PEPPER ECONOMY OF KERALA IN THE PRE AND POST WTO REGIMES

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DECLARATION

I, hereby declare that this thesis entitled **"Pepper economy of Kerala in the pre and post WTO regimes"** is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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29.09.2015

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CERTIFICATE

Certified that this thesis entitled **"Pepper economy of Kerala in the pre and post WTO regimes"** is a record of bonafide research work done independently by Ms. Anju Jacob (2013-11-184) under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to her.

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ANJU JACOB

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LIST OF ABBREVIATIONS AND SYMBOLS USED

AoA	Agreement on Agriculture
Agmark	Agricultural Marketing
ASTA	American Spices Trading Association
CV	Coefficient of Variation
CWS	Common Wealth Secretariat
CII	Coppock's Instability Index
CIF	Cost Insurance Freight
Ix	Cuddy Della Valle instability index
DRC	Domestic Resource Cost
ESA	European Spice Association
FSSAI	Food Safety and Standards Authority of India
FTA	Free Trade Agreement
FOB	Freight on Board
GAP	Good Agricultural Practices
GOI	Government of India
GOI	Government of India
GOK	Government of Kerala
GOK	Government of Kerala
g/L	Gram per Litre
GDP	Gross Domestic Product
GNP	Gross National Product
GSDP	Gross State Domestic Product
HACCP	Hazard Analysis at Critical Control Points
HYV	High Yielding Variety
IPC	International Pepper Community

IPE	International Pepper Exchange
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MSL	Mean Sea Level
MT	Metric Tonnes
ml	Milli litre
mm	Milli meter
NCDEX	National Commodity & Derivatives Exchange Limited
NPC	Nominal Protection Coefficient
% m/m	Per cent by mass
PRL	Pesticide Residue Limit
Rs.	Rupees
SPS	Sanitary and Phytosanitary
TBT	Technical Barriers to Trade
USFDA	United States Food and Drug Administration
USD	US Dollar
WTO	World Trade Organization

INTRODUCTION

1. INTRODUCTION

India is naturally endowed with diverse and varied agro-climatic conditions and a vast reservoir of resources and soil regimes for growing a wide variety of spices. India is producing around 63 spices among which pepper is one of the most ancient and traditional spice crop grown in India which has been traded worldwide. India produced a total of 50.87 thousand MTs from an area of 123.8 thousand hectare during 2013-14. Kerala holds more than 90 per cent, of the total pepper production in the country followed by Karnataka and Tamil Nadu. Obviously, any downturn in Kerala's production is bound to have a negative impact on the country's production. Moreover, black pepper is cultivated mostly by small and marginal holders and their livelihood is very much dependent on this crop. It also provides employment directly and indirectly to many.

The pepper economy of India contends with lots of challenges in the recent years including the decline in area, production and productivity and variability in price and exports. The total area under pepper in Kerala declined to 84,065 hectare in 2013-14 from 2,37,998 hectare in the past decade along with production and productivity. Pepper production in Kerala was about 80,000 tonnes during last decade and was dropped to 29,408 tonnes in 2013-14 with the lowest production of 33,991 tonnes in 2008. Even though Kerala is the leading producer of black pepper in the world, our productivity is very low (313 kg/ha) compared to other pepper producing countries like Thailand (4079 kg/ha) and Malaysia (1955 kg/ha). In Kerala, pepper is grown as a mixed crop on live standards with an average plant density of 560 vines per hectare whereas in Malaysia, it is being grown on dead standards with a density of 5000 vines per hectare. Labour cost which accounts for more than 60 per cent of total variable cost has increased by about 400 per cent in the predominantly spice growing state of Kerala during the last a few decades while the increase was only 47 per cent in Malaysia during the same period (Krishnan, 2012). This, unfortunately have resulted in a high price of Indian pepper in the international market than that of other origins.

India was the leading producer and exporter of pepper till 19th century after which Vietnam emerged as the top producing country pushing India to the second place. India ranks 4th in the world production of pepper having 10.5 per cent and has 8 per cent of world exports. More than 80 per cent of pepper produced is consumed within and only 17.2 per cent of the produce is currently exported (Deepika, 2015).

Vietnam, Indonesia, Brazil, Malaysia and Sri Lanka are the other major producers and exporters of pepper in the world. USA, Germany, Netherlands, Singapore, Japan, France and UK are the major importers while European countries like Germany and Netherlands are re-exporters of the commodity. India lost former USSR market and it is evident from USA pepper import direction that, India is facing competition from Vietnam and Indonesia (International Pepper Community, 2014). It is to be noted that USA is the major pepper importer of the world. During 2001-07, USA imported 22.42 per cent of the total world pepper import. During 1991 the major destinations for India's pepper exports were former USSR (47.22 %) and USA (20.71 %). During 1996, India contributed to 31.38 per cent of USA's total pepper import and it came down to 18.16 per cent during 2006 and further declined to 16 per cent during 2009 and decline continues. Since 2001, Vietnam's share in total pepper import of USA has been increasing and as Vietnam increased its share, India's share has come down.

India, despite being one of the largest producers of pepper in the world, has not exploited its potential to uphold its position in the global pepper market. The Indian economy in itself has undergone a rapid transformation after the inception of economic reforms in 1991. India's ratification of Agreement on Agriculture (AoA) with World Trade Organization (WTO) also had a major impact leading to redefining of its pepper trade. During this time span various pepper products exported from India have responded differently and their level of competitive advantages in the global markets have altered significantly.

India has a unique opportunity to substantially increase its export of agricultural products particularly in the free trade regime under WTO. With the implementation of the provisions of AoA by a member of WTO, the international trade opportunities are expected to change, as the trade barriers are reduced and free trade takes place. These changes will also ensure that competitiveness of countries in individual product or commodities will play a major role in the international trade. Pepper like other spices has been brought under the purview of AoA under the WTO. From April 2001 quantitative restrictions on the import of pepper has been removed. The bound rate for pepper fixed by India is 108 per cent and the applied rate is placed at 70 per cent (as on 01.03.2002). Import to the extent of 3 per cent of the domestic consumption would have to be permitted under the provisions of the AoA and hence import of pepper to India cannot be averted.

In its preamble, the Agreement on Agriculture states its aim as follows: "to establish a fair and market-oriented agricultural trading system by providing for substantial progressive reductions in agricultural support and protection over an agreed period of time, resulting in correcting and preventing restrictions and distortions in world agricultural markets". The preamble also specifies the Agreement's areas of coverage as follows: "Market access; Domestic support; Export competition; and Sanitary and Phytosanitary issues. According to Dr M S Swaminathan, "India should ensure that all boxes in the WTO must be abolished, and trade distortion, and unfair practices must be spelt out clearly and factors governing sustainable livelihood should be recognized so that resource-poor, developing countries should be able to place restrictions on imports"(Alam, A. M, 2006).

Stiff competitions from other pepper producing countries in the world, especially in the post WTO regime is a major challenge which is being faced by Indian pepper industry. Though Indian economy had diversified significantly over the years, agriculture in general and plantation sector including pepper in particular plays an important role in increasing the Gross Domestic Product

(GDP) and Gross National Product (GNP). The specific characteristics of pepper cultivation like domination of small and marginal holdings, concentration in backward areas and its close links with environment has been projecting it as the key sector in India's inclusive growth strategy.

Even though we have enormous potential than the other pepper producing countries in various aspects, we are not able to exploit the full potential of this crop especially in view of low productivity in our country, compared to other producing countries. The spices, the major export earning crops of India, are often subjected to wide price fluctuations in the domestic as well as international markets. In this context this study on pepper was framed to analyse the status of structural instability, trade competitiveness and export of pepper and suggest policy measures to improve pepper economy of Kerala.

a. OBJECTIVES OF THE STUDY

Taking into account the domestic as well as global scenario of pepper, the present study was initiated with the following objectives.

1. Analysing the structural instability of pepper over the period.
2. To analyse the trade competitiveness of pepper in the global market
3. To forecast pepper exports and to suggest policy measures to improve pepper trade.
4. To analyse the changes in economics of pepper cultivation

1.2 NATURE AND SCOPE OF THE STUDY

India enjoyed the top most position in world pepper production till the 19th century, but lost its place to south-east Asian countries like Vietnam, Indonesia and Malaysia. Also, India is facing competition from these countries which is the major challenge our country is encountering in the WTO regime. The area, production and productivity of pepper in Kerala have declined over the years and the price and export in terms of value and quantity showed a fluctuating trend.

Pepper was once the most important commercial export earning crop in India which had its notable share in the GDP of our country. Unfortunately the percentage share of pepper in total spices exports have nose-dived in the past few years. So, it is expected that the outcome of the research like the instability in area, production, productivity, export and price of pepper, competitiveness of pepper and changes in economics of pepper will be useful for policy makers to develop strategies for bringing back the period of glory of pepper in India.

1.3 LIMITATIONS OF THE STUDY

The study is part of Masters Research and is limited by time and resource constraint. The study examines the performance of India's pepper economy based on primary and available secondary data collected from various sources. The primary data were collected from very few respondents and hence generalization of the results may not be appropriate. The normal errors inherent in social surveys are bias in reporting data, inadequacy of information, common limitations of statistical analysis etc might also have affected the study. In spite of the above, maximum care has been taken to ensure that such limitations do not affect the authenticity of findings or results of the study.

1.4 ORGANISATION OF THE STUDY

For analytical convenience and clear exposition of the results of the present study, the thesis has been organised into five chapters including the chapter introduction, which highlights the importance of the topic, objectives, scope and limitations of the study. The second chapter deals with the review of literature including the findings of related studies in line with the objectives of the study. The third chapter highlights the methodology adopted including description of the study area, nature and sources of data and the analytical techniques employed in the study. The results and discussion of the study are presented in the fourth chapter. The summary and policy implications of the study are presented in the fifth chapter.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

The findings of earlier studies would guide the researcher in setting the hypotheses and objectives and enable him to evaluate the validity of his own findings. This chapter briefly reviews the concepts, analytical tools and findings from the past studies, which are relevant for the study.

2.1 REVIEW OF CONCEPTS

In this section, various concepts used in this study are reviewed and defined under the following titles:

2.1.1 Instability index
2.1.2 Nominal protection coefficient
2.1.3 Forecasting
2.1.4 Regression analysis
2.1.5 Changes in economics

2.1.1. Instability Index

Instability index is defined as the standard deviation of the residuals from the trend (Massell, 1970)

Pradhan (1988) used the terms variability, volatility and fluctuation to describe the instability or movements (both expected and unexpected) in exchange rates in different time periods.

According to Mohanty *et al.* (2014) instability is an inherent characteristic of agriculture everywhere and the instability in agriculture and food production has not been quite clear and has remained a matter of discussion.

In this study instability is defined as the fluctuations in area, production and productivity of pepper, the changes in international and domestic price of pepper and the total export quantity, export value and export unit value of pepper.

2.1.2. Nominal Protection Coefficient

The NPC can assume a range of numerical values showing the overall policy distortion. If NPC >1, the market price of output exceeds the social price, implying that the domestic producers receive higher price. This is called positive protection. Producers receive the output subsidy. For consumers it denotes negative protection. If NPC <1, protection is negative to producers. The consumer is being favoured while the producer is being discriminated against. It implies that the producer implicity pays a tax on the product output. If NPC =1, the protection is neutral. There may be either no policy intervention or producers and consumers are facing domestic prices that are equal to border prices (Thein and Oppen, 2002).

Nominal Protection Coefficient measures the deviation of domestic price from border price. It is not necessarily tariff but a composite designation of government's interventions that can influence prices such as legislative prohibition, tariffs, exchange rate, and so on. When the value of Nominal Protection Coefficient (NPC) is one it implies liberalization and efficient use of resources in the subsector. The NPC can indicate liberalization or otherwise as a result of government intervention. (Mkpadol and Arene, 2012).

Rani *et al.* (2014) described Nominal Protection Coefficient (NPC) as a straight forward measure of competitiveness. A decision criterion is if NPC is less than one, then the commodity is competitive (under importable hypothesis it is considered as good importable hypothesis and under exportable hypothesis, it is worth exporting). If NPC is greater than one, the commodity is not competitive (not a good import substitute or not worth exporting).

2.1.3. Forecasting

Forecasting techniques in agriculture include, inter alia, forecasting of production, yield, area of crops, forewarning of incidence of pests and diseases, predicting price and export (Ramasubramanian, n.d.).

The most popular method of forecasting the basis is historical moving averages. The attractiveness of these models is their ease of application. Studies have applied forecasts of various lengths in order to determine the optimal length of years to include. These models generally conclude that longer averages ranging from 3 to 7 years are optimal (Dhuyvetter and Kastens, 1998; Sanders and Manfredo, 2006).

2.1.4. Regression Analysis

Regression analysis is a statistical tool for the investigation of relationships between variables. Regression is a generic term for all methods attempting to fit a model to observed data in order to quantify the relationship between two groups of variables. The fitted model may then be used either to merely describe the relationship between the two groups of variables, or to predict new values (Sykes, n.d.).

Building a regression model involves collecting predictor and response values for common samples, and then fitting a predefined mathematical relationship to the collected data.

2.1.5 Changes in Economics

Simple tabular analysis has been used to analyze the structural changes in the cost of cultivation. Cost structure was analyzed by working out the share of each item of cost in the total cost of cultivation. The changes in the structure of cost of

cultivation of crops were assessed by comparing the cost structure of the crop during latest years with that of early years.

2.2. REVIEW OF PAST STUDIES

The reviews of past studies were undertaken and the same has been presented in following sections.

2.2.1 WTO and Indian agriculture

2.2.2 Spices economy in India

2.2.3 Instability analysis

2.2.4 Changes in economics

2.2.5 Trade competitiveness

2.2.6 Forecasting of exports

2.2.1 WTO and Indian Agriculture

Common Wealth Secretariat (1996) in its report titled 'The Global Spice Trade and Uruguay Round Agreements' presented at Geneva quoted that the spice sector has been characterized by unplanned production, resulting in volatile markets with widely fluctuating prices. Unplanned production has also turned spice producing countries into 'price followers' rather than 'price setters'. Some spice producing countries have fallen in the low quality – low price trap. Because of the small quantities produced and their indifferent quality, these countries have been forced to sell spices at low prices and these sales have had the effect of bringing down international prices significantly to lower levels.

Hargopal (2001) has evaluated the performance of external sector of India in the light of trade policy reforms for the period 1980-81 to 1997-98 by dividing whole period into sub periods i.e. pre-liberalization (1980-81 to 1990-91) and post-liberalization period (1991-92 to 1997-98). The study concluded that on the whole,

trade liberalization measures had a positive impact on external variables. Post liberalization period saw a tremendous growth of exports, imports, foreign exchange, and a decline of internal debt. The only concern found was the faster growth of imports as compared to exports.

Swaminathan (2002) discussed about Indian agricultural crisis in his work, "Why Indian farmers need WTO" Now a day's agriculture crisis in India is excess of production and not the shortage of production. We have a food grain mountain of over 60 million tonnes, as well as a mountain of unsold sugar. The transformation from scarcity to excess should have made India a great agricultural exporter. Exporting is reduced because of global agricultural prices have been falling for two decades. It shows that between 1980 and 2001, the price of rice crashed from $571/tonne to $179/tonne; of wheat from $219/tonne to $131/tonne. The same step downtrend is evident in other agricultural commodities like cotton, sugar, coffee, soyabeen, maize, tea, rubber, beef, coconut oil or palm oil. This was happened because of every country in the world has subsidised agriculture so much for so long that surpluses have grown everywhere. As incomes rise, people spend an ever smaller proportion of income on foods. Meanwhile, the spread of new technology the world over has revolutionized farm yields. The combination has meant rising gluts. Some countries have diversified into non-traditional crops, creating further surpluses. But the biggest reason for gluts remains huge subsidies in Europe, the USA, and Japan.

Chand (2005) in his paper on "Post WTO Agriculture Trade and Agenda for Negotiations on Agriculture" analyzed the performance of India's agricultural exports and imports during post WTO period. The paper identifies the main reasons for favourable/adverse effect on agricultural trade and draws lessons for future negotiations on AOA. He suggests that India needs to pay equal attention to what it agrees to do in its own market and economy and what other countries commit to do in

their markets. And India need not be extremely defensive and inward looking. Indian agriculture has some strength which needs to be appropriately used to compete in the global trade. Major threats are from import and adverse impact on export result from low level of international prices. As a net exporting country India stands to gain from increase in international prices. Therefore, India should follow an agenda which leads to reduction in domestic subsidies, other kinds of support and export subsidies, particularly in developed countries, as those subsidies are the major factor for distortions and low level of international prices.

Kalirjan and Singh (2006) discussed about issues related to the WTO's Agreement on Agriculture from India's point of view through their paper "India and the WTO's Agreement on Agriculture (AoA)". They opine that, India does not have to worry about its subsidy, as it is already below the required line and it also does not have any domestic support to reckon with. Moreover, the ongoing negotiations are likely to yield enough flexibility in product choice and tariff selection. Therefore, India should work towards the success of the Doha round and in the mean time make use of the opportunity to reform its domestic market to bring in more efficiency. With favorable bound rates for agriculture onboard, the negotiating framework of India must be different from that of other developing countries. The situation is highly tenacious for India, particularly in view of the fact that the developed countries have managed to link agriculture subsidy with the market access in services and industry.

Ibrahim (2007) in his study 'Export Performance of Indian Spices in the WTO Regime' stated that 78 per cent of the export earnings of spices are contributed by pepper (7%), turmeric (6%), chilli (18%), mint produce (25%) and spice oils and oleoresins (22%). India meets around 70 per cent of the world demand for spice oils and oleoresin. The quantity of spices exports from 1995-96 to 2005-06 increased by 57-58 per cent and value by 185-32 per cent. In the year 2005-06, the export of

pepper has increased to 16700 tonnes valued `140.5 crores as compared to 14150 tonnes valued `121.40 crores during 2004-05. The introduction of WTO Compatible Export Subsidy Schemes for pepper had an impact on the increase in pepper exports.

Singh (2014) in his article "Analysis of trade before and after the WTO: A case study of India" analyzed that the trade volume of India was increasing after the WTO implementation, though not at so good rate as compared to world trade. This is due to the new challenges faced by Indian economy imposed by WTO. The trade volume of India was rising before the WTO. The country has not only maintained the trend but rate of growth in also increased. India is the only country in the current analysis, who has gained advantage of the WTO in the perspectives of international trade. Also he opined that the effect of agriculture sector is negatively affecting the international trade of India because the WTO caused serious concern to the performance of agriculture sector and food security. The negative effect of agriculture sector remained continue even after WTO.

2.2.2 Spices Economy in India

Pal (1992) in his article 'Agriculture Exports of India-Issues of Growth and Instability' opined that the comparative advantage in the production of agricultural products could not be exploited by least developed countries in the real world mainly because of poor bargaining power in the international market and tariff and non-tariff protection strategy followed by developed countries. He further stated that the export of least developed countries fluctuated more than developed countries and this unstable export has a tendency to weaken the stability of developing countries since they depend on export of agricultural products as the major source of national income.

In a study conducted by Bhatia in 1994, it is found that the relative share of traditional export commodities of spices, sugar, raw cotton and tea in the total

agricultural exports has declined over the years (1960-61 to 1992-93). This is primarily because India is facing tough competition for some of the traditional export items from its neighbouring countries due to its limited world trade.

Edison (1995) found that even from the export of just 5 per cent of the spices production substantial foreign exchange is earned. There has been an overall growth rate of 8% of spices as envisaged during the Eighth plan. This is due a 4 per cent growth rate in global trade, which was mainly due to the population growth and the growth in the per capita income.

Black pepper is one of the most ancient and traditional spice crops of India which has been produced and traded worldwide. Black pepper is the native of the Western Ghats Mountains in Southern India. However, with the emergence of competition from other pepper producing countries such as Vietnam, Brazil, Indonesia and Sri Lanka, India is missing out the opportunity to take advantage of the fast- growing international pepper market (Koizumi, 1999).

Madan (2000) in his study on Indian Black Pepper, Economics and Marketing, stated that Kerala is the major producer of pepper in India. Among other producing states, Karnataka contributes a sizable quantity to the total production. Pepper has a high contribution on rural employment and farmers' income in these regions of production.

Mukundan and Indira (2001) in their study on 'Economy and Marketing of Black Pepper in India' revealed that there has been a widening supply-demand gap in world pepper market since 1995 which is estimated to the tune of 35000 t in 1997. Most of the producing countries have already exhausted their stocks and the demand is to be fully met by current year's production. Indian pepper harvests begin by January-February which is the earliest among major producing countries. So all

major consuming nations have entered the Indian pepper market and pepper prices have reached the record level.

Behera and Indira (2002) in their article 'Indian Spices Challenges Ahead' evaluated the growth of spices export from India during the period from 1995-'00. The export of Indian spices has grown at the rate of 7.94 per cent in terms of quantity and 17.64 per cent in terms of value during this period. Likewise, the export of other items like spice oils and oleoresins, mint oil and curry powder has sharply increased during the period. The growth of spices import into India during the period was found to be 6.69 per cent in terms of value, which was much below the growth rates of exports. It was found that India imports clove in comparatively larger quantities and nutmeg, pepper and other spices in small quantities mainly from European Union and USA.

Nicey (2003) made an economic analysis of the pepper industry in Kerala – its production, productivity and export and also analysed the problems faced by the pepper industry and the causes for its declining trends in exports. She pointed out that the absence of an integrated approach to boost exports and the lack of co-ordinated publicity programmes also affect the pepper export from Kerala.

Kurien (2005) found that since 1999, when the pepper prices sourced to an all time high of Rs. 270 per kg, there has been a steady dip in prices; also that pepper production has been registering a diminishing trend. According to him, an agro based industry and farmers marketing network are essential for the revival of the sector.

Peter *et al.* (2005) in their paper 'Spices Production and Export from India' discussed the spices production and exports from India for the last five decades. They reported that the quantity exported and export earnings showed an increasing trend during the period from 1960-2000. Based on an analysis of growth in export and earnings at five year interval, it is seen that the quantity showed a decreasing trend in

the 5 year period ending 1970-71 and 1985-86 and increasing trend are noticed in all other quinquenniums. Again they reported that the export earnings from spices during 1960-61 was Rs. 16 crores and the earnings increased to Rs. 2025 crores during 1999-'00.

Sharma (2006) examined the prospects of India's pepper trade regaining its past glory. He found that India had the prominent place in the pepper trade, but its position declined in the recent years and at present Vietnam tops in pepper production. He analysed the reasons for this and concluded that it is possible for India to regain its part glory in black pepper, if all the concerned agencies put in a strong front with combined efforts and practical strategies to revive black pepper. For this farmers will need guidance from organization like Spices Board, Agricultural Universities and even NGO's.

