traders	3.35	Mahesh Trading Company	3.13
Top 4 share	16.51	Top 4 share	14.97
Total number Bidders	195		260

Source: Same as Table 4.

A key aspect of ICT application is the opportunity to get rid of human intervention and the plausible arbitrariness in the decision-making process. Under e-auction, however, it is noted that the auctioneer decides lot number for a particular lot registered for auction. This is the practice followed during the pre-e-auction period. Since the auctioning takes place in ascending order as per the lot number, the auctioneer also could decide the timing of auction of a particular lot registered. It was discerned from discussion with the auctioneer that, some of them place the top quality lot initially apparently with a view to send "right signal" about the quality of the product available from the auction centre. In some other auction centres, on the other hand, the practice is to auction the lowest quality lots initially. From our interaction and focus group discussion with the growers, it was discerned that ordinary growers could never expect to get an early lot number. Hence, we explored whether there exists any significant difference in price obtained by lots auctioned at the early stage of the auction and at the final stage.

It is evident from Table 6 that during all the years under consideration, in a large proportion of the auctions (as high as 100% in 2015 and 85% in 2018) the average price obtained by the first 50 lots has been higher than the last 50 lots. The price difference is more than 10% in 13.6% of the auctions in 2009 which increased to 71% of the auctions in 2011 thereafter it was 45% in 2015 and 45% in 2018.

Table 6: Price realization for initial 50 and terminal 50 lots sold through auctions

	2009	2010	2011	2015	2016	2018
Total Auctions	154	309	110	37	14	20
% of auctions where P1>P2	77.2	65.4	70.9	100.0	78.6	85.0
% of auctions where P1>P2 by 0-5%	40.9	35.6	0.0	18.9	21.4	15.0
% of auctions where P1>P2 by 5-10%	22.7	11.7	0.0	35.1	28.6	30.0
% of auctions where P1>P2 by more than 10%	13.6	18.1	70.9	45.9	28.6	40.0
% of auctions where P2>P1	22.1	35.0	29.1	0.0	21.4	10.0
% of auctions where P2>P1 by 0-5%	19.5	23.9	18.2	0.0	7.1	0.0
% of auctions where P2>P1 by 5-10%	0.0	5.5	4.5	0.0	7.1	5.0
% of auctions where P2>P1 by more than 10%	2.6	7.4	6.4	0.0	7.1	5.0
% of auctions where I1>I2	50.6	67.6	62.7	0.0	0.0	0.0
% of auctions where I2>I1	48.1	32.0	36.4	0.0	0.0	0.0
% of auctions where W1>W2	55.2	48.5	61.8	48.6	35.7	65.0
% of auctions where W1<W2	32.5	45.0	35.5	51.4	64.3	35.0

Source: Same as Table 5
Notes: P1= Mean bid price of first 50 lots, P2=Mean bid price of last 50 lots
I1=mean iterations of first 50 lots and I2 mean iterations of last 50 lots
W1= weight per litre for the first 50 lots
W2 = weight per litre for the last 50 lots

Table 6 also reveals that very rarely price of last 50 lots was found higher than the first 50 lots, which was 22 percent in 2009 and only 10 percent in 2018. The Table also suggests that the extent of competition (measured in terms of the mean number of iterations or bids) is more for the first fifty lots as compared to the last fifty lots. In 2009 in only about 50% of the auctions the first 50 lots received higher number bids than the last 50 lots. Whereas in 2011, nearly in 63% of the auctions, the number of bids for the first 50 lots was higher than the last fifty lots. As a result, it was observed that the price difference between the first 50 lots and last 50 lots is found increasing from about Rs 10 per Kg in 2009 to Rs 66 per Kg in 2010 and further to Rs 126 per kg in 2011. The observed price difference could not be attributed to quality factor because the quality (weight per litre) of the first 50 lots is not substantially higher than what was reported by the last fifty lots. Hence it is hypothesized that notwithstanding the application of ICT there are human interventions in the auction process, which influences the price. This hypothesis is subjected to further verification by estimating price equation in the next section.

As per the marketing rules, while the growers lose control over their output once the price is fixed through the auctions, there is no restriction for a trader or auctioneer on placing the quantity bought in an auction for re-sale in a subsequent auction (called re-pooling). Hence, it has been observed that there is an increasing tendency of e-auction being used for re-pooling that amounts to certain actors making use of e-auction for arbitrage. From Table7 it is evident that in 2018 re-pooling has been reported in six out of 13 auctioneers and the quantity re-pooled is substantial; in case of one of the auctioneers it is as high as 67% of the total quantity placed for the auction. This could have the effect of creating an artificial excess supply situation with its adverse impact on price. Hence it is hypothesized that re-pooling has an adverse effect on the price obtained in the auctions.