Selvan and Cherian (2008) in their study 'Pepper Production and Prospects' reported that Kerala is the major pepper producing state in India and small and marginal farm holdings dominate 80 per cent of the total number of pepper farms in the state. Pepper is grown in almost every homestead or plot of land in the plain lands; and in high ranges like Idukki and Wayanad. In Kerala, eight out of fourteen districts namely, Idukki, Wayanad, Kannur, Kollam, Kozhikode, Kottayam, Kasargod and Thiruvananthapuram account for more than 83 per cent of the area under pepper cultivation and 90 per cent of total pepper production in the state.

Thomas (2009) in his thesis titled 'Problems and Prospects of Spices Trade in Kerala' expressed the view that a major problem in the domestic market of pepper in Kerala is the sale of imported pepper. He suggested that pepper imported for value addition and re-export should be re-exported within the prescribed time and should not allowed to be sold in the domestic market. He also recommended that the Government should announce WTO compatible export subsidy for pepper in order to increase the pepper export from Kerala.

During 1960s, with 25 per cent share in world production and 20 per cent share in world export, India was the major producer and exporter of pepper in the world. During the period 2001 to 2008, India's share in world production and export has come down to 17 per cent and 8 percent respectively. (Nagoor, B. H., 2010).

Sakamma and Ananth in 2011 reported that the spices export also increased by almost tenfold from $ 132.53 million in 1990-91to $ 1299.5 million in 2009-10, of course, with inter year variation. However, the increase in the share of spices export in India's agricultural and allied export, from 4.25 per cent in 1990-91 to 7.32 per cent in 2009-10, showed the significant and increasing share of spices in the export of agricultural products from India. The CV for total agricultural export was 60.89 per cent and that for spices was 79.87 per cent which revealed that there was wide inter year variations in spices export. They also opined that the share percentage of spices exports in India's total export had increased from 0.74 per cent in 1990-91 to 1.28 per cent in 1999-00 and declined to 0.66 per cent in 2009-10. Otherwise, the share of pepper exports in India's total exports had decreased from 0.31 per cent in 1990-91 to 0.18 per cent in 1995-96 and it marginally increased to 0.56 per cent in 1999-00 but again declined to 0.04 per cent in 2009-10. The share of pepper in India's spices export also fell drastically from 42.29 per cent in 1990-91 to 5.65 per cent in the end of the study period was not encouraging to the exporters.

The study conducted by Sajitha (2012) about pepper cultivation in Kerala shows that, in 1951, 70 per cent of world's pepper cultivation was concentrated in India and this has gone down to 18.7 per cent in 2007. The distribution pattern of pepper across various states of India showed the dominance of Kerala with 89 per cent of the total area under cultivation and produces around 95 per cent during 2007-08 followed by Karnataka and Tamil Nadu.

Sajitha in 2012 reported that the intensity of cultivation in Idukki as compared to Wayanad is very high. Moreover it is noted from the field that Wayanad is more

prone to risk than Idukki. The incidence- govasp attack on murukke-happened after 2000 in Wayanad destroyed the standards of black pepper. This adversely affected black pepper vines in the district. After this incidence, pepper growers in Wayanad are facing the problem of lack of proper, strong standards to grow the black pepper vines. Whereas, Idukki has the advantage of more strong standards like murukke which allows the growers to cultivate more black pepper in their small plot of land.

Yogesh and Mokshapathy (2013) mentioned that the production of the pepper is around 3,38,380 metric tonnes per annum with 4,76,514 hectare under cultivation in 2010. They also pointed out that this was the major reason for decline in output in recent years. Further, the crop in the major producing countries such as Vietnam and India has been affected by disease and poor maintenance due to decreased prices during past few years.

According to Sajitha (2014) the production of black pepper in Kerala for the year 1960-62 was 26.2 thousand tonnes and increased to 39.5 thousand tonnes in 2007-09. It has been noted that Kerala has recorded a decline in yield from 263 kg/ha in 1960-62 to 249 kg/ha in 1980-82. After 80s, yield started increasing and reached the peak level of 303 kg/ha in 2000-02. While in the final period, average yield of the state has come down and reached to 236 kg/ha which is lower than 1960-62 level. There was a decline in the performance of black pepper (in terms of area, production and yield at the state level) which has been contributed mainly by the northern region of the state. Price in the Cochin and Calicut markets from 1980-81 to 2010-11 moved more or less same pattern, though it recorded wide fluctuations over the years.

Prakash and Varadharaj (2014) in their descriptive study on the quality standards of spices, they have pointed out that, India caters to the 48 per cent of demand of spices in the world. India's spice export was 2.25 lakh tones valued at Rs.1213 crores during 1996-1997. For the first time in the history of spices exports,

during 2012-2013, Indian spice exports have able to record all time high of 22 per cent. The total export of spices during the period crossed Rs.10000 crores.

Sudheer (2014) in his study mentioned that the World pepper production in 2012 is estimated at 435115 tonnes and it is cultivated in 42 countries. Among these countries Vietnam is the leading producer of pepper and their share in world production is 33.5 per cent, followed by Indonesia with a share about 17 per cent. India is the third largest producer of pepper with a share about 12 per cent.

2.2.3 Instability Analysis

Pal and Sirohi (1989) identified the sources of instability in crop production and yield in different states in India between two periods, 1960-1965 and 1966-1984. The results revealed that yield variation contributed largely to the variance in production of pulses and oil seeds and the same being increased over time. After adoption of High Yielding Varieties (HYV), the absolute variance increased on account of increased sensitivity of HYV to inputs and weather, especially rainfall. The intensive use of irrigation led to comparatively stable production of food grains.

Ananthi (2000) studied the instability in export value and export unit value of basmati and non-basmati rice for the period from 1990-91 to 1997-98. The coefficient of variation was 90.76 per cent for export quantity, 55.77 per cent for export value and 24.35 per cent for export unit value. She concluded that the instability was relatively high in the case of export quantity value of basmati rice.

Kaushik and Paras (2000) verifies the growth, variability, sources of variability, and its impact on economic growth during the process of ongoing policy reforms. To this end, export instability and variance of export earnings around an exponential trend are estimated to examine the relative importance of price and quantity fluctuations. The major findings of the study are as follow: Firstly, the exports of Indian agricultural and allied products and manufacturing products have

increased significantly since initiation of liberalization. Secondly, export-earning instability is mainly due to volume instability rather than that of price variability. Thirdly, study confirmed that export instability does make an adverse impact on domestic economic performance, more pronouncedly by inducing instability in capital goods imports, and less significantly through jeopardizing the pace of domestic capital formation.

Kaushik and Karol (2001) backed by an econometric exercise, confirm that export instability does make an adverse impact on domestic economic performance, more pronouncedly by including instability in capital goods imports, and less significantly through jeopardizing the pace of domestic capital formation.

Mahadevaiah (2001) studied the export trade performance of Indian Cotton. He found that the stability in export earnings from total cotton export, exports to major importing countries and others indicated that change in price variance, change in mean price and change in the interaction term were the major sources which contributed to the variability in cotton exports. He found that the change in price variance (19.72%) together with change in mean price (13.72%) increased the instability in total cotton export earnings. About 66 percent of variance in export earnings was due to interaction between change in mean quantity and mean price. The change in price variance has contributed less than one per cent to the instability of export earnings from most of the major importing countries except in case of Japan, where it has stabilized the export earnings. The study also found that the increase in mean price has mainly contributed to the increase in total cotton export earnings.

Reddy and Mishra (2001) studied the growth and instability of chickpea in India and came up with reasons for instability (variability). Rajasthan and Madhya Pradesh along with change in interstate covariances contributed large chunk of increase in variability in countries chickpea production. Change in area variance and

change in area-yield covariances and change in mean yields are contributed to increase in variability in chickpea production, while change in mean areas helped to decrease production variability.

Girma (2002) studied the instability and its sources in cotton production in Karnataka. The results showed that the instability increased from 14.81 per cent to 27.80 per cent in the second period, the coefficient of variation was 40.66 per cent. All the study districts except Belgaum and Gulbarga showed maximum instability in cotton production.

Deb *et al*. (2004) studied the Productivity Impacts of Improved Sorghum Cultivars and concluded that there was an increase in variability in sorghum yield in five out of the nine study countries of Asia during the 1990s. In both India and China, relative variability in yield increased during this period. In the 1990s, both countries had a relative variability in yield of around 12.3 per cent, though China had a much lower yield variability in the 1970s (4.23%) compared to India (8.72%). On the other hand, Pakistan was the only major sorghum-producing country which showed a decline in relative variability in yield in all the time periods, except for the 1980s compared to the 1970s.

Rangarajan (2004) made an attempt to understand the relationship between income growth and export fluctuations in eleven countries. Study states that an increase in the instability of exports leads to an increase in the instability of income but the impact is not same in all the countries.

Sharma and Kalita (2008) studied the variation and instability in area, production and productivity of major fruit crops in Jammu and Kashmir for the period from 1974-75 to 1999- 2000. It revealed that growing of pear, cherry and almond were more risky compared to other fruit crops in the state as revealed by higher coefficient of variation. The coefficient of area production and productivity of

these were more than 78 per cent. The raising of apple in the state was less risky, which had a coefficient of variation of less than 35 per cent.

Bhastine et al., (2010) studied the trade performance and transmission of price volatility in pepper and found that the instability indices for the entire price series under consideration were found to be higher for the second period from 2000- 2008. The instability of prices in dollar terms was found to be higher than that for the prices in rupee terms. The instability of international price in rupee terms more than doubled in the second period while in dollar terms it increased by 1.7 times. A similar pattern was also found in the case of average world price instability. So it can be rightly concluded that the volatility of international prices have risen considerably in the recent past. The magnitude of domestic price instability was similar to that of international price instability and has almost doubled in rupee terms. They also reported that the instability of the Export Unit Value in rupee terms was found to be higher. The Import Unit Value instability more than doubled in the case of imports from Sri Lanka.

Krishnadas in 2010 found out that, at all India level (1983-84 to 2006-07), area under black pepper cultivation showed instability of 27.18 percent. When compared to the major black pepper growing states, Karnataka and Kerala had shown coefficient of variation of 73.85 per cent and 26.26 per cent respectively. At national level, black pepper production had shown instability in production of 36.57 per cent. Karnataka showed instability of 65.84 per cent followed by Kerala (35.81%). At national level, black pepper productivity showed instability of 15.10 per cent. Kerala showed instability of 16.28 per cent while Karnataka (5.91%) was more stable. The quantity of black pepper exported had shown instability of 32.40 per cent while value of export had shown instability of 75.22 per cent while the export price of black pepper had shown instability of 92.63 per cent.

Joseph and George (2010) reported that price instability and long-term or short–term trends have become major concerns of commodity dependent developing countries. The adverse effect of price instability is harmful to the small and medium holders as it drives them to indebtedness. It also adversely affects the livelihood of millions of workers.

Anoopkumar (2012) studied the intra-year price instability of commercial crops in India and pointed out that turning to the nature of intra-year price instability of pepper across years, in majority of the cases it is turned out to be high in those years with supply shortage (1993-94, 1994-95, 1996-97, 2000-01, 2001-02, 2006-07) and low intra-year instability is associated with years with excess supply (1991-92, 1995-96, 1998-99, 2002-03, 2003-04, 2004-05, 2005-06, 2007-08).

Krishnan (2012) examined that during the reforms period the area under total spices increased from 2215860ha to 2341540ha, production from 24,10,000 tonnes to 30,02,290 tonnes and productivity from 1087.61 kg/ha to 1282.90kg/ha. This general increased trend might be due to the initial fascination that liberalized trade might boost export. During the post reforms period the area under spices showed a decrease from 27,76,910 hectare to 24,10,770 hectare. But the production and productivity showed an increase from 33,53,240 tonnes to 39,44,200 tonnes and 1207.54 kg/ha to 1636.07 kg/ha respectively. One of the reasons for this phenomenon might be due to the severe disease and pest incidence affecting the major spics crops like pepper and cardamom. Also he examined that the area, production and productivity of pepper steadily increased from 1,19,960 hectare, 26,160 tonnes and 218.07 kg/ha in 1970-71 to 2, 62,780 hectare, 80,940 tonnes and 308 kg/ha in 2006-2007 respectively. The pre-reforms, reforms and post-reforms period are not apparent. The export of pepper touched a peak of 48,743 tonnes worth Rs. 18910 lakhs from a base of 17,970 tonnes worth Rs. 1525 lakhs in 1970-71. The reforms period was spectacular with intermittent shift in trends both in quantity and value of exports. The post reforms

period was characterized with a steep fall in exports both in quantity and value. The liberalized trade dealt a heavy blow on this cash crop. Pepper began flowing into the Country in the post reforms period. The import of pepper to the tune of 17,725 tonnes costing Rs. 11604 lakhs was made in 2004-2005 starting from 4028 tonnes costing Rs. 5683 lakhs in 2000-2001.

Rao (2012) studied the changes in spices export under WTO regime. He found out that although Indian spices exports have been growing steadily in quantity and value during the last fifty years, Instability in export earnings is a major problem retarding the export performance of this sector. The Economic Liberalization Policies and formation of WTO during the nineties have profound impact on Indian agricultural exports in general and on Spices Exports in particular. The Agreement on Agriculture (AoA), The Agreement on Sanitary and Phytosanitary (SPS) Measures, The Technical Barriers to Trade (TBT), Safeguards and Subsidies and Countervailing Measures (SCM) are some of the outcomes of WTO having implications on Indian Spices Exports both in terms of growth and instability.

In the study conducted by Sendhil (2012) it is found that the top onion producing states viz., Maharashtra and Karnataka have positive growth coupled with high instability for the whole period. Most of the states recorded positive growth with low instability in productivity. In Period I (1975-76 to 1997-98), Punjab witnessed a negative growth coupled with high instability in area, while Maharashtra and Karnataka exhibited a positive growth coupled with low instability. But the major producing states witnessed high instability in area and production in Period II (1998-99 to 2009-10).

Jeyanthi and Gopal (2012) analyzed the instability in Indian frozen scampi export. Coppock's Instability Index (CII) of Indian frozen scampi export revealed that among the countries studied, the highest and the lowest instability were observed in Netherlands (521.99%) and UAE (41.05%) for quantity, and Netherlands

(719.30%) and UAE (50.12%) value. But, in terms of unit value, the highest and the lowest instability was in Netherlands (108.14%) and USA (15.22%). Countries were ranked based on degree of instability by CII method in terms of quantity, value and unit value. Netherlands and Japan were the top two countries showing high instability in terms of quantity, value and unit value. Both quantity and value instability was low for UAE and the unit value instability was low for USA. The growth rate in export of chilli from India (in terms of quantity of export) recorded 16.98 per cent per annum whereas there was a tremendous growth in export value to tune of 24.59 per cent per annum and annual growth in export price was 8.70 per cent. The instability in export in terms of export quantity, exports value and export price was calculated to be 93.65 per cent, 52.34 per cent and 121.01 per cent respectively. The reason for instability can be attributed to the cultivation of high yielding varieties across the country which has greater demand in international markets.

According to Krishan and Chanchal (2014), High growth in production accompanied by low level of instability for any crop is desired for sustainable development of agriculture.

The instability indices for area, production and productivity for major spices in the NE region were positive with maximum of 8.84 per cent and thereby indicating less riskiness for growing of spices in the region. The CV of area, production and productivity of major spices were more than 4.16 per cent. The raising of turmeric in the region is less risky, which has CV of less than 4.16 per cent (Sharma, 2013).

2.2.4 Changes in Economics

Santhosh (1984) in his paper 'Cost of Cultivation And Marketing of Pepper in Kannur District' – pointed out that pepper proved to be a labour intensive crop and labour cost accounts for more than 50 per cent of total cost. He reported that the

situation of scarcity of agricultural labour and high wage rates have caused gradual decline in pepper cultivation. Though Idukki is leading in cultivation, the profitability of the crop is higher in Kannur. He also estimate the benefit-cost ratio of pepper as only 1.09 in Idukki as against 1.16 in Kannur.

Gurjar and Varghese (2005) studied the competitiveness and comparative advantage of various rabi crops in terms of cost of cultivation, the cost structure and changes in cost over time for wheat, barley, gram and rapeseed and mustard for the year 1999-2000 in relation to 1981-1982. It was revealed that the share of operational cost to total change in cost of cultivation has been almost the same for all major rabi crops indicating that the operational cost and fixed cost increased over time in a commensurate manner for rabi crops. The major contributing factors for the change in operational cost has been increase in wage rate, increase in quantity and price of fertilizers, increase in price of seed and substitution of bullock labour by machine labour. Consequently, the share of bullock in total cost has declined over time for all major rabi crops except gram. The increases in rental value of own land has been the main contributor for the increase in fixed cost for all rabi crops. For all the rabi crops, the cost of cultivation has increased at a faster rate as compared to increase in the price of their out implying that in the years to come the real net gain from rabi crops may come down from the current levels.

Karnool *et al.* (2007) analyzed the comparative advantages of the kharif oilseed crops in terms of cost of cultivation, cost structure and changes in cost over time for groundnut during the pre-WTO and post WTO periods. It has been found that cost has increased on all major inputs like, human labour, bullock labour, seeds, fertilizers and manures. The positive increase in cost of groundnut seeds over the years was mainly due to rise in prices of seeds and a substantial increase in physical quantity of seeds being used for groundnut cultivation. The gross return from groundnut has recorded an increase of 107.82 per cent during the post-WTO over pre-

WTO period. The increase in gross return from groundnut could be attributed to rise in production and also prices of groundnut.

Parthasarathy and Madan (2008) opined that spice trade was characterized by sharp fluctuations in the quantum and value of exports. The high pricing due to productivity decline and high production cost rendered them uncompetitive in the international market. Over the years, India's share in the world spices market has not appreciated much as it should be and its monopoly as a supplier of spices was threatened by countries like China, Brazil, Vietnam, Pakistan, Egypt, Turkey, other African and Caribbean countries.

Shende and Thakare (2011) in their study on the structural changes in cost of cultivation of selected crops in Vidarbha observed that the total cost of cultivation of cotton, soybean, sorghum and paddy has been depicting an increase by 1.82, 1.86, 1.17 and 1.42 times during the period of study (1999-00 to 2008-09) respectively. It was revealed that the share of operational cost to total change in cost of cultivation has been almost same for cotton, soybean and paddy crops indicating that the operational cost and fixed cost increased over time in a commensurate manner for these crops except sorghum crop. For all selected crops, the cost of cultivation has increased at a faster rate as compared to increase in prices of their output.

2.2.5 Trade Competitiveness

As examined by George *et al.* (1987) often it is proposed that there exists a proportional relationship between domestic and international prices of Indian pepper and the latter varies with demand-supply mismatch in the world market: in period of supply shortage price rises and vice-versa.

George *et al.* (1989) in their book' The Pepper Economy of India' reported that the price analysis shows that Indian pepper has lost its premium to Indonesia and Malaysian varieties. As a result, Indian pepper has to compete in the world market in

order to maintain its market share. Its competitive position is weakened during mid-eighties due to its low productivity and high unit cost of production. The increased uncertainty may be a factor that caused the stagnation of pepper production. Therefore the Government has to take urgent step to stabilize price and reduce uncertainty. The recent change of ownership of pepper production in Brazil to multinational companies and Brazilian Government assistance to hold stocks through credit facilities will only help to put further pressure on the dwindling share of India's export market.

George (1994) studied the problems and prospects of cardamom cultivation in Idukki district of Kerala. She pointed out that increasing productivity; reducing cost of production and improving labour relations are necessary for the cardamom industry of Kerala to become competitive in the world spices market.

According to the findings of Sinharoy and Nair (1994) due to open trade status for pepper, prices have moved synchronously indicating integration of world pepper market. This result is quite striking when the market for Indian pepper are considered as against those of other countries. This fact might reveal a kind of tacit collusion among exporters on market sharing and export parity.

Prasad (1997) highlighted the impact of economic reforms on India‘s exports during the period from 1990 to 1994. The study concluded that reforms process has helped India‘s exports, despite relatively lower world demand. This period has witnessed rise in India‘s competitiveness vis-à-vis its competitors. This has also paved the path for India to reap the benefits of any increase in world demand.

In the opinion of Madan (2000), although pepper price fluctuates sharply, pepper farming still exists and is extended to new areas with the hope of getting better returns on investment. This condition will strengthen the Indian pepper industry in the global competition.

Divya (2001) analysed the export performance of cardamom, pepper, ginger and turmeric and their competitive share in the total export of spices from India. The analyses revealed that the Indian spices are overpriced in the international markets compared to that of the competitors.

According to Kumar *et al,* (2005) the share of India during pre-WTO period had increased from 0.06 per cent in 1988 to 0.33 per cent in 1994. This shows a declining competitiveness of Indian potatoes in comparison to developed countries during the post WTO period. They also suggest that this may be due to continuance of high support to potato in the developed countries during post WTO era also.

Azhar *et al.* (2005) in their book 'Cultivation of Spice Crops' described that quality is the key to good marketing of spices. They reported that Indian motto should be 'clean spices rather than cleaned spices'. In order to compete and retain India's position in the world spices market, our ability to meet the quality expectations in the area of pesticides residues should be strengthened. According to them the critical need is effective transfer of technologies.

In the study done by Karnool *et al*., (2007) it was given that more than unity value of NPC in the pre-WTO period revealed that the domestic price of groundnut was more than the import price, which signified that groundnut received protection from the state. The level of DRCs showed that costs involved in import of groundnut were lower than the value of domestic resources used in producing groundnut in one-hectare area.

Nagoor in 2010 reported that with increasing domestic demand for pepper, Indian export unit value of pepper has increased, leading to decline in export competitiveness.

Singh (2011) opined in his India's export competitiveness must be seen in larger context in an open economic environment as export performance has also been

accrued to external factors especially the exchange rate fluctuations. Increasing world demand and depreciation of Indian rupee during 1991-1995 and appreciation of the currencies of major exporters during 2001-2006 have benefited India's exports by making them competitive in global export market. The currency devaluation of crisis-ridden East Asian economies has adversely influenced the Indian exports during the period 1996-2000 and even mitigated the positive impact of the support provided to exports within the domestic policy framework by shifting the demand for India's exports towards the devalued countries and increasing the relative prices of India's exports.

Mkpadol and Arene (2012) in their paper 'Trade Liberalization, Exchange Rate Changes, and the Competitiveness of Carbohydrate Staple Markets in Nigeria' stated that trade liberalization accounted for most of the changes in the prices of non tradable maize and local rice but not a determinant of price of non tradable yam, increase in the nominal protection co-efficient for rice over exportable cassava negatively affected the price relative for non tradable maize and yam. It is also a positive determinant of the price of non tradable rice. Also they found out that the implication of increase in nominal protection coefficient for imported rice is a decrease in the price incentive for the production of non tradable maize and yam and an increase in price incentive for the production of exportable.

Yogesh and Mokshapathy (2013) reported that pepper prices in the international market of Indian origin since July 2010 were quoted at higher rates than other origins. Those led overseas buyers to shift to cheaper destinations such as Vietnam, Indonesia. But, all the major origins started to move northwards and were quoted at the same levels as that of India lower global availability till fresh arrivals in the next year led prices to improve. Pepper arrivals in India commences in the month of January whereas in Vietnam arrivals commences in the month of February, this leads to the bulls in the domestic market. Pepper prices in the spot markets after

making a low of Rs. 17,652/q in the month of July is still trading at higher levels. India participation on the International Pepper Exchange (IPE) however is domestic with regulatory restrictions on international membership on local exchanges; something common to almost all Asian Commodity Exchanges.

Rani *et al*. analyzed the competitiveness of rice, maize, groundnut and cotton in 2014. The NPC under exportable hypothesis implied that the Andhra Pradesh had non-competitiveness of price in rice production as revealed by NPC values (above one in all the years). The higher NPC implies that domestic prices received by the farmers were higher than the international prices for the crop. Under exportable hypothesis NPCs for maize were greater than unity for all the years. This implies that Andhra Pradesh do not have any advantage in the export of this crop. In the case of groundnut NPC under exportable hypothesis showed that the state had poor competitiveness for groundnut exports in pre-WTO period which is shown by NPC greater than one.

2.2.6 Forecasting Of Pepper Exports

Sherly (2001) in her study 'Emerging Trends in Spices Exports' evaluated the growth performance in export of spices to different countries. Among the traditional export markets, European Union and East Asia show relatively a better performance than other countries. Based on the growth parameters, America shows much higher growth rate than European Union and East Asia. The period 1990-95, shows a declining trend in spices export earnings. This declining trend is the result of the disintegration of USSR and Gulf crisis. The prices of Indian spices are very high when compared to its competing countries. One of the main bottle necks in export of spices is the high fluctuation in unit prices.

John (2003) found that although Indian spices exports have been increasing in quantity and value and cover a large number of countries, future prospects depend on

exporter's ability to meet quality standards set by importing countries. Various programmes initiated to ensure the export of clean and hygienic spices should go hand in hand with marketing and export development strategies.

Krishnan (2012) examined in his study 'Impact of WTO on spices sector in India – an econometric analysis', that in the year 2008-09 India has exported 25250 tonnes of pepper valued Rs. 413.74 crores as against 35,000 tonnes valued Rs.519.90 crores in 2007-08, registering a decline of 28 per cent in volume and 20 per cent in value. USA is the largest buyer of pepper in the world market. During 2008-09 India's exports to major destinations like USA, European Union etc. declined. USA continued as the major market for pepper and has imported 10,050 tonnes, accounting for 40 per cent of total pepper. Other major buyers are UK (1475 tonnes), Italy (1290 tonnes), Canada (1265 tonnes) and Germany (1200 tonnes).

Paul *et al.* (2013) in his study on the forecasting of meat exports from India has revealed that the SARIMA model being stochastic in nature, could be used successfully for modelling as well as forecasting of monthly export of meat and meat preparations from India. It has been found that there is a significant increasing trend in the meat export from India.

Sudheer (2014) pointed out that during the year 2011-2012, the total export of pepper through Cochin Port was 24016.94 tonnes, which valued Rs.79707.73 lakhs. Pepper export from Kerala, through Cochin Port find its way to nearly 50 markets all over the world. However, during this period, USA was the major market for Kerala pepper and their import demand constituted around 50 per cent of the total pepper export from the state. Important other markets for Kerala pepper were U.K (6%), Italy (5%), Australia (4%), Canada (4%), Germany (4%) and Sweden (3%).

METHODOLOGY

3. METHODOLOGY

The study was shaped based on data collected from primary as well as secondary sources. Primary data was collected from Idukki and Wayanad districts and secondary data from various published sources. Data were analyzed using various statistical tools and techniques to full fill the objectives of the study. This chapter elaborates the methodology adopted in present study under the following headings.

3.1 Description of study area
3.2 Nature and source of data
3.3 Analytical tools and techniques

3.1 DESCRIPTION OF STUDY AREA

Knowledge about the study area is essential in order to understand the geographical background in which pepper cultivation is being undertaken. The study was conducted in Kerala, the major producer of pepper in India, which contributes to more than 90 per cent of the total pepper production in the country. Idukki and Wayanad districts, being the major pepper cultivating districts of Kerala, were purposively selected for gathering primary data from farmers and traders. Basic information regarding the topography, soil and climate, land utilization pattern, demography and other factors corresponding to the study area will be highly useful in deriving meaningful inferences from the results of the study. A profile of the study area is presented in this section.

3.1.1 Location

Kerala is situated in the south west region of India and spread over 38,863 sq. km bordered by Karnataka, Tamilnadu and Arabian sea. Kerala lies along the coastline, to the south west of the Indian peninsula, flanked by the Arabian Sea on the west and the Western Ghats on the east and stretches north-south along a coastline of

580 km with a varying width of 35 to 120 km. The topography and physical characteristics changes distinctly from east to west. The nature of the land and its physical features, divides an east west cross section of the state into three distinct regions- hills and valleys, midland and plains and the coastal region encompassing 1.18 per cent of the country.

Idukki is one of the mountainous districts of Kerala with a total geographical area of 5,019 sq. km (13 per cent of the total area of the state) falling mainly on the upland area. The district was formed by carving out portions from erstwhile Ernakulam and Kottayam districts enclosing Devikulam, Udumbanchola and Peermade taluks of erstwhile Kottayam district and Thodupuzha Taluk of Ernakulam district (excluding Kallorkkad village and portion of Manjalloor village). It is bounded by Trichur, Kottayam, Ernakulam and Pathanamthitta districts of Kerala and Coimbatore, Madurai and Ramanathpuram districts of Tamilnadu.

Wayanad district came into existence on 1st November, 1980 as the 12th district of Kerala. The District is bounded on the north by Kodagu district of Karnataka, on the east by Mysore district of Karnataka and Nilgiri district of Tamilnadu, on the south by Ernad taluk of Malappuram district and Kozhikode taluk of Kozhikode district on the west by Koyilandi and Vadakara taluk of Kozhikode district and Thalassery taluk of Kannur district. The district has an area of 212.9 thousand ha, which account for 5.48 per cent of the state total.

3.1.2 Topography

Kerala State lies between $8^0\,18^1$ and $12^0\,48^1$ north latitude and between $74^0\,52^1$ and $77^0\,22^1$ east longitudes and have three natural divisions - low land, mid land and high land forming parallel belts across the length of the state. The low land with stretches of sand and numerous back waters lies on western edge of the state along the seashore which is ideally suited for the cultivation of coconut and rice. The mid land region, with hills and valleys presenting an underlying tract of laterite soil cut

across by numerous rivers, is renowned for a large variety of agricultural crops like rice, coconut, pepper, cashew, ginger, tapioca and rubber. The high land which including Idukki and Wayanad districts consists mainly of mountains covered by dense forests bordering the Western Ghats. Important plantation crops like tea, cardamom, coffee, pepper and rubber are grown in this region.

Idukki, the hilly district of the state, has many unique topographical and geographical characteristics. The high ranges vary in altitude from 2500 feet above the mean sea level (MSL) in Kulamavu to more than 5000 feet above the MSL in Munnar including eleven peaks which exceeds a height of 6000 feet above the MSL. The highest peak in Kerala, Anamudy is in the Kannan Devan Hills village of Devikulam taluk. It extends by 115 km from south to north and 67 km from east to west. The district lies between $9^0 15^1$ and $10^0 21^1$ of north latitudes and between $76^0 37^1$ and $77^0 25^1$ longitudes.

Wayanad is a mountainous tract with picturesque plateau with forested hill region consisting of ravines, high mountains, deep valleys and terrain varying in altitude range of 700 to 2100 above MSL. Wayanad district lies between 11° 27' and 15° 58' latitude and 75°47' and 70° 27' longitude sprawling over an area of 2132 sq km and has all the fascinating views that the Western Ghats offers.

3.1.3 Climate and Rainfall

In general, Kerala state has a humid climate except in the southern most pockets and in the eastern part of Palakkad region which possess a moist sub-humid climate. Most of the areas are under tropical wet and dry conditions, with high nautical influence, but certain areas in the eastern parts experience subtropical type of climate. The most noticeable feature of Kerala's climatology is the existence of the monsoon activities in association with the reversal of temperature and pressure gradients over the country. The hot and humid climate of sub mountainous tracts of Western Ghats is ideal for pepper cultivation.

The state receives both south west and north east monsoon with mean annual rainfall of 2946 mm. A well distributed annual rainfall of 1250-2000 mm is considered ideal for black pepper. The Southern parts of Kerala experiences comparatively higher rate of south west and north east monsoon while the northern districts like Kannur and Kasargod receives very little rain from the north east monsoon. Since western parts of the state are facing the Arabian sea, south west monsoon is more active and account for 60 per cent of annual rainfall on an average.

In Idukki district Munnar, Devikulam, Pallivasal, Vellathooval etc. are places getting high rainfall while Marayoor, Kanthalloor, Vattavada, Thaliar etc experience low rainfall. Marayoor and Kanthalloor are virtually rain shadow areas lying in the eastern side of Western Ghats. The rainfall distribution of Kerala is presented in Table 1. The annual rainfall of Idukki and Wayanad districts, 3527.6 mm and 2793.0 mm respectively, in 2013-14 is more than the average rainfall of the state (2946.1mm). In 2013-14 the actual rainfall is seen to have shown an increase than the previous years.

Table 1. Rainfall distribution of Kerala

Sl No.	**Districts**	**Rainfall in mm**			
		Normal	**2011-12**	**2012-13**	**2013-14**
1.	Idukki	3303.2	3216.2	3141.9	3527.6
2.	Wayanad	3251.4	2097.7	2606.1	2793.0
State (Average)		2946.1	2639.4	2706.4	2819.2

Source: Directorate of Economics and Statistics

3.1.4 Soil

The soil of Kerala is lateritic and very permeable like the soil of desert or arid regions and is suitable for growing copious spices. It is devoid of humus and is unable to retain much water. However, alluvial soil is usually found along the banks

of the main rivers and broadly in the lower basins of the Pampa and Periyar rivers. Besides these regions, alluvial deposits are also found in the paddy fields of Kerala. Laterite soil is found in the midland and high land regions and red soil in the Southern-most part of Kerala.

Two types of soil are found in the Idukki district, forest soil (alluvial soil) overlaying the high land area and laterite soil in the other parts. The climate in the district undergoes a sudden variation as we go from east to west. The highland regions are having a comparatively cold climate. Munnar, Devikulam, Pallivasal, Vellathooval etc. are places getting high rainfall while Marayoor, Kanthalloor, Vattavada, Thaliar etc experience low rainfall among which Marayoor and Kanthalloor are virtually rain shadow areas lying the eastern side of western ghats.

In Wayanad the soil is mainly of forest loam and laterite type and is dark in colour with the upper layer highly enriched with organic matter and high nitrogen but poor in base due to leaching. It also has red loamy and red sandy soils. The important crops are coffee, tea, paddy and cardamom. During December- January temperature lowers to 15^0 C and experiencing severe cold and during summer season the temperature will go up to 35^0 C. In Wayanad the mean maximum and minimum temperature for the last five years were 29^0C and 18^0C respectively and experiences a high relative humidity which goes even up to 95 per cent during the south west monsoon period.

3.1.5 Land Utilization Pattern

The total geographical area (38,86,287 ha) of Kerala is classified according to thirteen different uses of land and the area under each classification is presented in Table 2. The net area under cultivation during the year 2013-14 was 20,50,994 hectare, which accounts to 52.78 per cent of the total geographical area in the state and the total cropped area was 26,16,670 hectare which is 67 per cent of the total area

during the same period. Kerala has a cropping intensity of 127 per cent where as Idukki and Wayanad have 126 per cent and 152 per cent respectively.

Table 2. Land utilization pattern of Kerala in 2013-14

Sl. No.	Classification of land (ha)	Kerala	Idukki	Wayanad
1.	Total Geographical area	3886287 (100.00)	436328 (100.00)	212966 (100.00)
2.	Forest	1081509 (27.83)	198413 (45.47)	78787 (36.99)
3.	Land put to non agricultural uses	405826 (10.44)	11867 (2.72)	11070 (5.20)
4.	Barren and uncultivated land	13655 (0.35)	2181 (0.50)	171 (0.08)
5.	Permanent Pastures and Grazing land	8 (0.003)	171 (0.04)	0 (0)
6.	Land under miscellaneous tree crops	2521 (0.06)	178 (0.04)	106 (0.05)
7.	Cultivable waste land	97069 (2.50)	1460 (0.33)	1195 (0.56)
8.	Fallow other than current Fallow	57346 (1.48)	740 (0.17)	833 (0.39)
9.	Current Fallow	70976 (1.83)	940 (0.21)	1750 (0.82)
10.	Net area sown	2050994 (52.78)	229650 (52.63)	114966 (53.98)
11.	Area sown more than once	565676 (14)	60180 (13.79)	60334 (28.33)
12.	Total cropped Area	2616670 (67)	289830 (66.42)	175300 (82.31)
13.	Cropping intensity (%)	127	126	152

(Figures in parentheses are percentages)

Source: Directorate of Economics and Statistics

Department of Agriculture and Cooperation

3.1.6 Agriculture

Kerala is essentially an agricultural State and the main occupations of the people are associated with agriculture which is the foundation of Kerala's economic edifice. Depending on the diversity of the agro-climatic environment, there is a variety of crops which ranges from tapioca, pepper, coconut and rubber of the high rainfall humid tropics to coffee and tea of the humid temperate climate. Even among the tropical crops, they vary from arecanut and coconut requiring moist conditions throughout the year to cashewnut which can tolerate extremely dry conditions of summer and from seasonal crops such as rice and annuals such as banana to perennials such as coconut and arecanut.

Table 3. Share of agricultural and allied sectors in GSDP of Kerala

Sl No.	**Year**	**Share of Agriculture and allied sectors in GSDP (%)**
1.	2009-10	11.5
2.	2010-11	10.1
3.	2011-12	9.1
4.	2012-13*	9.51
5.	2013-14**	8.83

*Provisional
**Quick
Source: Economics Review, 2013-14

The growth performance of the agriculture and allied sector has been fluctuating across the years. Table 3 showing the share of agriculture and allied sectors in Gross State Domestic Product (GSDP) reveals that the share of the sector in total GSDP has declined from 9.51 per cent in 2012-13 to 8.83 per cent in 2013-14.

3.1.7 Cropping Pattern

Table 4. Cropping pattern in Kerala during 2013-14

Sl No.	Crops	Kerala		Idukki		Wayanad	
		Area (Ha)	Production (MT)	Area (Ha)	Production (MT)	Area (Ha)	Production (MT)
1.	Rice	199611	564325	661	1796	11481	30755
2.	Tapioca	67589	2479070	6332	313513	1323	55172
3.	Cardamom	39730	14000	31810	13040	158	650
4.	Coffee	85359	66645	13060	7545	67364	56450
5.	Tea	30205	62937	21970	45052	5306	14040
6.	Rubber	548225	648220	40395	47680	10730	8720
7.	Pepper	84707	29408	42924	15036	9527	2751
8.	Ginger	4538	21521	575	3302	1992	11006
9.	Turmeric	2430	6253	185	733	168	503
10.	Arecanut	100008	100018	2381	1795	12181	3985
11.	Banana	62261	531299	3211	29664	11579	98518
12.	Cashew nut	49105	33375	1413	530	850	266
13.	Coconut	808647	5921	16518	90	11725	65

Production of Coconut in Million Nuts, Productivity in numbers
Source: Directorate of Economics and Statistics

Cropping pattern in the state is controlled by the divergent physiographic characteristics including the high hill ranges along the eastern border of the state which are suitable for tea, coffee and cardamom plantations and the lower hills and slopes of the highland region suitable rubber, pepper, and other tree crops. Further west, in the midland region a variety of annual and seasonal crops thrive and in the coastal belts with wide flatlands paddy and coconut are grown. The area under major crops grown in Kerala during the year 2013-14 is given in Table 4. The major crops grown were Paddy, Rubber, Arecanut, Coconut and Pepper. Kerala has near monopoly of area and production of pepper in India with about 90 per cent of the total production in India with a total area of 84707 hectare during 2013-14.

3.1.8 Land Holding Pattern

The land holding pattern of Kerala during 2013-14 is presented in Table 5. Kerala state is characterized predominantly by the small holdings (about 96.33%) with size of holdings below one hectare, which constitutes 58.64 per cent of the operational area.

Table 5. Distribution of land holding in Kerala

Sl No.	**Classification (ha)**	**Number (in '000)**	**Area ('000 ha)**
1.	Below 1.00	6580 (96.33)	886 (58.64)
2.	1.00 to 1.99	180 (2.64)	282 (18.66)
3.	2.00 to 3.99	57 (0.83)	159 (10.52)
4.	4.00 to 9.99	12 (0.18)	64 (4.24)
5.	10.00 and above	2 (0.03)	120 (7.94)
	Total	6831 (100)	1511 (100)

(Figures in parentheses are percentages)
Source : Ministry of Agriculture

Table 6. Distribution of land holding in Idukki and Wayanad

Classification of Holding	Idukki		Wayanad	
	No. of holders	Percentage (%)	No. of holders	Percentage (%)
Up to 1 ha	169822	80.42	129429	83.04
Between 1 to 2 ha	30283	14.34	24518	15.73
Above 2 ha	11069	5.24	1908	1.22
Total	211174	100	155855	100

Source: National Informatics Centre (Idukki District Unit)
District Handbook, Department of Economics and Statistics

The land holding pattern in Idukki and Wayanad districts are given in Table 6. A majority of the 80.42 per cent and 83.04 per cent in Idukki and Wayanad districts are small holders with less than 1 hectare land holdings. In Wayanad only a negligible portion of 1.22 per cent holds more than 2 hectare and in Idukki it is 5.24 per cent. The per capita availability of the land in Idukki district is 0.24 hectare and the average size of holdings in Wayanad district is 0.68 hectare (Government of Kerala, 2014).

3.1.9. Pepper Cultivation in Kerala

Pepper is one of the most ancient and traditional crops of Kerala whose origin is believed to be the natural evergreen forests of the Western Ghats. Pepper, which is considered as the king of spices, has played an important role in Kerala's economy for centuries. Kerala has near monopoly of area and production of pepper in India with more than 90 per cent of the total production in India. In Kerala pepper is commonly cultivated as "homestead cultivation" growing it as a secondary crop interspersed with several other crops. Cultivation of pepper as a pure crop is also practiced in several parts of Karnataka though it is becoming rare.

Table 7. State -wise area and production of pepper in India

Year	Area/Production	Karnataka	Kerala	Tamil Nadu	India
2011-12	Area	20	170.25	3.84	200.28
	Production	5.5	31.69	0.78	40.62
2012-13	Area	27.01	86.79	4.3	124.6
	Production	6.15	42.49	0.98	52.61
2013-14	Area	28.28	84.88	4.29	123.81
	Production	8.03	38.67	0.98	50.87

(Area in ' 000 Hectare; Production in '000 MT)

Source: indiastat website

Table 7 reveals the area and production of pepper in Karnataka, Kerala and Tamil Nadu during 2011-12, 2012-13 and 2013-14. Karnataka showed an increase in the area and production of pepper whereas Kerala registered a decrease in area. Tamil Nadu seemed to have shown a slight increase in area and production of pepper.

3.1.9.1. Annual Growth Cycle of Pepper

Pepper plant is essentially a crop of the wet tropics which requires a moderate well distributed rainfall with high temperature for better performance. Light showers during May-June are considered beneficial for fruit set. Pepper plant starts flowering during May –June with the onset of the southwest monsoon and harvesting is usually in November –January. Apart from this in certain parts of India there is another cropping season during August-September. Pepper fruits mature in about 68 months after flowering and the period may vary depending on factors such as variety, rainfall, altitudes, ambient temperature etc. The period generally coincides with dry weather

in India. Pepper pollination is also possibly aided by water drops falling on spikes during the time of pollination.

3.1.9.2. Rainfall and Relative Humidity

Total rainfall and its distribution play an important role in black pepper cultivation and productivity. An annual rainfall of 2000 mm with uniform distribution is idle and a relative humidity of 60-95 per cent is optimum at various stages of growth. Rainfall of 70 mm received in 20 days during May-June is sufficient for triggering off flushing and flowering processes in the plant. Any dry spell even for a few day, with this critical period of 16 weeks (flowering to fruit ripening) will result in low yield. In India black pepper growing areas receive 1500 mm to more than 4000 mm rainfall.

3.1.9.3. Temperature

The crop tolerates temperature between 10-40˚C. The ideal temperature is 23-32˚C with an average of 28˚C. Optimum soil temperature for root growth is 26-28˚C.

3.1.9.4. Soil

Black pepper grows well on soils ranging from heavy clay to light sandy clays rich in humus with friable nature, well drained, but with ample water holding capacity. Soil with near neutral p^H, high organic matter and high base saturation with Ca and Mg enhance the productivity but soils with pH above 7.5 inhibit growth. Soil for black pepper cultivation require 0.26% N, 0.25% P_2O_5, 0.41% K_2O, 0.18% MgO and 0.5% CaO. Water logged soils and diseased soils are not suitable for black pepper cultivation while well drained loamy soils rich in humus nourish the crop well and the best crop could be obtained in virgin forest soil.

3.1.9.5. Pepper Cultivars

Over 75 cultivars of pepper are being cultivated in India. Karimunda is the most popular of all the established cultivars. The other important cultivars are Kottanadan, Narayakkodi, Aimpiriyan, Neelamundi, Kuthiravally, Balancotta and Kalluvally etc. in Kerala and Billimalligesara, Karimalligesara, Doddiga, Mottakare and Uddagare are popular in Karnataka. Panniyur1 and 3 are pepper hybrids evolved at Pepper Research Station, Panniyur, Kerala. In terms of quality, Kottanadan has the highest oleoresin (17.8%) followed by Aimpiriyan (15.7%).