Table 7: Quantity of Cardamom sold through re-pooling (2018)

Auctioneer name	Quantity re-pooled	Total quantity Pooled	Share
Greenhouse cardamom Mktg.IndiaPvt.ltd	224845.1	630246.3	35.68
Header systems (India) ltd.	218880.9	324859.8	67.38
Mas Enterprises limited	612751.8	1989953	30.79
South Indian green cardamom company limited	187821.9	2567930	7.31
The Cardamom Planters Marketing Co-op.SocietyLtd	108923.6	2301975	4.73
The Kerala cardamom processing and marketing company Ltd	87468	1687646	5.18

Source: Same as Table 6.

During e-auction, as already noted, the trader's (bidder's) expression of price increase for a lot placed for auction is made through their bid by pressing the ENTER key. By each depression, the price increases by a certain amount and this increase in price per depression or bidis called the bidding rate. When the e-auction was introduced, the bidding rate was Rs 0.50. In 2012 on demand from the growers, the bidding rate was raised from Rs 0.50 to Rs 2.00[8]. While it is reasonable to expect that an increase in the

[8] For details please visit Cardamom auction resumes at Puttady, available at https://www.thehindu.com/news/national/kerala/cardamom-auction-resumes-at-puttady/article4028569.ece

bidding rate would have led to a reduction in the numbers of iterations, its ultimate effect on price is an open question. One possible way to deal with this issue is by examining the number of iterations and the increase in average price recorded from the start of auction, before and after the increase in bidding rate. From table 8 it is evident that, as expected, the average number of iterations, as well as the maximum number of iterations,declined after the bid rate increased to Rs 2.0. However, we also observe that there was a marked decline in the maximum price quoted with the new bid rate. At the same time,we also noted a decline in the price increase from 2015 (Rs 48.78) to 2018 (18.31). Interestingly enough the recorded average increase in 2018 is almost in line with what was recorded prior to the increase in bid rate. On the whole, from the available evidence, it appears that the increase in the bid rate hardly had any significant influence on price formation.

Table 8: Effect of increase in the bidding rate from Rs 0.5 to Rs 2 on price

Year	Number of lots placed for auction	Mean Iterations	Max Iterations	Mean price increase from the base	Max price increase from base
Old bidrate= Rs 0.5					
2009	35113	33.55	386	16.77	193
2010	63628	39.25	730	19.62	365
2011	20539	40.80	391	20.40	195.5
New Bidrate= Rs 2.0					
2015	17088	24.39	46	48.78	92
2018	29141	9.16	60	18.31	120

Source: Same as Table 7.

Price Formation and Variation Under E-auctions: Econometric Analysis

Following the structure-conduct performance paradigm which postulates that the price realized depends on the structure of the market in conjunction with the behaviour of the actors involved, let us now empirically analyze the bearing of market structure and the functioning of the market as represented by behaviour of major actors of the price formation.

To begin with, we shall analyze the observed price variation across different lots under the e-auctions. Here we have focused on 2010 and 2018 for which data is available for both the peak season and the lean season (Table 9). Average price obtained by lots belonging to different size class of lots for both the seasons and also for the whole year is reported in Table 9. It is evident that with the introduction of e-auctions there has been a significant reduction in the price variation across lots belonging to different size classes. In contrast to the significantly higher price realization recorded for the larger lots as compared to the smaller lots under the conventional auctions, we find that for the whole year and in the lean season the lots in the smallest size class received a higher price than the larger lots. But during the peak season price received by the larger lots is found to be higher than the smaller lots. What is interesting to note is the significant reduction in the extent of price variation between larger and smaller lots and that the extent of price variation at present is marginal when compared to what prevailed during 1980s. Thus viewed the introduction of e-auctions appears to have addressed the equity deficit that prevailed earlier by reducing significantly the price wedge between larger and smaller lots of cardamom sold through auctions.