3.1.9.6. Harvest

The crop takes about 68 months from flowering to harvest. The harvest season extends from November to January in the plains and January to March in the hills. When one or two berries in the spike turn bright orange or purple it is time for harvest. However, pepper berries are harvested at different maturity levels depending on the intended use or product preparation. The extraction industry prefers berries which contain the highest level of oleoresin and essential oils. High levels of both are usually found when the berries are picked couple of weeks before full maturity.

3.1.9.7. Export Market of Pepper

Pepper exported from Kerala through Cochin Port, the centre of pepper market in Kerala, find its way to nearly 50 markets all over the world. USA is the major importer of pepper followed by China, UAE, Malaysia, Saudi Arabia, UK, Germany, Singapore and Sri Lanka.

3.2 NATURE AND SOURCE OF DATA

The time series data on the following aspects were collected for the study from 1980-81 to 2013-14,

- Area, production and productivity of black pepper,

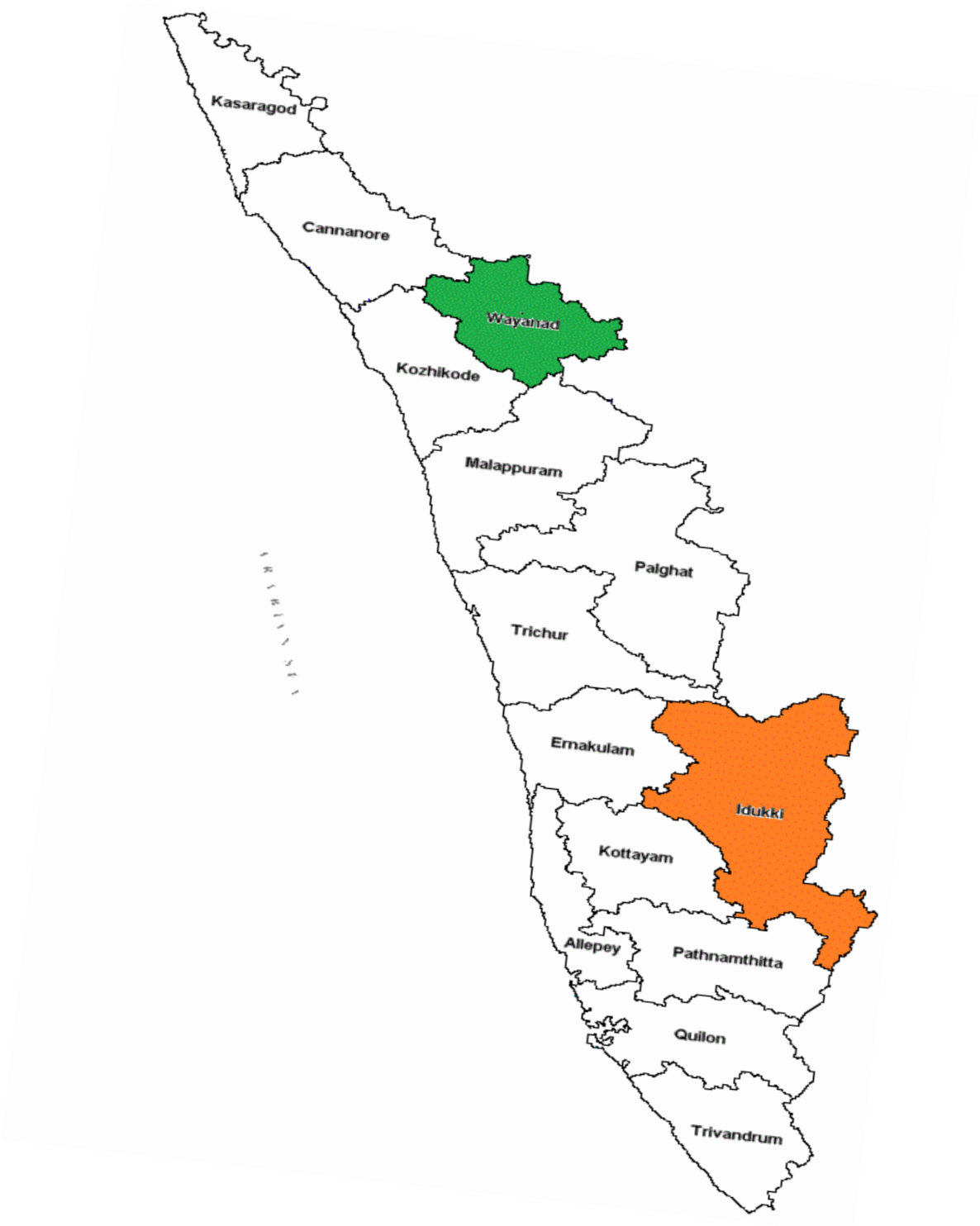

Figure 1. Map of Kerala showing the districts of study

- Export value and export quantity of black pepper from India
- Quantity of black pepper exported from India to various countries
- International and domestic price of black pepper and
- Cost of cultivation of black pepper in Kerala was collected from the following institutions.

The sources of data were Department of Economics and Statistics, Govt. of Kerala, Spices board, Directorate of Arecanut and Spices, Calicut, Centre for Development Studies, IISR (Indian Institute of Spices Research), Calicut and Indiastat website. Various publications like Cost of cultivation, Agricultural statistics and Price statistics by Department of Economics and Statistics, Government of Kerala and Spice India by Spices board. The relevant data were segregated and classified for study and analysis in view of the objectives of the study. The study period was divided into two sub periods: Pre- WTO period (1980-81 to 1994-95) and Post-WTO period (1994-95 to 2013-14).

Primary data was collected from 30 farmers and 10 traders from Idukki and Wayanad districts of Kerala using a well structured interview schedule in order to get an idea about the awareness and opinion of farmers and traders on WTO.

3.3 ANALYTICAL TOOLS AND TECHNIQUES

Data collected were subjected to analysis using the following statistical techniques, keeping in view the objectives of the study.

3.3.1. Instability analysis
3.3.2. Nominal Protection Coefficient (NPC)
3.3.3. Tabular analysis
3.3.4. Simple moving average method
3.3.5. Regression analysis

3.3.1. Instability Analysis

The variability in the area, production, export value, export quantity and price have been measured using Cuddy-Della Valle index, which is used as a measure of variability in time series data (Deb *et al*., 2004, Sendhil, 2012). The simple coefficient of variation (CV) overestimates the level of instability in time series data characterized by long-term trends, whereas the Cuddy-Della Valle Index corrects the coefficient of variation by:

$$Ix = (CV)\ (1- Adj.R^2)^{0.5}$$

Where,

Ix is the Cuddy-Della Valle Index, i.e., the corrected CV.

CV is the coefficient of variation in %

$$CV = \frac{Standard\ deviation}{Arithmetic\ Mean} \times 100$$

Adjusted R^2 is the coefficient of determination from time trend regression adjusted by the number of degrees of freedom.

For analyzing the instability in area, production, productivity, export and price of pepper the total study period was divided into three. For the purpose of analysis the overall period of study was divided into three- pre WTO period (1980-81 to 1994-95) taken as period 1, post WTO period (1995-96 to 2013-14) as period 2 and the last thirteen years coming under the post WTO period, taken as period 3 (2000-01 to 2013-14), was figured out so as to examine whether there is any tendency of stability in production and export after the elementary stage of WTO.

3.3.2. Nominal Protection Coefficient

The nominal protection coefficient (NPC) is a straightforward measure of competitiveness. (Shivaraya and Hugar, 2005; Mulk and Khan, 2013; Esnaashari, 2013) It is calculated as the ratio between the domestic price (PD) to the international reference price (PR) of a comparable grade of commodity, adjusted for all transfer costs such as freight, insurance, handling costs, margins, losses, etc. Symbolically, it is given by Equation:

$$NPC = \frac{PD}{PR}$$

If NPC is less than one, then the commodity is competitive (a good import substitute or worth exporting). If NPC is greater than one, the commodity is not competitive.

3.3.2.1. Domestic prices

Monthly average prices of pepper (MG-1) at Cochin market was collected from Spices Board and was employed in the analysis.

3.3.2.2. Border prices / References prices

Border prices were computed by using international price adjusted for freight, insurance, marketing costs and trading margins including any processing cost or by using the Cost Insurance Freight (CIF) or Freight On board (FOB) prices which are derived by dividing value of imports or exports by their respective quantities. This border price is equal to the export unit value and so the latter is used in finding out the trade competitiveness of pepper.

3.3.3 Tabular Analysis

Tabular analysis method was adopted to analyse the changes in economics of pepper. The procedure was used by Gurjar and Varghese (2005), Karnool et. al. (2007).

The data on cost of cultivation of pepper during 1980-81 to 2013-14 collected from the Department of Economics and Statistics was used to analyze the changes in economics of pepper. The total period was divided into two sub-periods, viz., Pre-WTO (1980-81 to 1994-95) and Post-WTO period (1995-96 to 2013-14) and the average cost and returns were worked out for the two sub-periods separately and was compared. The percentage change in cost and returns from pre-WTO period to post-WTO period was then derived.

The percentage change over post WTO period was found using the equation,

$$\textit{Percentage change (\%)} = \frac{(Post-WTO\ period)-(Pre\ WTO\ period)}{Pre\ WTO\ period}$$

3.3.4 Simple Moving Average Method

Forecasting is a process of estimating a future event by casting past data forward. The past data are systematically combined in a predetermined way to obtain the estimate of the future. Thus forecast is an estimate of future values of certain specified indicators relating to a decisional/planning situation.

The most popular method of forecasting is the historical moving averages. The attractiveness of these models is their ease of application. Studies have applied forecasts of various lengths in order to determine the optimal length of years to be included. These models generally conclude that longer averages ranging from 3 to 7 years are optimal (Dhuyvetter and Kastens, 1998; Sanders and Manfredo, 2006). The

idea is that these longer moving averages can smooth out temporary deviations in markets (Hatchett *et al.,* 2009).

Simple moving average method is useful in removing the random fluctuations for forecasting. 3 year moving average and 5 year moving average was used in the study.

The formula for a simple moving average is

$$F_t = \frac{A_{t-n....} + A_{t-2} + A_t + ...A_{t+n}}{n}$$

Where,

Ft = Forecast for the coming period

n = Number of period to be averaged

A_{t-n}, A_{t-2}, A_{t+n} and so on are the actual occurrences in the past period, two periods ago, three periods ago and so on respectively.

3.3.5. Regression analysis

Regression analysis was used for finding out the best fit regression equation which was employed in working out instability in production, exports and prices of pepper and forecasting of pepper exports from India. The best fit regression equation was identified using the coefficient of determination (R^2) and the adjusted R^2 value obtained from the various regression equations employed in the analysis.

3.3.5.1 Coefficient of determination (R^2)

R-squared (R^2) is a statistic that explains the amount of variance accounted for in the relationship between two (or more) variables. R^2 is also called the coefficient of determination, and it is given as the square of a correlation coefficient. The range of R^2 lies between 0 and 1; the closer it is to 1, the better is the fit. On the other hand R^2 equal to zero indicates that the model does not explain any variability in Y.

$$R^2 = SSR/SST$$

SSR= Regression sum of squares

$$SSR = SST - SSE$$

SSE = Error sum of squares measures the amount of variability in Y that is not explained by the model.

SST = Total sum of squares measures the variability of the dependent variable, i.e., total variation in the Y variable.

3.3.5.2. Adjusted R^2 ($\bar{R}^2$)

As the number of regressors in a model increase, the R^2 value also increase, so R^2 cannot be a useful measure for the goodness of model fit. Therefore, R^2 is adjusted for the number of explanatory variables in the model. It is defined as,

$$\bar{R}\text{Adj.}\,R^2 = 1 - (1 - R^2)\frac{(n - 1)}{(n - p - 1)}$$

Where,

n = Total number of observations

p = Total number of parameters

The value of adjusted R^2 is always lesser than the R^2 value. Various regression models like linear, logarithmic, cubic, exponential, power quadratic and log quadratic were tried for finding out instability in area, production, productivity, export and price of pepper and the one with the highest adjusted $\bar{R}^2$ was selected for the interpretation of the results. Table 8 shows the best fit regression models which were used in the analysis

Table 8. Best fit regression models

Dependent Variable	Model		Adjusted R^2
Area	Period 1	Quadratic: $y= 111198.5-3595.93x_0+935.96x_1-0.0075x_2$	97.75
	Period 2	$y= 6.82-0.26x_0+0.013x_1-0.0002x_2$	85.16
	Period 3	$y= -3203221+355236.8x_0-11807.7x_1+123.35x_2$	85.23
Production	Period 1	Log $y = 28216.09-1642.84x_0+361.66x_1-0.0028x_2$	75.23
	Period 2	Log $y= 26.23-3.69x_0+0.23x_1-0.0063x_2+0.00006x_3$	48.86
	Period 3	Log $y= -72.54+11.01x_0-0.58x_1+0.013x_2-0.0001x_3$	54.96
Productivity	Period 1	$y= 239.85+1.34x_1+0.199x_2$	11.96
	Period 2	$y= 6744.78-1109.96x_0+70.84x_1-1.99x_2+0.02x_3$	24.23
	Period 3	$y= 274.70+29.02x-6.16x+0.34x$	10.51
Export quantity	Period 1	$y= 20412.35+2267.73x_0-88.65x_1$	10.59
	Period 2	$y= 101211.5-5325.35x_0+88.33x_1$	27.56
	Period 3	$y= 4.25+0.22x_0-0.13x_1+0.03x_2-0.002x_3-.00007x_4$	39.28
Export value	Period 1	$y= 5.24x^{1.08}$	61.59
	Period 2	$y= -7.9^7+11645272-527649x_0+7714.61x_1$	45.49
	Period 3	$y= 1.4^8-1.4^7+456035.6x_0-4573.36x_1$	73.32
Export unit value	Period 1	$y= 44.06-37.98x_0+12.48x_1-1.28x_2+0.04x_3$	90.26
	Period 2	$y= -3751.18+530.47x_0-23.71x_1+0.35x_2$	89.71
	Period 3	$y= 2696.29-200.48x_0+3.47x_1+0.015x_2$	94.78
International price	Period 1	Log $y= 0.83+0.21x_0-0.014x_1-0.00008x_2$	66.47
	Period 2	Log $y= -0.69+0.31x_0-0.009x_1+0.0002x_2$	58.45
	Period 3	$y= 3376.74-261.03x_0+5.16x_1$	94.71
Domestic price	Period 1	Log $y= 0.77+0.22x_0-0.01x_1-0.000008x_2$	73.52
	Period 2	$y=-4305.12+608.89x_0-27.19x_1+0.39x_2$	87.94
	Period 3	$y= 2046.33-117.05x_0-0.026x_1+0.062x_2$	94.90

3.3.6. Analysis of Primary Data

3.3.6.1 Analysis of constraints

For the analysis of constraints the respondents were asked to rank the constraints listed (16 Production and 5 marketing constraints) after making an overall comparison with regard to the intensity of constraints. A score of 16 to 1 was given to the 1st to 16th rank for production constraints and a score of 5 to 1 for the marketing constraint. Accordingly the maximum score that can be obtained is 480. The frequencies of the rank given to each constraints were found out and multiplied with the corresponding score values to obtain the total score value. The constraint with higher score value in each category was considered as the most serious constraint in that category followed by others in the order of decreasing score value.

3.3.6.2 Percentage analysis

The primary data on the perception and opinions of farmers and traders on pepper cultivation, pepper trade and WTO were collected by using open ended questions and were tabulated and analyzed using averages and percentages.

Percentage analysis was used in descriptive analysis for making simple comparisons. For calculating percentages, the frequency of the particular cell was multiplied by 100 and divided by the total number of respondents. Percentages were corrected to two decimal places.

RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

Keeping in view the objectives of the study, data collected from different sources were analysed employing appropriate techniques. This chapter presents results in line with the objectives of the study under the following headings.

4.1. Instability analysis

4.2. Forecasting of pepper exports

4.3. Trade competitiveness of pepper

4.4. Structural changes over time in cost of cultivation of pepper

4.5 Analysis of primary data

4.6. Policy implication

4.1. INSTABILITY ANALYSIS

The main focus of the study was to analyze the degree of fluctuations in pepper production (Area, Production and Productivity) and export (Quantity, Value and Unit value) and price of pepper during the pre and post-WTO periods. For the purpose of analysis the overall period of study was divided into three- pre WTO period (1980-81 to 1994-95) taken as period 1, post WTO period (1995-96 to 2013-14) as period 2 and the last thirteen years coming under the post WTO period, taken as period 3 (2000-01 to 2013-14), was figured out so as to examine whether there is any tendency of stability in production and export after the elementary stage of WTO. Accordingly, instability in area, production and productivity of pepper in Kerala and instability in export quantity and value of pepper have been studied using the Cuddy Della-Valle instability index and are presented below.

4.1.1 Instability in Area, Production and Productivity of Pepper

Since pepper is a small holder's crop the livelihood of many small and marginal farmers depends up on this crop and it is important to analyse the declined performance recorded in recent years by this crop in Kerala. The production and productivity of pepper in Kerala showed fluctuations over the years without a precise trend. The production of pepper accounting to 29,490 tonnes in 1980-81 increased to 68,568 tonnes during 1995-96 and dropped to 29,408 tonnes in 2013-14. It is also evident from Table 9 and Figure 2 that the area under pepper showed a steady increase during 1980-81 to 2005-06 with 1,09,290 hectare to 2,37,998 hectare in the respective periods and thereafter showed a continuous decline. The reasons for the decline in area and the fluctuations in production and productivity are to be given urgent attention and various studies have examined the reasons for the same.

The study conducted by Sudheer (2014) observed that there is a negative correlation between the annual rainfall and the pepper production. Even though rainfall during May-June is sufficient for pollination and flowering, heavy rain fall in north-west monsoon season always badly affects the pepper fructification of pepper.

Mammootty *et al.* (2008) reported that phytophthora foot rot caused by *P. capcisi* is a major devastating disease of black pepper causing a crop loss of 25-30 per cent in Kerala and 44-48 per cent of vines in Karnataka. According to Devasahayam *et al.* (2008) the crop loss of over 1000 tonnes annually is reported at Kozhikode and Kannur districts in Kerala due to foot rot. They also reported that the incidence of stunt disease is found to be higher (45.4%) in Wayanad district. Pollu beetle (*Longitarsus nigripennis*) is the most serious pest of pepper and the losses due to the pest ranges from 6-40 per cent.

The evaluation report of Kerala state planning board (2011) attributed higher production cost, increased cost of labour, market uncertainty, lack of proper

manuring, poor marketing facilities and lack of processing industries and warehousing facilities in rural areas for the very poor and declining performance of pepper production in the state.

From the above mentioned facts it can be stated that the variability in area, production and productivity of pepper in Kerala during the post-WTO period is influenced by several factors like pest and disease incidence and climatic conditions. The decreasing trend in area and production after 2005-06 attribute to pest and disease incidence, poor post harvest practices, weak crop management, climate change, shortage of labour etc. Price crisis and unfavorable weather conditions were found to be the other major reasons for the decline in the production of pepper.

To analyse the effect of area and productivity in production a regression analysis was worked out with production as the dependent variable and yielded the following regression equation:

$$Y = -39542.38 + 115.57\ X_1 + 0.328\ X_2$$

Where, Y is the production,

X_1 denotes productivity

X_2 denotes area

The R^2 value was 0.97 implying that 97 per cent of the total variation is explained by the variables included in the model. The regression equation revealed that the fluctuation in production is due to productivity effect rather than area effect which is evident from coefficient of 115.57.

The results of the instability analysis in the area, production and productivity of pepper in Kerala are presented in Table 10. The Cuddy Della-Valle instability index revealed that the instability in area, production and productivity of pepper in Kerala that was low during the period 1was augmented in the period 2.