Table 9: Price variation across different lots sold through e-auctions (2010 and 2018)

2010							
Season	Less than 40kg	40 to 100 kg	100 to 200 kg	200 to 300 kg	Above 300kg	Total	Price of smaller lots as % of larger lots
Average lean season price	1103.8	1134.5	1136.1	1100.8	1050.9	1124.6	105.03
No of lots sold	2130	7286	14613	6438	595	31062	
Average peak season price	976.7	1010.5	1019.7	1036.3	1055.6	1022.2	92.53
No of lots sold	1072	5960	15349	8120	1266	31767	
Average price for the year	1061.2	1078.7	1076.5	1064.8	1054.1	1072.8	100.67
No of lots sold	3202	13246	29962	14558	1861	62829	

2018							
Average lean season price	853.633	870.987	896.998	921.395	919.061	905.817	92.88
No of lots sold	430	2317	5777	6973	3432	18929	
Average peak season price (Rs/kg)	1131.19	1157.12	1185.57	1207.55	1225.35	1198.82	92.32
No of lots sold	173	904	3127	3850	2158	10212	
Average price for the year (Rs/kg)	933.264	951.293	998.342	1023.19	1037.3	1008.5	89.97
No of lots sold	804	3221	8904	10823	5590	30632	

Source: own estimates based on the auction data obtained from the auction centres:
Note: For the year 2018, number of lots indicates the lots for which data is available

With a view to empirically verify the hypotheses regarding market concentration, the incidence of re-pooling and human interventions in auctions discussed already, we have estimated the following model of price formation.

$$LnPrice = \alpha + \beta_1 Lntotqty + \beta_2 Lnlotsize + \beta_3 Lnlitwt + \beta_4 Iterations + \beta_5 Seasondummy + \beta_6 Repooldummy + \beta_7 Auctioneerconcentration + \beta_8 Bidderconcentration + \beta_9 lastfiftdummy + U_{it}$$

Wherein

LnPrice, the dependent variable is the price released by a lot placed for auction

Totqty: Total quantity registered for sales in a particular auction
Lotsize: quantity offered for sale through a particular lot
Litwt: quality of the lot offered for sale measured by weight per litre (reported data on this variable for 2018 is found not reliable and hence used)
Iterations: number of bidding made for a particular lot
Seasondummy: takes value 1 for peak season and 0 for lean season
Repooldummy: takes value 1 if re-pooled 0 otherwise
Auctioneerconcentration: A dummy taking value1 if the lot is sold through any of the top four auctioneers 0 otherwise
Bidder concentration = A dummy taking value 1 if the lot is bought by any of the top 4 dealers and zero otherwise
Lastfiftydummy: Takes value 1 if the lot auctioned is among the last 50 and 0 otherwise
U_i= Errorterm

As hypothesized, in the estimated model, the effect of re-pooling dummy, other things remain the same, is likely to be negative as it might send signals of excess supply in a particular auction. Auctioneer concentration, as already indicated, is likely to have a positive effect on price, but it could also be negative if larger supply from and particular auctioneer serves as a signalling device of excess supply situation especially in the context of weak demand. Dealer concentration is found to have a negative impact on price on account of their price-setting power. To capture the extent of competition for a particular lot we have included the number of bids for each lot represented by the variable Iterations, which is hypothesized to have a positive effect on price. The bearing of last 50 dummy on price, as hypothesized earlier is expected to have a negative effect on price.

The control variables in the model include total quantity registered for sale in the auction, the lot size (quantity offered for sale by individual growers), the quality of the lot offered for sale measured by weight per litre and season dummy (taking value I for the peak season and zero otherwise). Theoretically, if the market is competitive, any single seller of the product is expected to be a price taker. Hence, the lot size (quantity offered for sale by a particular grower) could have neither positive nor negative influence on price. The relationship, however, could be contingent on the supply and demand conditions. In case of an excess demand situation, the lot size may have a positive influence on price. The total quantity registered for sale in particular auction provides an indication of the supply situation for the exporter/dealer. Its impact on price could be either positive or negative because the price, in general, depends on the supply in conjunction with demand. Similarly the influence of season dummy also would be dependent on the supply and demand situation. With higher supply peak season may be associated with lower price and with lower supply peak season may be associated with higher price. The lot quality (for which we have reliable data only for 2010) is expected to have a positive effect because higher quality product could receive higher price.