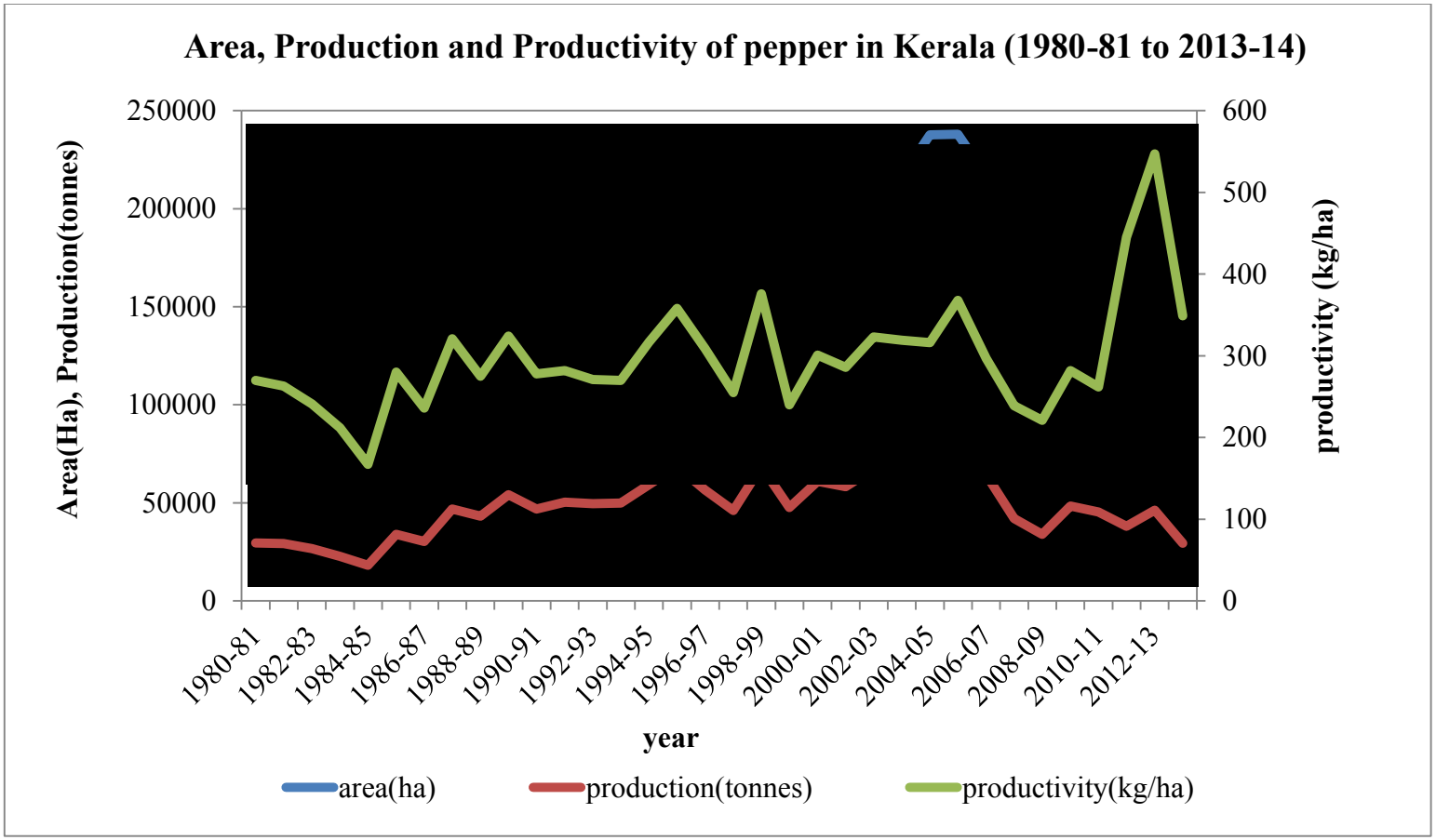

Figure 2. Area, production and productivity of pepper in Kerala (1980-81 to 2013-14)

Table 9. Area, production and productivity of pepper in Kerala from 1980-81 to 2013-14

Year	Area (ha)	Production (tonnes)	Productivity (kg/ha)	Year	Area(ha)	Production (tonnes)	Productivity (kg/ha)
1980-81	109290	29490	270	1997-98	180370	46040	255
1981-82	111020	29230	263	1998-99	182384	68510	376
1982-83	110440	26610	241	1999-00	198406	47543	240
1983-84	107350	22710	212	2000-01	202133	60929	301
1984-85	109400	18220	167	2001-02	203956	58240	286
1985-86	121565	34000	280	2002-03	208607	67358	323
1986-87	128865	30378	236	2003-04	216440	69015	319
1987-88	146081	46819	321	2004-05	237669	74980	316
1988-89	157006	43241	275	2005-06	237998	87605	368
1989-90	167104	54135	324	2006-07	216709	64264	297
1990-91	168507	46802	278	2007-08	175679	41952	239
1991-92	178126	50309	282	2008-09	153711	33991	221
1992-93	183478	49666	271	2009-10	171489	48442	282
1993-94	184410	49845	270	2010-11	172182	45267	262
1994-95	186720	59256	317	2011-12	85335	37989	445
1995-96	191596	68568	358	2012-13	84707	46298	547
1996-97	182887	56546	309	2013-14	84065	29408	349

Source: Department of Economics and Statistics, 1980-81 to 2013-14

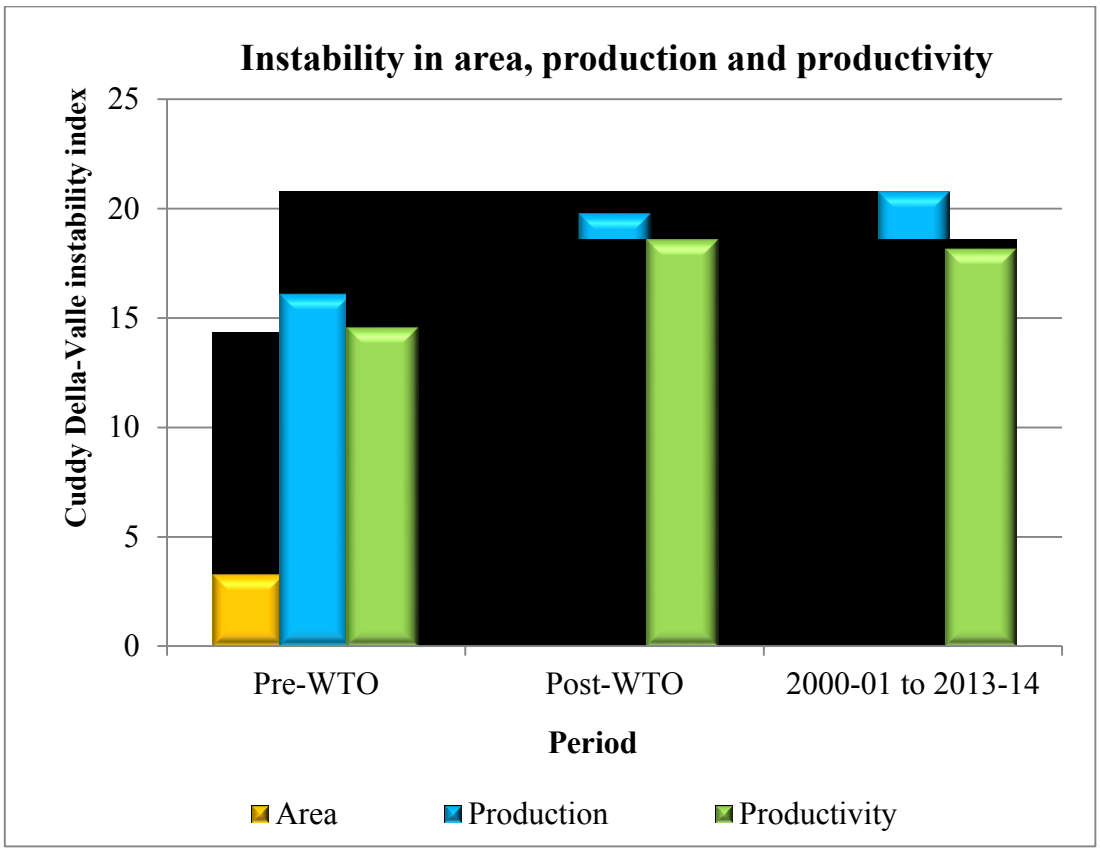

Figure 3. Instability in area, production and productivity of pepper in Kerala

Although instability in area showed a remarkable change from period 2 to period 3, the variation of instability in production and productivity was negligible in both the periods.

Table 10. Instability in area, production and productivity of pepper cultivation in Kerala

Particulars	Area		Production		Productivity	
	CV (%)	Ix	CV (%)	Ix	CV (%)	Ix
Period 1 (1980-81 to 1994-95)	22	3.30	32.35	16.10	15.53	14.57
Period 2 (1995-96 to 2013-14)	26.37	10.16	27.61	19.75	18.8	18.56
Period 3 (2000-01 to 2013-14)	37.3	14.33	30.9	20.74	19.2	18.16
Overall Period (1980-81 to 2013-14)	26.83	10.05	33.48	19.37	19.17	17.19

Ix = Cuddy Della Valle index; CV= Coefficient of variation

Also production registered the maximum instability than area and productivity in all the periods which, as mentioned earlier, is due to productivity effect.

4.1.2 Instability in Pepper Export

Despite the diminishing share of agriculture in the GDP and the total export earnings of the country, the role of agriculture sector and its importance to the overall economic growth continues to assume importance. Today the share of pepper in the export basket of India has considerably declined, the sector not being able to keep up with the pace of growth and value addition that took place over the years in the non-agricultural sector. In 2013-14 pepper contributed to 2.39 per cent of total spices export (Economic Survey, 2014-15). Figure 4 shows the trend in quantity and value of pepper exported from India and the fluctuations in export over the years.

Pepper exports rose from 15,979 tonnes in 2013-14 to 16,204 tonnes in 2014-15. The pepper export from Cochin port during 2014-15 fiscal year worth Rs.1112.6 crores.

More than 80 per cent of pepper produced in India is consumed within and only 17.2 per cent of the produce is currently exported (Deepika, 2015). India is rated as the highest pepper consuming country in the world. Our consumption is more than what we produce. This may be due to the marketable surplus available from the previous years as pepper can be stored for longer period of time. Another reason may be due to the import from other countries like Vietnam and Sri Lanka as we extend a FTA (Free Trade Agreement) with these countries.

A perusal of the data on domestic consumption of pepper in India (Table 11) revealed that pepper consumption varies from 87.12 per cent to 129.45 per cent. Sudheer (2014) pointed out that the two dimensions of the emerging problems related to the Indian pepper industry can be attributed to the sharply declining production of pepper and constant increase in its domestic consumption.

The domestic consumption of pepper has increased from an annual average of 4.84 thousand tonnes during 1961-1970 to annual average of 60.50 thousand tonnes during 2001-2007. Approximately 38 per cent of global production is consumed in the producing countries, which is close to 1,53,000 tonnes in 2014, with the major share of consumption by India and China (Gulick, 2014).

Asian countries like Vietnam, Srilanka and Thailand have emerged as major producers of pepper and their domestic consumption is practically nil. When compared to India the annual domestic consumption of pepper in Vietnam is very low accounting to only 10 per cent of their total pepper production. So, major portions of the total pepper produced in these countries are exported.

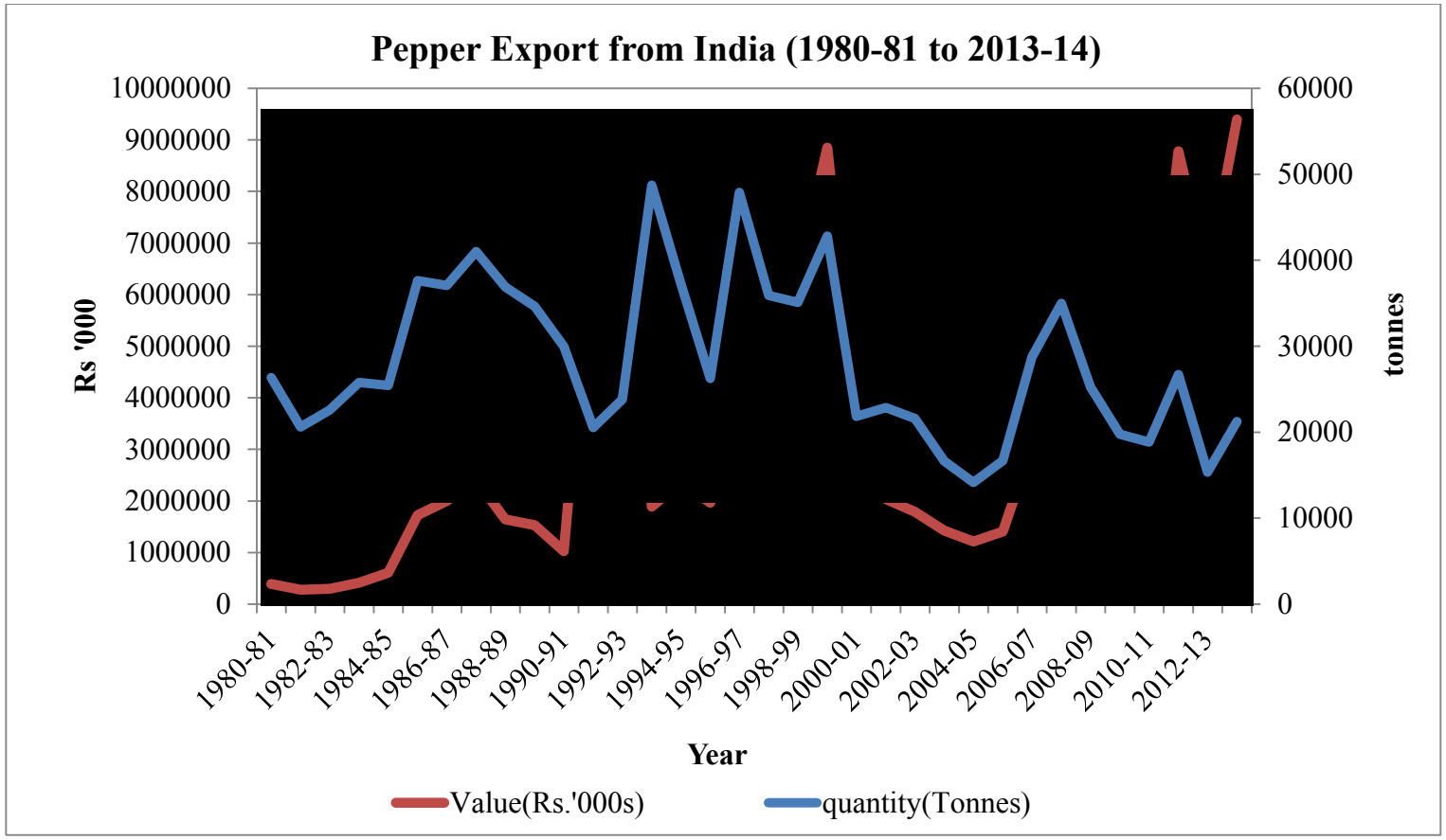

Figure 4. Export of pepper from India (1980-81 to 2013-14)

Table 11. Production and consumption of pepper in India from 2004-05 to 2013-14

Year	Production (MT)	Domestic Consumption (MT)	Percentage of domestic consumption to production (%)	Import Quantity (MT)
2004-05	70000	61000	87.14	17725
2005-06	55000	61000	110.91	18857
2006-07	50050	58000	115.88	16870
2007-08	50100	55000	109.78	13500
2008-09	50000	50000	100.00	10750
2009-10	50000	50000	100.00	18100
2010-11	48000	47500	98.96	16100
2011-12	43000	42500	98.84	17565
2012-13	55000	57193	103.99	15600
2013-14*	45000	58251	129.45	3300*

*Estimate

Source: International Pepper Community, 2014; Spices Board, 2014; Pepper Crop Report, ESA annual meeting, 2014

Vietnam's pepper export of more than 1,20,000 tonnes accounts for about 40 per cent of volume and 50 per cent of the market share worldwide and exports of pepper in 2014 set a record of 1 billion USD (Vietnam Trade Promoting Agency, 2015). Export from India during 2012 decreased to around 17,800 MT worth 122.5 million USD, including export of ground and green pepper products, as against 23,750 MT worth 149 million USD in 2011. The export recorded a decrease of 26 per cent in quantity and 18 per cent in value (International Pepper Community, 2014).

The prices of pepper exported from these countries are low when compared to Indian pepper and these cheap exports have adversely affected the market of Indian pepper. This is the major reason for the high export value of Indian pepper. The FOB (Freight on Board) price of Indian pepper was 9680 USD/MT and that of Vietnam

and Indonesia were 8294 USD/MT and 8394 USD/MT respectively during early 2015. The decline in total output of pepper in India and its high price led many of the regular buyers for Malabar pepper, like USA, UK, to switch over to cheaper pepper from other origins to satisfy their requirements. From the above facts it is evident that other pepper producing countries like Vietnam, Srilanka etc. are posing serious challenge to Indian pepper market.

To know India's performance in export of pepper during pre and post WTO period, Cuddy Della-Valle instability index was estimated for quantitative as well as value terms. The results obtained are presented in Table 12.

Table 12. Instability in export of pepper

Particulars	Export quantity		Export value		Export unit value	
	CV (%)	Ix	CV	Ix	CV (%)	Ix
Period 1 (1980-81 to 1994-95)	27.11	25.63	63.51	39.35	46.71	14.58
Period 2 (1995-96 to 2013-14)	36.58	31.13	60.68	45.62	64.45	20.66
Period 3 (2000-01 to 2013-14)	26.31	26.12	68.01	35.11	67.31	15.38
Overall Period (1980-81 to 2013-14)	32.92	27.99	80.85	53.28	96.00	39.56

Ix = Cuddy Della Valle index; CV= Coefficient of variation

It is clear from Table 12 that export value showed instability ranging from 35.11 to 53.28 in all the periods indicating high degree of variation whereas export quantity and unit value registered low instability when compared to export value. The instability in export value declined in the period 3 with the index value of 35.11 against 39.35 in the pre -WTO period indicating that pepper exports is tending towards stability.

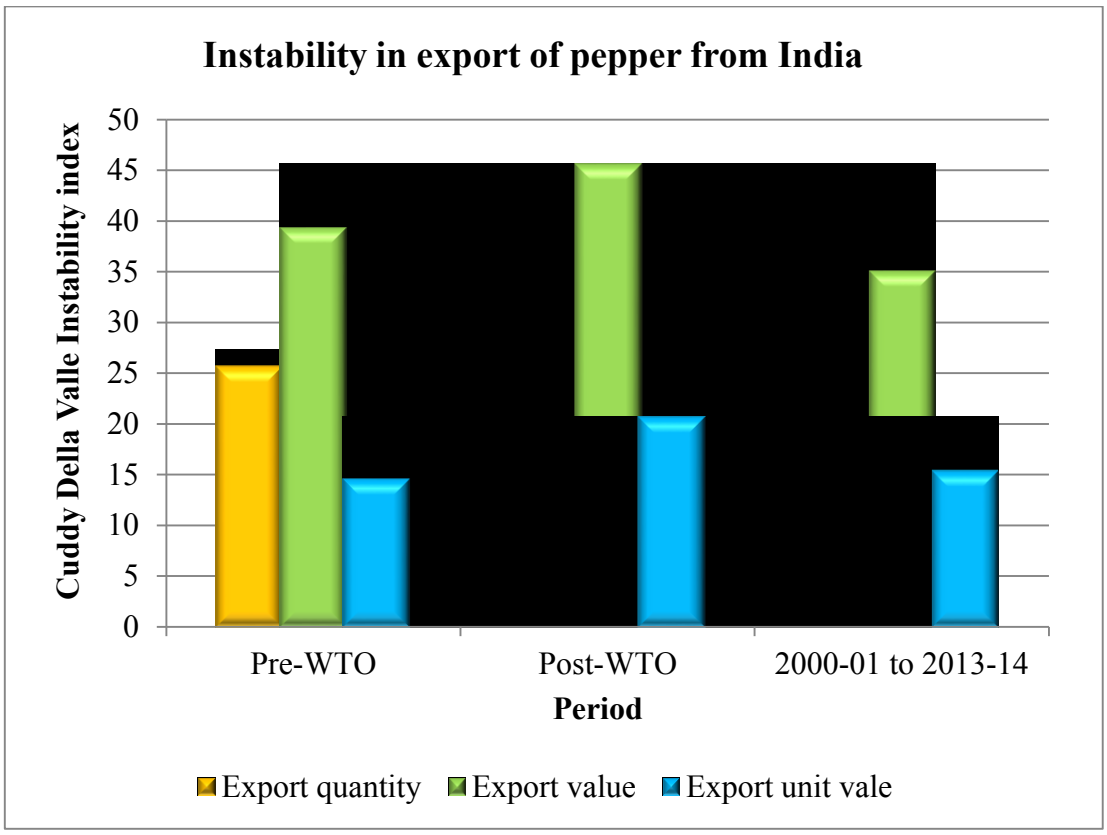

Figure 5. Instability in export of pepper from India

4.1.3 Instability in Price

Historically, black pepper has been a highly tradable export earning commodity of India and its domestic price, production as well as profitability are highly influenced by its international prices. In 2003-04, the domestic prices of black pepper plunged down to Rs. 74/kg from a peak of Rs. 215/kg in 1999-2000 (Figure 6). Factors influencing the price of pepper are domestic and international demand and supply, international trading prices, Government policies with regard to imports and exports etc. (Jain and Arora, 2014).

The domestic supply variables were found to be responsive to the international market conditions. The supply volatility of pepper in the global market is one of the reasons for price instability which impinge on the small and marginal farmers, with whom a majority of pepper cultivating area is vested. It was observed that the annual average growth rate of pepper price was found the lowest in India during 2004-09 when compared to other pepper producing countries (Joseph, n.d.).