Table 10 presents the results of the estimated model for the year 2010 and 2018. Here it may be noted that in 2010 where data covers all the months, for 2018 available data is

only for the sample auctions for the eight months from March to October. Since the March-October period covers peak season and lean season it may be considered as representative of the whole year. It may also be noted that while 2018 data provides information about re-pooling, this information is not available for the year 2010. Similarly, while 2010 data provides information on quality of the lot (weight per litre), the reliability of this variable for the year 2018 is found to be in suspect and therefore not used in the analysis**.**

Table 10: Estimates of price equation under e-auction

	(2010)	(2018)
VARIABLES	Model 1	Model 1
Lntotqty	-0.0292***	0.1320***
	(0.00193)	(0.00309)
Lnlotqty	0.0278***	0.0217***
	(0.00127)	(0.00164)
Lnlitwt	0.0474***	
	(0.0137)	
Iterations	0.000336***	0.00107***
	(2.86e-05)	(6.54e-05)
Seasondummy	-0.0831***	0.162***
	(0.00178)	(0.00258)
Repooldummy		-0.0290***
		(0.00224)
Auctioneerconcentration	0.0199***	-0.152***
	(0.00212)	(0.00220)
Bidderconcentration	0.0522***	-0.0285***
	(0.00195)	(0.00244)
Lastfiftydummy	-0.000563	-0.119***
	(0.00256)	(0.00590)
Constant	6.874***	5.362***
	(0.0849)	(0.0334)
Observations	61,741	29,141
R-squared	0.104	0.514

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From the estimated model it is evident that coefficient of re-pool dummy is negative and significant which tends to suggest that re-pooling has a dampening effect on price. Though the basic objective of market regulation and e-auction is to ensure fair price for

the growers, our results suggest that the dealers and the auctioneers, by resorting to re-pooling, are making use of the e-auction platform for arbitraging. As expected, the number of iterations, indicative of the competition for a particular lot, is found having a positive influence on price. As per the estimated model for the year 2018, the concentration at the level of both bidders and auctioneers is fund having an adverse effect on price. The estimated model further indicates that the last fifty lots auctioned received a lower price as compared to the first fifty lots presumably pointing towards the adverse effect of human intervention on price formation.

With respect to the control variables the results indicate that while the total quantity put for auction had a negative effect on price in 2010 indicative of excess supply situation, in 2018 total quantity put for sale was associated with a higher price. In 2010 a year with relatively higher production, the coefficient of season dummy was negative indicating lower price during the peak season. Whereas in 2018 the estimated coefficient of season dummy was negative indicating that peak season was associated with higher price. These findings need to be seen in the context of the marked decline in the supply in 2018. It is reported from the field that the output during 2018 has been only about half of the previous year on account of the heavy and continuous rain along with other natural calamities in the cardamom growing regions. Our analysis using the data for 2010 further revealed that higher quality lots are able to fetch higher price indicated by positive and statistically significant coefficient of quality variable.

4. Concluding Observations

Considering the implications of price realized by the farmers on equity and viability of the crop production on the one hand and the bearing of the marketing system in influencing the price formation process on the other, the Spices Board has been actively intervening in the marketing and price formation of cardamom. Along with institutional interventions in the form of formulating the rules governing the functioning of the market, the Board also made technological innovations, by harnessing ICT, which got manifested in the establishment of e-auction in cardamom from the year 2007.The e-auction system has been introduced in a context wherein, the conventional auction system had efficiency and equity deficit on account of the significant price variation across

different lots sold in auction regardless of the quality of the product. E-auctions not withstanding, human interventions in auctions remained because the lots are not auctioned at random, instead as decided by the auctioneer. There is also evidence indicating the prevalence of re-pooling and there has also been an increase in the bid rate after the introduction of e-auctions. In this context, the present study analyzed the process of price formation under e-auctions with higher bid rate, prevalence of re-pooling and auctioneers' interventions in e-auctions. The study approached the problem from the market structure perspective wherein it is presumed that the performance of the market is governed by the structure of the market (the extent of competition) and the conduct/ behaviour of different actors involved therein.

Following findings from the study may be of interest to policy makers. To begin with, under e-auction there has been a significant decline in the extent of concentration at the level of bidders along with significant reduction in the price variation across different lots sold through e- auction. Thus e-auction appears to have helped to address the equity and efficiency deficit associated with the earlier system. Secondly, higher concentration at the level of auctioneers notwithstanding, its impact on price was found positive in2010whereas in 2018 the concentration has had a dampening effect on price. This tends to suggest the need for removing entry barriers, if any, for the auctioneers, especially the associations of small farmers, such that the extent of market concentration is reduced. Increasing the number of auctions per day also might be helpful in increasing competition. Thirdly, the high incidence of re-pooling prevailing at presents is found to have an adverse impact on prices possibly because re-pooling serves as a signalling device of excess supply situation. Hence, the policy makers may consider getting rid of re-pooling such that actors shall not make use of e-auction as a platform for arbitraging. Fourthly, the last 50 lots auctioned in general (though there are exceptions) are found recording significantly lower price as compared to the first 50 lots. To the extent that the auctioneers currently do the sequencing of auction and lot assignment which involves the human interventions, there appears to be the need for getting rid of such human interventions by random auctioning so that the observed variations in price presumably on account of human interventions could be done away with. Finally, the preliminary

evidence tends to suggest that the increase in bid rate appears to have had no significant influence on the price formation process.