Table 13. Instability in price of pepper

Particulars	International price		Domestic price	
	CV (%)	Ix	CV (%)	Ix
Period 1 (1980-81 to 1994-95)	48.37	28.01	46.87	24.11
Period 2 (1995-96 to 2013-14)	62.01	29.49	66.71	23.16
Period 3 (2000-01 to 2013-14)	66.89	15.37	72.53	16.36
Overall Period (1980-81 to 2013-14)	93.26	48.04	98.65	61.13

Ix = Cuddy Della Valle index; CV= Coefficient of variation

Instability of pepper during the study period is presented in Table 13. The analysis revealed that the instability in both domestic and international price declined

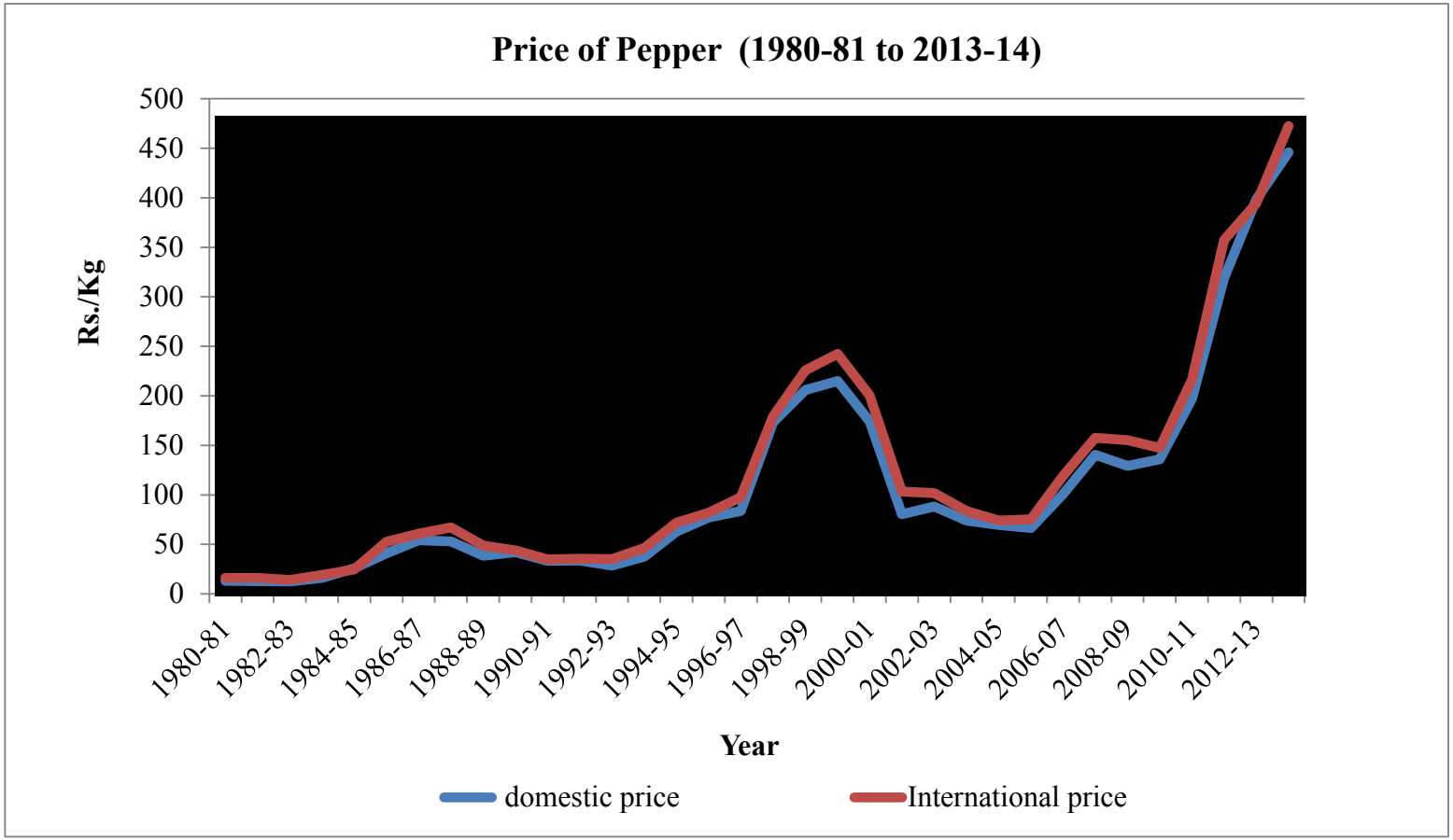

Figure 6. Price of pepper from 1980-81 to 2013-14

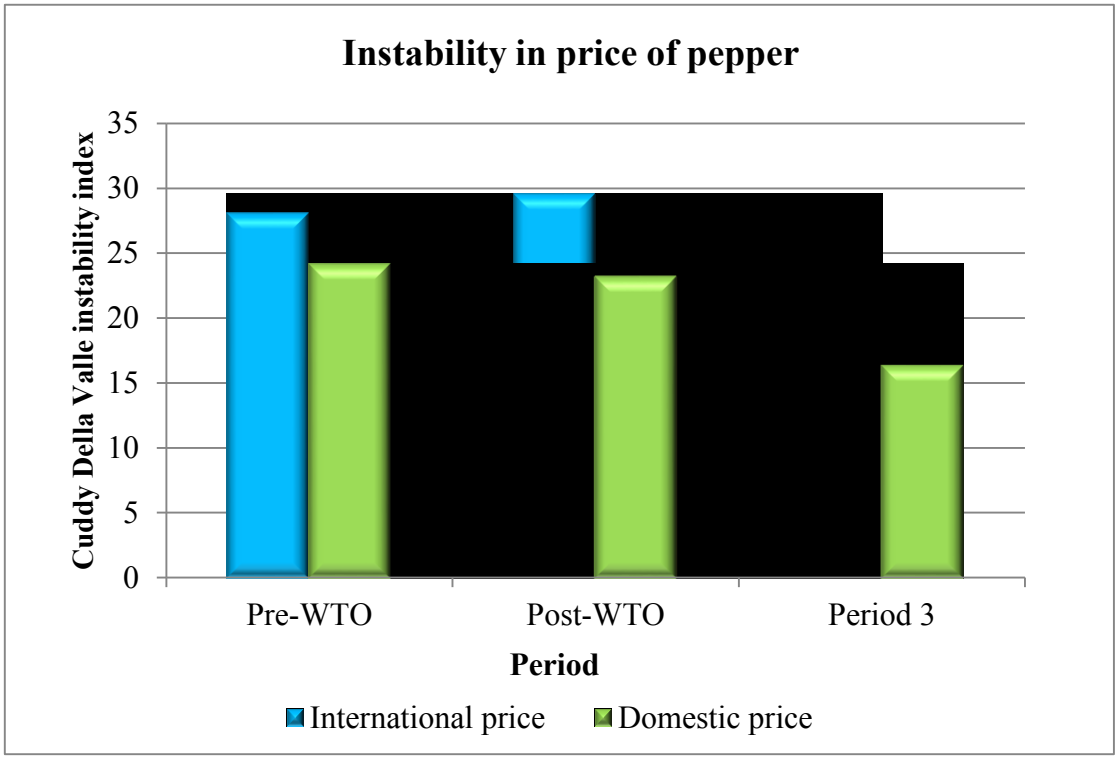

Figure 7. Instability in price of pepper

in period 3 and became stable. Sinharoy and Nair (1994) observed that due to open trade status of pepper, its prices had moved synchronously, indicating integration of the world pepper market. They also pointed out that due to the oligopolistic nature of the world market for pepper; its prices did not deviate much.

4.2 FORECASTING OF PEPPER EXPORTS

Forecasting was done by using time series data of pepper export from 1980-81 to 2012-13. Simple moving average method was adopted since it is useful in removing the random fluctuations in the data for forecasting. Three year moving average and five year moving average were tried to forecast pepper exports and the best forecasting model obtained was five year moving average.

4.2.1 Five Year Moving Average

Table 14. Comparison of 3 and 5 year moving average regression equations (1980-81 to 2013-14)

3 year Moving Average					
Particulars	**b_0**	**b_1**	**b_2**	**b_3**	**Adjusted R^2**
Coefficients	18030.7	3876.56	-251.6	4.21	50.39
t value	4.47	3.72	-3.45	2.89	
p value	0.0001	0.0009	0.0018	0.007	
Significance	Significant at 1% and 5% level				
5 year Moving Average					
Particulars	**b_0**	**b_1**	**b_2**	**b_3**	**Adjusted R^2**
Coefficients	21153.08	3534.9	-252.482	4.54	61.5
t value	6.46	3.93	-3.78	3.20	
p value	7.54E-07	0.00056	0.00083	0.0036	
significance	Significant at 1% and 5% level				

The five year moving average was found to be better than three year moving average and was employed in forecasting. The moving average values obtained was regressed with time. Quadratic model was found to be the best fit with R^2 value 61.5. The quadratic model fitted was,

$$Y = 21153.08+3534.9\ X – 252.48\ X^2 + 4.54\ X^3$$

Where, Y = export quantity of pepper

X = time (1980-81 to 2013-14)

Table 15 and Figure 8 provides the 5 year moving average and the predicted export value which was obtained by using the cubic regression equation being the best fit regression model. The projection by applying moving average put the total pepper export in terms of quantity as 22,546.02 tonnes, 23,350.62 tonnes and 24,494.69 tonnes, during the years 2014-15, 2015-16, and 2016-17 respectively showing a positive and increasing trend.

As per IPC (International Pepper Community), the global output of pepper in 2015 was estimated as 3,74,500 tonnes. The production in India during 2015 was forecasted to be around 70,000 tonnes which is almost double that of 2014 production. The domestic consumption in India was projected to be around 46,000 tonnes, which in turn is expected to grow annually at four to five per cent. The demand and consumption of pepper is increasing on an average of 3 per cent annually. USA is the largest importer of pepper followed by UK, Germany, UAE, Singapore, Saudi Arabia and other European countries with a consumption of 1,58,000 tonnes annually. Hence, considering the overall production and demand for pepper from the external markets the export quantity from India may witness an increase, especially since there was a decline in the total production of pepper in Vietnam last year. Vietnam’s decline in production will affect the importing countries and to meet their requirements they are expected to depend upon India.

Table 15. Five year moving average and predicted quantity of pepper exports from India

Year	5 year Moving average	Predicted export (tonnes)	Year	5 year Moving average	Predicted export (tonnes)
1980-81			1999-00	31709.4	29454.39
1981-82			2000-01	28849.8	28310.03
1982-83	24154.2	24440.04	2001-02	25155	27178.26
1983-84	26405.4	27249.28	2002-03	19420.2	26086.32
1984-85	29700.4	29608.03	2003-04	18394.2	25061.46
1985-86	33384.2	31543.54	2004-05	19568.8	24130.92
1986-87	35608.4	33083.04	2005-06	22247	23321.92
1987-88	37454.4	34253.78	2006-07	23970	22661.72
1988-89	35927.4	35082.99	2007-08	25090	22177.56
1989-90	32617.8	35597.93	2008-09	25520	21896.66
1990-91	29179.8	35825.82	2009-10	25110	21846.28
1991-92	31546.8	35793.90	2010-11	21182.6	22053.66
1992-93	32069.6	35529.42	2011-12	20382.6	22546.02
1993-94	31321.4	35059.61	2012-13		23350.62*
1994-95	36793	34411.72	2013-14		24494.69*
1995-96	39210.2	33612.99	2014-15		26005.48*
1996-97	36483.4	32690.65	2015-16		27910.2*
1997-98	37595.4	31671.94	2016-17		
1998-99	36712.6	30584.11	2017-18		

*Forecasted values

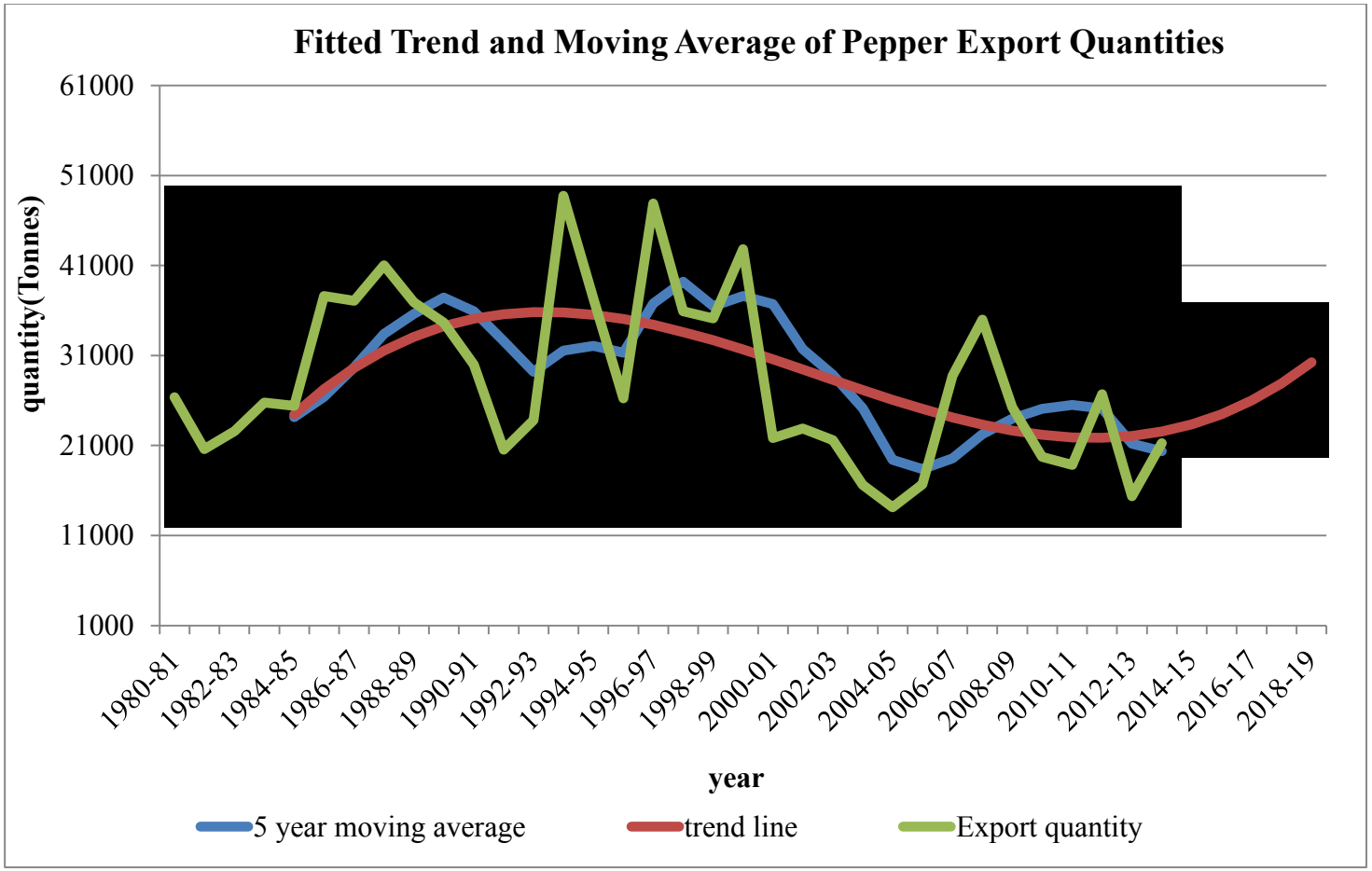

Figure 8. Fitted trend and moving average of pepper export quantities

4.3 TRADE COMPETITIVENES OF PEPPER

The export competitiveness of pepper was determined by estimating the Nominal Protection Coefficient (NPC) and the result of the analysis is given in Appendix IV. The pre and post WTO period was divided into four subdivisions each for getting more clarity in explaining the results of the analysis and is given in Table 16.

Table 16. Nominal Protection Coefficient (NPC) of pepper

Pre WTO	**NPC**
1980-81 to 1984-85	0.98
1985-86 to 1989-90	0.92
1990-91 to 1994-95	0.94
1980-81 to 1994-95	0.95
Average of pre-WTO	**0.95**
Post WTO	
1995-96 to 1999-00	1.08
2000-01 to 2004-05	0.93
2005-06 to 2009-10	0.87
2010-11 to 2013-14	0.98
Average of post-WTO	**0.96**
Average for Overall period	**0.96**

If the value of NPC is less than one it indicates that the commodity is competitive in that particular period and from Table 16 it is clear that pepper showed competitive advantage in all the periods except during 1995-96 to 1999-00. During this period domestic as well as international price of pepper registered a decline which put the most remunerative pepper crop in to a crisis. The study by Singh (2011) pointed out that the currency devaluation of crisis-ridden East Asian

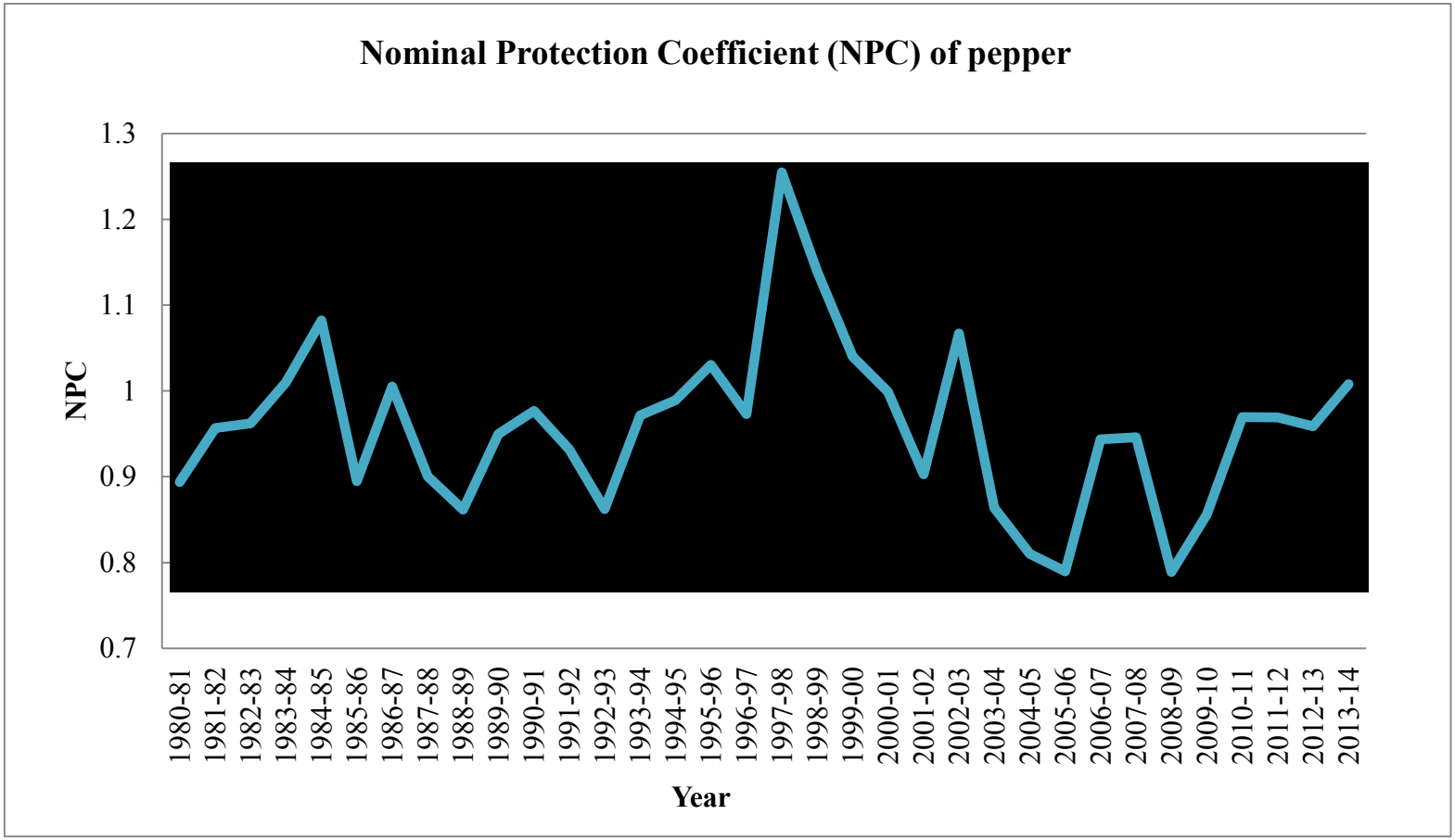

Figure 9. Nominal Protection Coefficient (NPC) of pepper

economies has adversely influenced the Indian exports during the period 1996-2000 and even mitigated the positive impact of the support provided to exports within the domestic policy framework by shifting the demand for India's exports towards the devalued countries and increasing the relative prices of India's exports. The trade competitiveness of pepper depicted in Figure 9 revealed that the NPC values lay around one showing that price in both domestic and international markets moved more or less in a same pattern indicating high competition in the international pepper market. Indian pepper is in the brim of competitive advantage and disadvantage. To perk up the competitiveness of Indian pepper, appropriate measures should be taken to improve productivity of pepper and to reduce the cost of production.

Cost of production and productivity per unit area determine the competitiveness of a commodity in the market (Thomas, 2009). Low productivity and high production cost made Indian pepper costlier when compared to other countries in the world market. So, measures to reduce the cost of production and enhancement of productivity of pepper are the thrust of the time.

4.4 CHANGES IN ECONOMICS OF PEPPER

The changes in economics cost of cultivation and returns of pepper was estimated using the time series data collected from the Department of Economics and Statistics, GOK. The changes in economics over time for pepper were analysed for the pre and post WTO period. It was found that the cost increased on all major inputs like, human labour, seeds, fertilizers and manures.

The change in cost of cultivation from pre WTO to post WTO period was from 45,672.8 Rs/ha to 2,98,296.9 Rs/ha registering a percentage change of 553.12 per cent at current prices resulting in an increase of 6.5 times. The percentage change in cost of human labour was mainly due to the increase in wage rates over time. The change in hired human labour (584.74%) and land tax and irrigation cess (752.31%) were incurred to the highest change than all the other inputs. Cost incurred for

Table 17. Changes in cost of cultivation of pepper over pre and post WTO periods (Rs/ha)

S l No.	Particulars	Pre WTO period	Post WTO period	Percentage change from pre WTO to post WTO period
1.	Hired human labour	1930.9	13221.59	584.74
2.	Animal labour	9	3.13	-65.28
3.	Machine labour	57.3	59.23	3.31
4.	Seed/Seedlings	92.6	350.3	278.14
5.	Farmyard manure and chemical fertilizers	912.8	4640.1	408.32
6.	Plant protection	37.4	216.6	479.83
7.	Land tax and irrigation cess	11.1	94.5	752.31
8.	Repair and maintenance charges	115.5	843.8	630.3
9.	Other expenses	313.4	1888.5	502.66
10.	Interest on working capital	75.9	882	1061.92
11.	Total cost A(1 to 10)	3521.7	30492.4	765.84
12.	Interest on fixed capital	685.6	5325.9	676.8
13.	Cost B1 (11+12)	4949.3	27589.2	457.44
14.	Interest on land value	39750.4	266399.3	570.18
15.	Cost B2(13+14)	44710.9	293988.5	557.53
16.	Imputed value of household labour	961.9	4308.4	347.91
17.	Cost C(15+16)	45672.8	298296.9	553.12

Table 18. Changes in returns of pepper cultivation in Kerala over pre and post WTO periods (Rs/ha)

S l No.	Particulars	Pre WTO period	Post WTO period	Percentage change from pre WTO to post WTO period
1.	Value of output	17392.6	56712.4	226.07
2.	Net returns at cost A	13870.9	26220	89
3.	Net returns at cost B1	12443.3	29123.2	134
4.	Net returns at cost B2	-27318.3	-237276	768
5.	Net returns at cost C	-28280.2	-241585	754

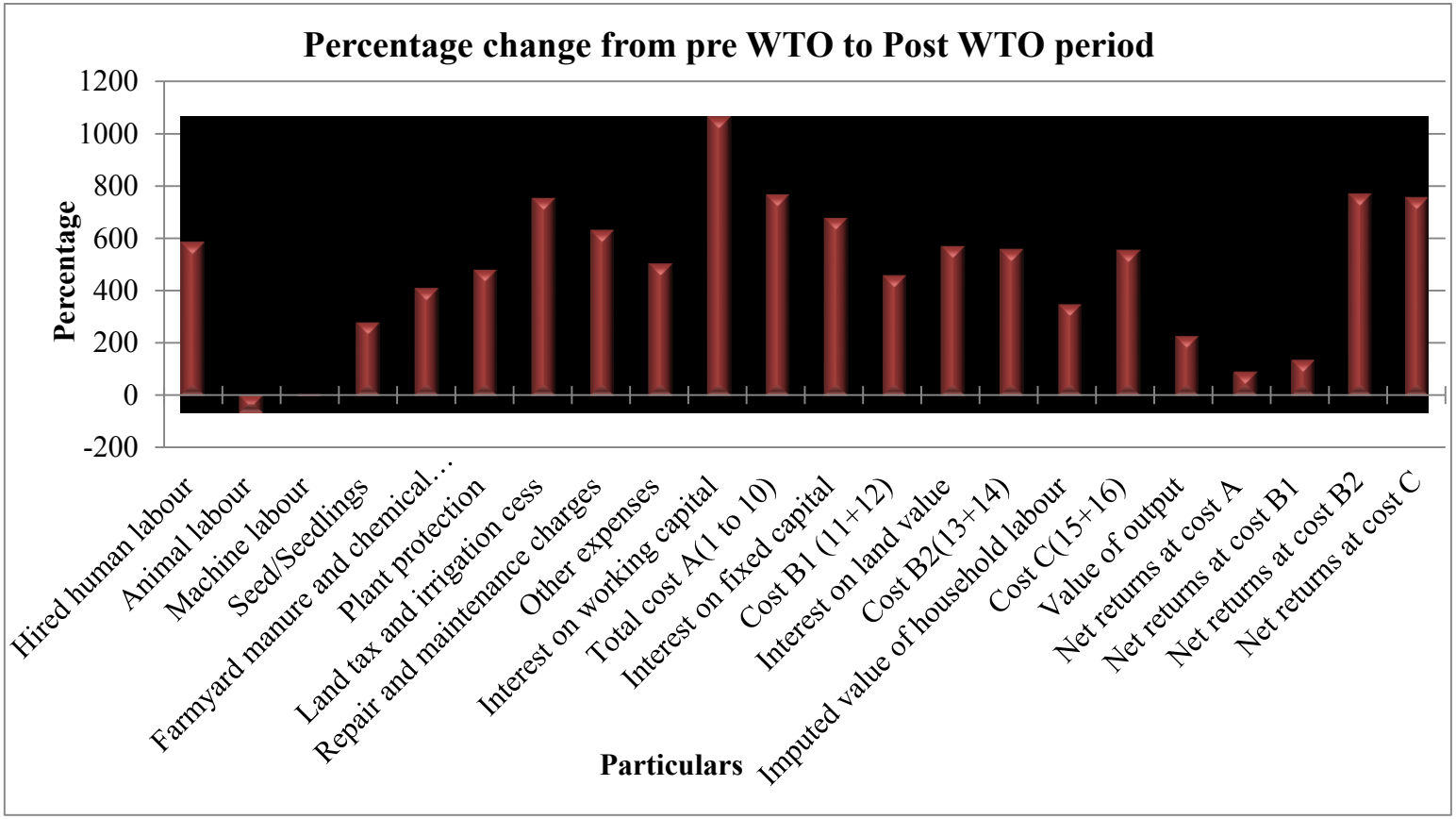

Figure 10. Percentage change from pre WTO to post WTO period

fertilizer and manure application have gone up to 4640.1 Rs/ha during post WTO period from 912.8 Rs/ha during post WTO period with a percentage change of 408.32 per cent.

The change in value of output of pepper cultivation is given in Table 18. The percentage change over pre WTO period was 226.07 per cent which is mainly due to the increase in price of pepper during the recent years. The net returns at cost A, cost B1, cost B2 and cost C showed a positive change with 89 per cent, 134 per cent, 768 per cent and 754 per cent respectively. It is also seen that pepper is profitable in the post WTO period.

4.5 ANALYSIS OF PRIMARY DATA

4.5.1 Constraints in Black Pepper Production and Marketing

In this study, the constraints experienced during pepper cultivation are grouped into production and marketing constraints. Production constraints are related to the biophysical and technical constraints. They include problems related to pest and diseases, soil and climate, quality of seeds etc. Marketing constraints include the difficulties faced by the farmers and traders in the process of marketing pepper.

In order to identify the major constraints the respondents were asked to rank the challenges they encounter and the response obtained were analysed and are presented in Table 19. Incidence of pest and diseases was ranked as the first by the respondents, with a total score of 426. Phytophthora foot rot (Quick wilt), which has destroyed most of the vines in the plantations in several parts of the districts, and other diseases have been responsible for the sharp fall in the output. Phytophthora foot rot disease caused by the fungus *Phytophthora capsici* occurring mainly during the southwest monsoon season continues to be a serious problem in India. All parts of the vine are affected and the symptom expression depends upon the site or plant part infected and the extent of damage. Pollu disease (Anthracnose) caused due to

Table 19. Constraints experienced by pepper farmers

Constraints	Total Score	Rank
Production		
Incidence of pest and diseases	426	1
Lack of agricultural labour	419	2
Impact of climate	384	3
Low productivity	369	4
High wage rate	360	5
Senile plantations	328	6
High cost of inputs	304	7
Wild animals	254	8
Soil problems	204	9
Absence of good quality standards	200	10
Lack of planting materials	182	11
Lack of knowledge about pest and diseases	178	12
Lack of credit availability	126	13
Absence of suitable varieties	120	14
Lack of knowledge about fertilizer recommendations	114	15
Lack of knowledge about plant protection chemicals	96	16
Marketing		
Low selling price	52	1
Delay in payment by traders	40	2
Lack of storage facility	38	3
Distance to the market	36	4
Lack of transportation facilities	23	5

*Colletotrichum gloeosporioide*s, which appears towards the end of the monsoon, was found to be another major disease affecting pepper. Most of the farmers opined that quick wilt and pollu disease were the major challenges they encounter in pepper cultivation. Similar findings were observed by Mammootty *et al,* 2008; Devasahayam *et al,* 2008; Soumya *et al,* 2014.

The pollu beetle (*Longitarsus nigripennis*) was the most destructive pest and is more serious in pepper plantations. Insect pest problem of erythrina (standard) was also a major issue. Erythrina was widely destroyed by a number of insect pests such as borers, leaf folders, spittlebugs and Erythrina gall wasp.

In most of the plantations pepper vines were trailed in disease affected standards which also affects the performance of the vines.

Acute shortage of labour was a very crucial problem in pepper cultivation and was ranked second constraint with a total score of 419. All small, marginal and big farmers are finding it difficult to avail labourers. Most of the labourers are now part of the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) programme. Even if the farmers can avail labourers through MNREGA, it is difficult to obtain their service at proper time. Other reasons for the scarcity of agricultural labour were migration of youths at least with primary level of education to cities in search of other jobs, lack of interest in farming among the present generation, small family size and spread of higher education in rural areas.

Impact of climate was another constraint the pepper farmers face. The untimely incessant rain leads to spike shedding and affects the productivity of the vines. Prabhakaran (1998) pointed out similar observations in his study. Also the pepper plantations in Mullankolli and Pulpally in Wayanad district were affected with severe droughts which resulted in a very low productivity. There has been decrease in area also. Low productivity, high wage rate, senile plantations, high costs of inputs, wild animals, soil fertility were the other constraints that the pepper farmers

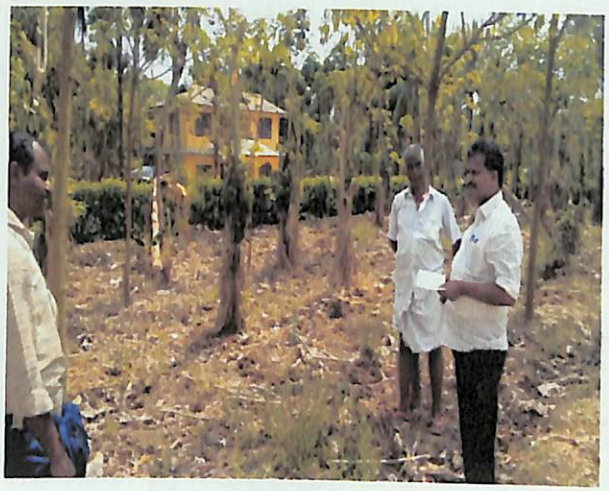

Plate 1. Survey in farmer's field

Plate 2. Senile plantations

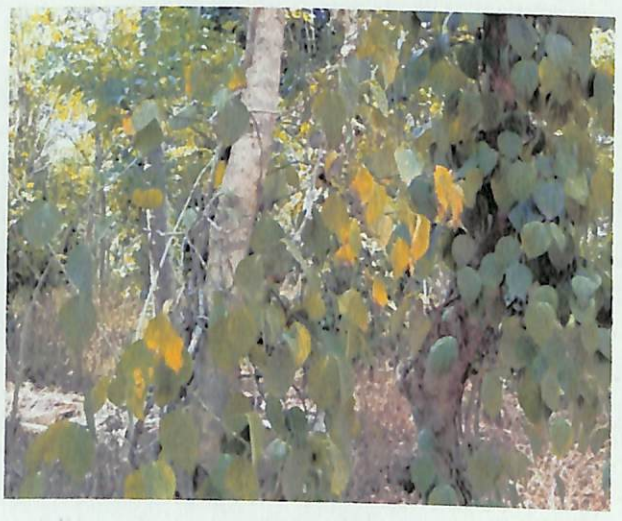

Plate 3. Disease affected pepper vines

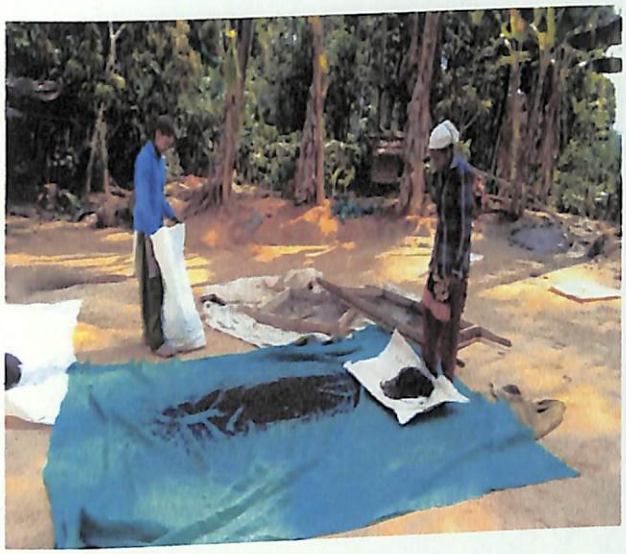

Plate 4. Drying of pepper

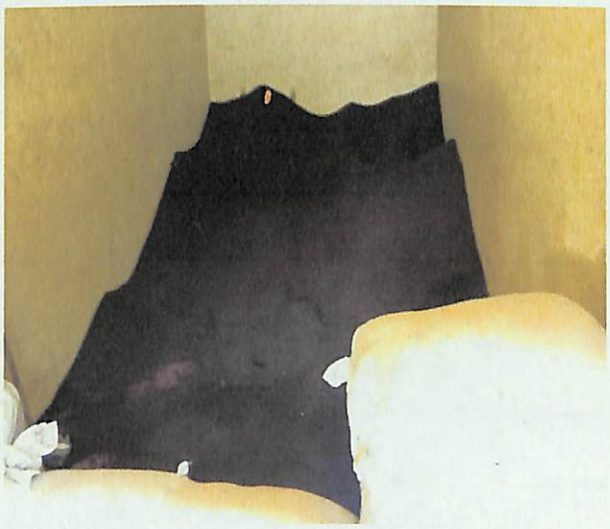

Plate 5. Storage of pepper

Plate 6. Organic pepper products exported by 'Vanamoolika'

face. A number of factors contribute to the decrease in productivity which includes factors mentioned above along with the constraints mentioned above, lack of good quality planting materials and standards also contributed to the decline in productivity of pepper. Wild animals are also posing threat in Wayanad district not only to pepper plantations but to all other crops also. The constraints obtained are in concordance with the study conducted by Sneha (2012).

From Table 20 it can be inferred that fluctuating prices are a real worry for pepper traders as well as exporters. The price of pepper during the study period showed an erratic nature. As a result traders could not predict the price of pepper which prevented them to think of a reserve price in pepper trade. The consistently falling selling price from 2000 till early 2012 affected pepper farmers and traders adversely. Most of the farmers shifted to more remunerative crops during this period. The import of pepper from other countries and the competition from the major pepper producing countries like Vietnam, Srilanka etc. also were a matter of concern for the traders.

Table 20. Constraints experienced by pepper traders

Constraints	Total Score	Rank
Fluctuations in price	52	1
Low selling price	40	2
Import of pepper	38	3
Competition from other pepper producing countries	36	4
Absence of suitable markets for sale	23	5

The only way to ensure remunerative price to the farmers while maintaining export price at competitive level is to increase the yield of the crop and to decrease the cost of production.

4.5.2 Production Aspects of Pepper

4.5.2.1 Economics of Pepper

Most of the pepper growers were small and marginal farmers in the study area and the average size of holdings of the sample was 2.64 hectare. The total maintenance cost incurred for one hectare pepper cultivation was estimated as Rs. 85,900 during 2014-15. The returns obtained for the same period with a market price of Rs. 445 was Rs. 4,22,750 with a net returns gained of Rs.3,36,850.

Table 21. Economics of pepper cultivation

Sl No.	Particulars	Average (n=30)
1.	Size of holdings (ha)	2.64
2.	Total cost (Rs/ha)	85,900
3.	Output/ha(q)	9.5
4.	Returns(Rs/ha) at Rs.445/kg	4,22,750
5.	Net returns(Rs/ha)	3,36,850

It is evident that in the prevailing price pepper is highly remunerative. Similar findings were reported by Sneha (2012) also.

4.5.2.2 Response of Farmers on Various Production Aspects of Pepper

Majority of the pepper farmers opined that the area under pepper cultivation has decreased. Most of them shifted to cardamom, vanilla and coffee during the period of price crisis of pepper during late 1990s. In Idukki district a large portion of the pepper plantations are now transformed in to cardamom plantations.

With regard to the productivity of pepper, 90 per cent opined that productivity of pepper declined over the years. This is because of the various constraints

mentioned resulting in the neglect of pepper fields leading to vast area of senile plantations.

Table 22. Response of farmers on various production aspects of pepper

Sl. No.	Particulars	Responses / Frequencies			
		Yes	%	No.	%
1.	Area under pepper decreased	17	56.70	13	43.30
2.	Productivity of pepper decreased	27	90.00	3	10.00
3.	Profitability of pepper	25	83.30	5	16.70
4.	Fluctuating price affected pepper cultivation	23	76.70	7	23.30
5.	Organic method of cultivation	18	60.00	12	40.00
6.	Adequate labour availability	14	46.70	16	53.30
7.	Labour wages are high	22	73.30	8	26.70
8.	Marketing practices need improvement	21	70.00	9	30.00
9.	Getting support from government	24	80.00	6	20.00

More than 80 per cent of the respondents opined that in the prevailing price situation pepper is a profitable crop. The decline in productivity resulting in low output accounts for the minimal returns from pepper.

It is evident from Table 22 that the fluctuating prices had adversely affected pepper cultivation. Due to the erratic nature of pepper price many of the farmers abandoned the crop and most of the farmers shifted to other remunerative crops and others neglected the plantations without any maintenance.

The Agreement on the Application of Sanitary and Phytosanitory Measures (SPS) under WTO deals with the application of food safety and plant health regulations. Under this agreement quality standards were to be followed. Organic products following good agricultural practices are fetching good market in international as well as domestic markets. Being the most important export earning crop, organic cultivation is a must in pepper cultivation. 60 per cent of the respondents were adopting organic cultivation and the remaining 40 per cent were following conventional cultivation.

Lack of labourers is a major problem faced by agriculture across Kerala, particularly in the plantation sector. More than 53 per cent of the respondents opined that labourers are not available for carrying out various operations in time. Most of the pepper plantations in Idukki district are employing agricultural labourers from Tamil Nadu. More than 73 per cent have of the farmers said that the labour wages were high whereas, about 26 per cent opined that labour wages are reasonable.

70 per cent of the farmers reported that marketing practices need improvement and 30 per cent of them were satisfied with the existing situation.

Government of Kerala and Spices Board have a number of schemes for providing financial assistance to spices growers, but all the farmers were not able to avail the benefit of such schemes. It is also seen that only 20 per cent of the farmers failed to avail support from Government. Spices Board provides replanting subsidy and new planting subsidy for pepper growers. State government's assistance is generally provided through the local Krishibhavans in the form of subsidized

fertilizers, subsidy for motor pumps and concessional supply of electricity for agriculture.

Table 23. Marketing preference of farmers

Responses	No. of farmers	%
Local traders	20	66.70
Trade oriented societies	7	23.30
Exporters	3	10.00
Total	30	100

Even though pepper is an important exported crop, majority of the farmers (66.70%) depend upon local traders for selling their produce. Only 10 per cent of the sample sold to 'Vanamoolika', an export oriented society in Wayanad.

4.5.3 Perceptions of Farmers about WTO

4.5.3.1 Awareness on WTO

To study the impact of WTO Agreements on pepper cultivators and traders information on their awareness about the agreements were collected and given in Table 24.

Table 24. Awareness of WTO (perception of pepper farmers and traders)

Responses	Pepper farmers		Pepper traders	
	No.	%	No.	%
Fully aware	-	-	2	20.00
Partially aware	11	36.60	5	50.00
Not aware	19	63.40	3	30.00
Total	30	100	10	100

Perceptions of pepper cultivators and traders on the awareness of WTO Agreements on pepper trade revealed that 36.60 per cent of the respondent farmers are partially aware of WTO and 63.40 per cent are not at all aware and none of them are fully aware of WTO. In case of pepper traders 70 per cent are fully or partially aware of WTO, while 30 per cent are not at all aware of WTO. It can be concluded that pepper traders have a better awareness of WTO compared to pepper farmers.

4.5.3.2 Perceptions of Pepper Traders Regarding the Impact of WTO

Table 25. Response of pepper traders on the impact of WTO

Responses	Positive impact	
	No.	%
Yes	7	70.00
No	3	30.00
Total	10	100

A total of 70 per cent of the farmers responded that WTO has a positive impact in pepper trade, while 30 per cent opined that WTO doesn't have a positive impact on trade. It was seen that pepper showed trade competitiveness in international market in the post WTO period which shows the positive impact of WTO.

4.5 POLICY IMPLICATIONS

4.5.1 Drivers of Pepper Export Value

To ascertain the drivers of export value of pepper, an empirical analysis was carried out using regression analysis. The analysis capitulate the best set of factors influencing the export value and is provided in Table 26. The equation with the best adjusted R^2 of 96.33 and Mallows Cp value of 5.0 includes area, production, productivity, domestic price and export quantity which implies that the value of

pepper exported from India is highly influenced by these factors. Similar findings were reported by Krishnadas (2010).

Table 26. Factors influencing export value of pepper from India

No. of model parameters	R-Square	Adjusted R-Square	Mallows Cp	Variables in Model
1	0.8697	0.8589	30.3369	Area
2	0.9579	0.9502	5.0490	Export quantity Domestic price
3	0.9637	0.9529	5.2273	Export quantity Domestic price Area
4	0.9647	0.9490	6.9303	Productivity Export quantity Domestic price Area
5	0.9774	0.9633	5.0014	Area Production Productivity Export Quantity Domestic price

The equation with maximum R^2 was,

$$Y= -8337.25 - 0.21Pr +21.60Pv + 39.87Eq + 18.89Dp + 73.75A$$

Where,

Y = Export value of pepper

Pr =Production of pepper

Pv = Productivity of pepper

Eq =Export quantity

Dp =Domestic price

A =Area

Since the area, production, productivity of pepper is showing a decreasing trend over the years, emphasis should be given for enhancing the area, production and productivity of pepper by addressing the various constraints faced by the farmers timely and properly. Measures should be taken to stabilize the domestic price of pepper at a reasonably higher level to attract more farmers and to prevent farmers from shifting to other crops which adversely affected the export earnings of the country.

The Government of India has introduced number of programme to increase the production and productivity of pepper. Two schemes with Government assistance of Rs.120 crores for ldukki and Rs.53.28 crores for Wayanad and North East Region have been sanctioned in 2013 to enhance the pepper productivity and production in the country through replantation and rejuvenation of pepper. Spices Board is implementing various export development/promotion programmes for boosting the export of pepper from the country (GOI, 2013). The timely and efficient implementation of these programmes should be ensured by the Government to avail the benefits of these schemes by farmers. Export quantity is depended on the domestic production and consumption of pepper. Since India's domestic consumption accounts to more than 90 per cent of the total pepper production, enhancement of production should be ensured to satisfy the increasing domestic need as well as export requirements.

4.5.2 Sanitary and Phyto-Sanitary Compliance in Pepper

Sanitary and Phyto-sanitary (SPS) compliance in agricultural trade has received considerable attention for its ability to contribute towards production and development of safe and quality agri-products for domestic and international markets.

The Agreement on the application of Sanitary and Phyto -Sanitary Measures (SPS) under WTO deals with the application of food safety and animal and plant health regulations.

When it comes to quality of pepper, Indian pepper known in the market as Malabar Grade 1, is renowned for its good quality. Unfortunately, SPS measures were a big barrier to the export of agricultural products from the developing countries. Jain and Arora (2014) pointed out that the stock of Pepper was found adulterated with mineral oil in National Commodity & Derivatives Exchange Limited (NCDEX) accredited warehouse, Kerala in 2012. After the complaint of buyers on the stock of Pepper contained mineral oil, Food Safety and Standards Authority of India (FSSAI), the country's apex food regulator, had tested the stock with the help of NCDEX and the Spices Board, India, led to the sealing of at least 6400 tons of black Pepper till now.

To recapture the lost glory of Indian pepper in the international market and to compete with the cheap exports from other pepper producing countries we have to maintain a better quality adoption strategy. In this WTO driven environment, import from other countries also increased due to liberalization of trade

After WTO, black pepper from indigenous supply has become a relatively more risky enterprise from point of farmers and exporters. The SPS measure adopted by different importing countries are different and compliance with the varying SPS measures as fully legally vetted system of importing countries has brought challenges to Indian black pepper export. Since most of the importing countries have evolved SPS standards for having access to their markets, continuous efforts need to be made to harmonize the existing standards and form a uniform food safety standard (Aarathi *et al*., 2012).

In India, Agmark standards for spices are set as per the Spices Grading and Marking Rules, 2005 (Ministry of Agriculture, 2005). International Pepper

Community (IPC) is an intergovernmental organization of pepper producing countries (Brazil, India, Indonesia, Malaysia, Sri Lanka and Vietnam as full members and Papua New Guinea as an associated member) have developed certain quality standards for black pepper in 2001 (Table 27).

In USA, USFDA (United States Food and Drug Administration) fixes the standards for black pepper to be sold in USA in consultation with the ASTA (American Spice Trading Association). For Europe, the European Spice Association (ESA) fixes the standards for black pepper import and also specifies methods to be adopted by the black pepper exporting countries to test the physical parameters to be adopted. Physical parameters are clearly specified in the ASTA standards as well as in the Malaysian and IPC standards. The presence of insects and excreta are not at all allowed in Malaysia, whereas it is allowed to a certain limit in the US. But, these physical parameters are not defined in the Agmark (Indian) standards which indicate that these parameters are not considered important in India, and this needs to be reviewed.

Pesticide residue limit is another SPS measure which is also a challenge that the farmers in India have to deal with. Developing countries have been used to a certain type and level of usage of pesticides among which some pesticides like DDT and BHC have fallen out of favor. Henceforth, the Indian exporters are usually placed at a disadvantageous position to make use of the novel procedures to meet the international standards of pepper because of their limited ability to access the best quality ensuring practice, technology and information.