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References

Arora, A., V. S Arunachalam, J. Asundi and F. Ronald. 2001. 'The Indian Software Services Industry', *Research Policy*, 30 (8): 1267-87.

Barrett C B (2008) Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa, *Food Policy*, 33(2) 299-317.

Cashin, P., H. Liang and C. McDermott. 1999. How Persistent are Shocks to World Commodity Prices?, IMF Working Paper. Washington, DC: IMF.

DOI. 2001. *Creating a Development Dynamic: Final Report of the Digital Opportunity Initiative* (Washington DC: UNDP) available at http://www.opt-init.org/framework/DOI-Final-Report.pdf

Government of India, Ministry of Commerce, Cardamom (Licencing and Marketing) Rules 1977, Cardamom Board, Cochin 1977, 1987 and 2014.

Harris, Barbara. 1981. State and Market – A Report to ESCOR of The Overseas Development Administration of the U.K. Government on State Intervention in Exchange in a Dry Region of South India.

Indjikian, R., Siegel, D. S. 2005 'Impact of Investment in IT on Economic Performance: Implications for Developing Countries'*World Development* 33(5), pp. 681-700.

Jacks, David S., O'Rourke, Kevin H. and Williamson, Jeffrey G. 2009. CommodityPriceVolatility and World Market Integration Since 1700, NBER Working Paper Series, Vol. w14748, pp. -, 2009. Available at SSRN: http://ssrn.com/abstract=1347270

Joseph, K. J. 1985. *An Analysis of Marketing and Price Formation of Cardamom in Kerala*, M Phil Dissertation, Jawaharlal Nehru University (CDS Trivandrum).

Joseph, K. J. 2002. Growth of ICT and ICT for Development: Realities of the Myths of Indian Experience, Discussion Paper No. 2002/78, Helsinki: UNU/ WIDER.

Joseph K. J. 2011. Commodity Markets and Computers: An Analysis of e-auction in Cardamom Marketing from An Inclusive Innovation System Perspective, NRPPD Discussion Paper No. 9, Centre for Development Studies Trivandrum.

Joseph K. J and P. S. George. 2010. Report on Structural Infirmities in Plantation Sector (spices & Natural Rubber, A Report submitted to the Ministry of Commerce, Centre for Development Studies, Thiruvananthapuram.

Joseph, K. J.2014. 'Exploring Exclusion in Innovation Systems: Case of Plantation Agriculture in India,' *Innovation and Development*, 4(1), 73-90.

Juma, C. and Yee-Cheong Lee. 2005 *Innovation: Applying Knowledge in Development*, UN Millenium Project Taskforce on Science Technology and Innovation, Earthscan, London, Sterling, Va.

Maizels A. 1994. 'The Continuing Commodity Crisis of Developing Countries,' *World Development*, 22(11) 1685-1695.

Nair, K. N., D. Narayana and P. Sivanandan. 1989. *Ecology or Economics in Cardamom Development*, Oxford & IBH, New Delhi.

Narayana, D. 1994. *Government Intervention in Commodity Trade: An Analysis of the Coffee Trade in India*, Working Paper No. 256, Centre for Development Studies, Trivandrum.

Sen, Amartya. 2000. Social Exclusion: Concept, Application and Scrutiny, Social Development Papers No. 1, Asian Development Bank, Manila.

Singh Manmohan. 1964. India's Export Trends and Prospects for Self Sustained Growth, Oxford Clarendon.

Silver, Hilary. 1995. Reconceptualizing Social Disadvantage: Three Paradigms of Social Exclusion. In Social Exclusion: Rhetoric, Reality, Responses, edited by Gerry Rodgers, Charles Gore, and Jose Figueiredo. Geneva: International Institute for Labour Studies.

UNCTAD. 2008. *Trade and Development Report 2008: Commodity Prices, Capital Flows and the Financing of Investment*, UNCTAD, Geneva

UN Task Force on Science, Technology and Innovation. 2005. *Innovation: Applying Knowledge in Development*, Earthscan. London. Available at. http://www.unmillenniumproject.org/documents/Science-complete.pdf

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