To ensure access to markets and to meet expectations of the major users of pepper, there has to be continued emphasis on improving quality of products exported from the producing countries. Attention has to be paid to microbiological and chemical safety of pepper and pepper products since the use of pesticides is increasing among pepper farmers. Pepper growers, traders and processors need to be

aware of the quality requirements of importing countries and quality systems such as GAP (Good Agricultural Practices) and HACCP (Hazard Analysis at Critical Control Points). Also, it is to be ensured that the quality requirements imposed are reasonable, uniform and achievable.

Table 27. Comparison of physical quality standards adopted by various countries and institutions for black pepper

Particulars	**Agmark (India)**	**ASTA**	**ESA**	**Japan**	**Malaysia**	**IPC**
Organic extraneous matter (% m/m) max	0.8		2			
Conventional extraneous matter (% m/m) max	0.2	1	2		1	1
Light berries (% m/m) max	5				2	2
Pinhead and broken berries max	4					
Bulk density (g/L) min	490					550
Moisture % (max)	11	12	12	11	10	12
Total ash (% m/m) max	6		7			
Non volatile ether extract % (min)	6					
Volatile oil % (ml/100 gram)	2.5		2			
Piperine content (% m/m) min	4					
Whole insects dead (by count)		2			<=2	
Excreta mammalian (mg/lb)		1			0	0
Other excreta (mg/lb)		5		0		
Mold (by weight)		6			1	
Insects defiled /infested % by weight max		5		0	1	
Acid insoluble ash (% w/w) max			1.5			

Source: Aarathi *et al*., 2012

SUMMARY

5. SUMMARY

From time immemorial India is regarded as the legendary land of spices, producing about 63 spices of the world. Pepper, known as the king of spices, plays a dominating role in the international as well as domestic markets all around the globe. Kerala renowned as the 'land of spices' is the major producer of pepper contributing to more than 90 per cent of the total pepper produced in the country followed by Karnataka and Tamil Nadu. India was the leading producer of pepper till 1990 after which Vietnam emerged as the top producing country pushing India to the second place. Pepper along with other plantation crops is a livelihood for millions of small and marginal farmers and provides employment directly and indirectly for many. So, a fall in this sector adversely affects the socio-economic development and likelihood security of these people who depends on this crop. In this WTO driven environment the present study was undertaken to analyse the impact of WTO in the pepper economy of Kerala with the following specific objectives,

5. Analysing the structural instability of pepper over the period.
6. To analyse the trade competitiveness of pepper in the global market
7. To forecast pepper exports and to suggest policy measures to improve pepper trade.
8. To analyse the changes in economics of pepper cultivation

The total study period was subdivided into two –Pre WTO period (1980-81 to 1995-96) and Post WTO period (1995-96 to 201314). Also, the instability for the last thirteen years (2000-01 to 2013-14), mentioned as period 3 henceforth, was figured out so as to examine the stability of production and export after the elementary stage of WTO.

The instability in area, production and productivity of pepper in Kerala and the instability in export of pepper from India in terms of quantity and value have been studied by using the Cuddy Della- Valle instability index. The analysis revealed that

the lower instability in area, production and productivity of pepper in Kerala during the pre-WTO period augmented in the post WTO period. The decreasing trend in area and production after 2005-06 can be attributed to pest and disease incidence, poor post harvest practices, weak crop management, climate change, shortage of labour etc. Price crisis and unfavorable weather conditions were found to be the other major reasons for the decline in the production of pepper. The study conducted by Soumya *et. al.,* (2014) on the growth and instability of spices revealed that the decrease in area and productivity of pepper was due to incidence of phytophthora foot rot and pest attacks since 1990.

Export value showed instability ranging from 35.11 to 53.28 in all the periods indicating high degree of variation whereas, export quantity and unit value registered low instability when compared to export value. The instability in export value declined in the period 3 with the index value of 35.11 against 39.35 in the pre -WTO period. The export of black pepper from India in terms of quantity and value fluctuated in a year to year basis. The major problems related to Indian pepper industry can be attributed to the sharply declining production of pepper and constant increase in its domestic consumption. India is rated as the highest pepper consuming country in the world. The liberalization of markets in the WTO era facilitated an increase in imports resulting in an inflow of pepper to India from other pepper producing countries.

Historically, black pepper has been a highly tradable export earning commodity of India and its domestic price, production as well as profitability are highly influenced by its international prices. The analysis revealed that the instability in both domestic and international price declined in period 3 and became comparatively stable. The supply volatility of pepper in the global market is one of the reasons for price instability which impinge on the small and marginal farmers, with whom a majority of pepper cultivating area is vested.

Forecasting was done by using time series data of pepper export from 1980-81 to 2012-13. Simple moving average method was adopted since it is useful in removing the random fluctuations in the data for forecasting. The projection by applying five moving average yielded the total pepper export in terms of quantity as 22,546.02 tonnes, 23,350.62 tonnes and 24,494.69 tonnes, during the years 2014-15, 2015-16, and 2016-17 respectively showing a positive and increasing trend.

The export competitiveness of pepper estimated using the Nominal Protection Coefficient (NPC) showed competitive advantage in both pre and post WTO period except during 1995-96 to 1999-00. During this period domestic as well as international price of pepper registered an unfathomable decline which also misshapen one of the most remunerative crops in to a crisis.

The structural changes over time in cost of cultivation of pepper was estimated using the time series data on cost of cultivation of pepper (1980-81 to 2013-14) collected from the Department of Economics and Statistics, GOK. It was found that the cost of all major inputs like, human labour, seeds, fertilizers and manures increased tremendously in the post WTO over the pre WTO period and the total cost of cultivation showed a change of 553.12 per cent. During the pre WTO period it was Rs.45,672.8/hectare and increased to Rs.2,98,296.9/hectare in the post WTO period recording an increase of 6.5 times. The change in human labour cost was mainly due to the increase in wage rates over time. The percentage change for hired human labour was 584.74 per cent which showed a remarkable increase of 8.5 times over the post WTO period. The net returns at cost A, cost B1 cost B2 and cost C showed an increase of 89 per cent, 134 per cent, 768 per cent and 754 per cent respectively during the period.

Primary data were collected from Idukki and Wayanad districts being the major pepper producing districts in Kerala, to analyze the constraints experienced by farmers and traders, the production aspects of pepper and the awareness about WTO. A total of 30 farmers and 10 traders were selected from both the districts.

The most important production constraint experienced by pepper growers were incidence of pest and disease and avoid high wage rate. Phytophthora foot rot (Quick wilt), has destroyed most of the vines in the plantations in several parts of the districts, was responsible for the sharp fall in the output.

Acute shortage of labour was a very crucial problem in pepper cultivation and was ranked second constraint with a total score of 419. All small, marginal and big farmers are finding it difficult to avail labourers. Impact of climate was another important constraint that the pepper farmers face. The untimely incessant rain leads to spike shedding affected the productivity of the vines. Also the pepper plantations in Mullankolli and Pulpally in Wayanad district were affected with severe droughts which resulted in a very low productivity. There has been decrease in area also. Low productivity, high wage rate, senile plantations, high costs of inputs, wild animals, soil fertility were the other constraints that the pepper farmers face. A number of other factors like lack of good quality planting materials and standards also contributed to the decline in productivity of pepper. Wild animals are also posing threat in Wayanad district not only to pepper plantations but to all other crops also.

The price of pepper during the study period showed an erratic nature. As a result traders could not predict the price of pepper which prevented them to think of a reserve price in pepper trade. The consistently falling selling price from 2000 till early 2012 affected pepper farmers and traders adversely. Most of the farmers shifted to more remunerative crops during this period.

Majority of the pepper growers were small and marginal farmers in the study area and the average size of holdings of the sample was 2.64 hectare. The maintenance cost incurred for one hectare of pepper cultivation was Rs. 85,900. The return obtained with a market price of Rs. 445 was Rs. 4,22,750 with a net return of Rs.3,36,850 per hectare. From the above analysis it is evident that in the prevailing market price pepper is a highly remunerative crop.

According to a majority of the farmers the area under pepper cultivation hectares decreased and was observed that most of the farmers in Idukki district shifted to crops like cardamom and vanila. A total of 90 per cent of the respondents opined that the productivity of pepper hectares declined for which the major reasons attributed was infestation of pest and diseases on vines and standards and climate change. About 77 per cent of the farmers opined that the fall in price had adversely affected pepper cultivation and about 83 per cent of them reported that pepper is a profitable in the prevailing price situation pepper. Among the total respondents 60 per cent had been adopting organic cultivation and the remaining 40 per cent were following conventional cultivation. Government of Kerala and Spices Board have a number of schemes for providing financial assistance to spices growers, but all the farmers were not able to avail such schemes. Among the total respondents only 20 per cent of the farmers failed to avail support from Government.

Awareness on the existing situation of trade policies under the liberalized WTO regime is obligatory for pepper farmers to reap the benefits of WTO policies. Unfortunately, none of the farmers were fully aware about WTO. About 37 per cent of the respondents were only even partially aware of WTO while 63 per cent were not at all aware of WTO. Among pepper traders 20 per cent were fully aware of WTO and 70 per cent responded that WTO has a positive impact in pepper trade.

5.1 Conclusion and Policy Implications

WTO (World Trade Organization) has brought remarkable changes to the global market by liberalizing trade through its three pillars: Market access, Domestic support and export subsidy. Like all the other sectors trade in agriculture was also liberalized which at the same time was a boon and ban for Indian farmers. Pepper was once the major export earning spice in India.

The instability in area, production, productivity and export of pepper, in terms of quantity and value, showed an increasing trend during the post WTO period.

Forecasted value of pepper exports showed a positive trend and pepper exports were found to be competitive during post WTO period implying that export competitiveness of black pepper was not negatively affected by WTO agreements. The results of the study also revealed that the area, production, productivity, export quantity and domestic price of pepper had significant influence in the value of pepper exported from India.

Alas, the period of glory of pepper in India is long gone and other south-east Asian countries are rapidly taking its position in the global market. Based on the salient findings of the study, to improve the present status of Indian pepper and make pepper trade more competitive in future also, certain policy implications that can be thought of are given below,

1. In order to increase the area under pepper in Kerala, pepper cultivation should be extended to all coconut farms and the existing pepper plantations should be rejuvenated. Incentives should be given to pepper farmers as subsides for planting material, irrigation and fertilizers. Cost of production also should be reduced.
2. For improving the production of pepper the farmers should update the technique of cultivation by adopting new and improved technologies
3. Government should procure pepper at reasonable price through regulated shops. Importance should be given to soil testing before applying fertilizers and awareness of farmers on the Pesticide Residue Limit (PRL) should be ensured.
4. Government should make sure that the dissemination of various schemes and policies, formulated for enhancing pepper cultivation and trade, is timely and effective.
5. Separate strategies have to be formulated for large and small holders so as to make this sector more competitive and more profitable.
6. Ensure GAP (Good Agricultural Practices) including better post harvest handling and storage facilities.

7. Quality standards are exceedingly important in international trade. Since the cost of Indian pepper is more than pepper produced from other countries, the only way we could attract buyers and prevent them from shifting to cheap exports is by ensuring high quality of pepper.
8. Produce more value added products using pepper and encourage both internal and external trade
9. To perk up the competitiveness of Indian pepper appropriate measures should be taken to improve productivity of pepper and to reduce the cost of production.
10. The export of pepper from India is being offered enormous potential. To make use of this potential, we have to figure out a clear cut export strategy like application of advanced technologies for production, setting up more processing units, strengthening of storage and warehouse capacity and improved quality standards.
11. Appropriate measures should be taken to stabilize price of pepper in international and pepper price. This could be achieved by maintaining a demand -supply equilibrium by organizations like International Pepper Community.
12. Awareness on WTO, tariffs, quotas and other trade policies should be given to pepper farmers and traders.

Raising the level of productivity and quality standards of pepper to internationally competitive levels is one of the major challenges following the dismantling of quantitative restrictions on imports, as per the WTO Agreement on Agriculture. The world trade regime under the WTO has opened up new export possibilities and new vistas for the farmers to earn higher values for their produce. The WTO, in fact the Agreement on Agriculture (AoA), provides new opportunities for export of agriculture products and, in this respect, India has yet to take advantage of the emerging opportunities to enlarge its trade, particularly with the widening of the global market.

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APPENDICES

Appendix I

Pepper economy of Kerala in the pre and post WTO regimes

Masters Research

Dept. Agricultural Economics

College of Agriculture, Vellayani

I. PERSONAL INFORMATION (PEPPER FARMERS)

Name: Age:

Address:

Education:

☐ Below SSLC ☐ SSLC ☐ PDC ☐ Degree ☐ Above degree

II. LAND HOLDINGS

Sl. No	**Particulars**	**Wet**	**Irrigated**	**Dry**	**Total**
1	Area owned				
2	Gross Cropped area				
3	Net Cropped area				
4	Valued of own land				

III. CROPPING PATTERN

Sl.No	Crop/Crop combinations	Variety	Area	yield

IV. COST OF CULTIVATION

	ITEM	QTY.	RATE	VALUE	COST	MACHINE LABOUR	HUMAN LABOUR						COST
							HIRED		FAMILY		MANAGEMENT		
							M	F	M	F	M	F	
1	Clearing of land												
2	Digging pits												
3	Standards												
5	Digging pits for pepper												
6	Pepper cuttings												
7	Organic manure												
8	Fertilizers												
9	Liming Material												
10	Gap filling												
11	Digging around standards												
12	Training of vines												
13	Plant protection chemicals												
14	Biopesticides/bioinsecticides												

15	Weedicides												
16	Irrigation												
17	Shading												
18	Mulching												
19	Other intercultural operations												
20	Harvesting												
21	Transport												
	TOTAL												

V. RETURNS

Sl.No	**Quantity**	**Price / Unit**	**Total Value**
1			
2			
3			
4			

VI.

1. How long have you been cultivating pepper?
2. Are you practicing organic cultivation
3. How long have you been adopting organic cultivation?
4. Were you cultivating pepper continuously over the year?
5. Plant protection:

Pest/Disease	Name	Chemicals/Organics used

6. Is pepper cultivation profitable in the current scenario?
7. Is there any decrease in the area under pepper cultivation?
8. Have the fluctuating pepper price affected your cultivation?
9. What do you think is the reason for the price fluctuations?
10. Do you think pepper is a reliable crop?
11. Is there a decrease in the productivity f pepper over the years?
12. If so, what were the major reasons for that in your opinion?
13. Labour availability :

    ☐ High ☐ Low

14. Labour charges:

    ☐ High ☐ Low

15. How far did the increased cost of production affect your total production?
16. How do you market your produce?
17. Do you think there must be an improvement in marketing practices?

18. Do you face any constraints in finance availability?
19. What are the major constraints faced during production and marketing practices?
20. Do you receive any Govt. support for cultivation?

VII. AWARENESS ON WTO

1. Do you know about WTO?
2. Do you think that globalisation can promote sustainable profit?
3. What is the trend in production of pepper in the last 20 years?
4. What is the trend in area, production and productivity in the last 20 years?
5. Are there any benefits due to WTO?

VIII. Constraints experienced by farmers:

Constraints	**Rank**
Absence of good quality standards	
High cost of inputs	
High wage rate	
Soil problems	
Impact of climate	
Senile plantations	
Lack of planting materials	
Wild animals	
Low productivity	
Incidence of pest and diseases	
Lack of agricultural labour	
Lack of knowledge about pest and diseases	

Lack of credit availability	
Absence of suitable varieties	
Lack of knowledge about fertilizer recommendations	
Lack of knowledge about plant protection chemicals	
Lack of transportation facilities	
Distance to the market	
Lack of storage facility	
Low selling price	
Delay in payment by traders	

Appendix II

Pepper economy of Kerala in the pre and post WTO regimes

Masters Research

Dept. Agricultural Economics

College of Agriculture, Vellayani

I. PERSONAL INFORMATION (PEPPER TRADERS)

Name: Age:

Address:

Education:

☐ Below SSLC ☐ SSLC ☐ PDC ☐ Degree ☐ Above degree

II.

1. How many years have you been in pepper trade?
2. Among organic and inorganic pepper, which do you market most?
3. How do you market pepper?
4. How are you procuring pepper from farmers?
5. Is procurement and export done by you?
6. Is there any change in trade practices over the years?
7.

Procured quantity(tonnes)	Procurement price(Rs.)	Exported quantity (tonnes)	Export price (Rs.)

8. What is your supply chain?
9. Have you heard about WTO?

10. Is there any impact on pepper trade?
11. What is the trend in the quantity exported during the past 20 years?
12. What is the price trend from 1990 to 2014?
13. Have you been marketing pepper continuously for more than 20 years?
14. What are the crops that you export?
15. Is the situation of other crops same as that of pepper?
16. Which crop earns more profit?
17. Do you think WTO has a positive impact on export of pepper?
18. Is there any increase in the quantity of pepper exported after 1995?
19. What is the quality standard adopted for exported pepper?
20. After WTO is there any relaxations or changes in the quality standards adopted for pepper?
21. Did the import of pepper increase after WTO?
22. How competitive is pepper export?
23. What is the global demand for Indian pepper?
24. Is there a difference in the demand and price for organic and inorganic pepper?
25. Which are the international markets to which you are exporting?
26. Which market fetches high demand for pepper?
27. Do you have value addition units?
28. Which grade of pepper is exported the most? (Garbled, ungarbled, whole, white)
29. Current rate:

Type	**Cost(Rs.)**
Garbled	
Ungarbled	

30. Do you get any Govt. support?
31. How sound is your finance availability?

32. Where do you get financial support from?
33. What are the constraints faced in marketing of pepper?

III. Constraints:

Constraints	**Rank**
Import of pepper	
Competition from other pepper producing countries	
Fluctuations in price	
Absence of suitable markets for sale	
Low selling price	

Appendix III

Price of pepper (1980-81 to 2013-14)

Year	Domestic price	International price
1980-81	13.2	16.291
1981-82	12.99	16.067
1982-83	12.52	14.192
1983-84	16.19	19.108
1984-85	25.78	24.733
1985-86	41.03	52.583
1986-87	54.29	60.883
1987-88	52.82	67.233
1988-89	38.4	48.85
1989-90	42.03	44.042
1990-91	33.35	34.967
1991-92	33.72	35.35
1992-93	28.58	35.092
1993-94	37.69	46.387
1994-95	62.81	72.086
1995-96	77.08	81.923
1996-97	83.75	97.729
1997-98	173.43	179.493
1998-99	206.03	225.913
1999-00	215.02	242.459
2000-01	174.24	200.506
2001-02	80.39	103.256
2002-03	88.32	101.762
2003-04	74.11	83.617
2004-05	69.51	74.028
2005-06	66.44	75.347
2006-07	100.48	118.938
2007-08	140.39	157.613
2008-09	129.30	155.126
2009-10	136.01	1147.39
2010-11	197.06	216.573
2011-12	318.77	357.198
2012-13	398.18	394.375
2013-14	445.85	472.53

Appendix IV

Nominal Protection Coefficient (NPC) of pepper

YEAR	NPC
1980-81	0.893703
1981-82	0.956554
1982-83	0.962337
1983-84	1.009981
1984-85	1.082284
1985-86	0.894875
1986-87	1.004998
1987-88	0.900443
1988-89	0.861566
1989-90	0.949616
1990-91	0.976574
1991-92	0.931749
1992-93	0.862402
1993-94	0.971642
1994-95	0.989134
1995-96	1.030481
1996-97	0.972819
1997-98	1.254648
1998-99	1.139483
1999-00	1.040101
2000-01	0.998796
2001-02	0.902853
2002-03	1.066924
2003-04	0.863552
2004-05	0.810234
2005-06	0.78973
2006-07	0.943474
2007-08	0.945897
2008-09	0.789136
2009-10	0.855678
2010-11	0.969402
2011-12	0.96923
2012-13	0.958684
2013-14	1.00789

PEPPER ECONOMY OF KERALA IN THE PRE AND POST WTO REGIMES

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ABSTRACT

The study entitled “Pepper economy of Kerala in the pre and post WTO regimes” was conducted to examine the structural instability, trade competitiveness, forecasting of pepper exports and changes in economics of pepper cultivation in the light of liberalized WTO regime and to suggest policy measures to improve pepper trade based on the results of the study. The study was based on both secondary and primary data. Secondary data were collected from various published sources and primary data were collected from 30 farmers and 10 traders from Idukki and Wayanad districts. The study covered a period of 34 years from 1980-81 to 2013-14. The analysis was done for two sub periods -pre WTO (1980-81 to 1994-95) and post WTO (1995-96 to 2013-14) period so as to ascertain the changes in pepper economy.

The results of the instability index revealed that the instability in area, production and productivity of pepper in Kerala was more pronounced during the post WTO period with 9.27 per cent, 17.41 per cent and 16.36 per cent respectively. The instability in export quantity (29.35%), export value (41.64%) and export unit value (18.87%) in the post WTO period were high when compared to instability in pre WTO period. Instability index for international price during post WTO period was more than that of pre WTO period. In the case of domestic price the instability during the pre as well as post WTO periods were almost the same, which were 21.38 and 21.14 respectively.

The forecast for quantity of pepper export from India for the years from 2014-15 to 2017-18 showed an increasing trend. The analysis of trade competitiveness using Nominal Protection Coefficient (NPC) revealed that pepper had competitive advantage in all lustrums except during 1995-96 to 1999-00. The cost of cultivation of pepper increased in the post WTO period when compared to pre WTO period which could be attributed to increase in input costs. The regression of export value with area, production and

productivity showed that production had a positive and significant influence on export value of pepper.

The major problems faced by pepper farmers were incidence of pest and diseases, unavailability of labour and changes in climate. The problems faced by pepper traders were fluctuating prices and import of pepper from other pepper producing countries like Vietnam and Sri Lanka. The study also revealed that 63.4 per cent of the farmers and 30 per cent of the traders were not aware about WTO. Majority of farmers opined that even though pepper is profitable (83.3%) in the current scenario, productivity of pepper is decreasing (90%) and according to the opinion of 76.6 per cent of the farmers pepper cultivation is affected by the fluctuations in price.

The instability in area, production, productivity and export of pepper, in terms of quantity and value, showed an increasing trend during post WTO period. Forecasted value of pepper exports showed a positive trend and pepper exports were found to be competitive during post WTO period implying that export competitiveness of black pepper was not negatively affected by WTO agreements. The results of the study also revealed that the area, production, productivity, export quantity and domestic price of pepper had significant influence in the value of pepper export from India. Hence, urgent action is needed for enhancing the area, production and productivity of pepper in Kerala to reap more benefits from the WTO agreements.