IMPLICATIONS OF TRADE AGREEMENTS ON INDIA'S TRADE IN BLACK PEPPER AND ITS PRODUCTS

By

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(2017-21-011)

DEPARTMENT OF AGRICULTURAL ECONOMICS

COLLEGE OF AGRICULTURE

VELLANIKKARA, THRISSUR – 680656

KERALA, INDIA

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DECLARATION

I, hereby declare that this thesis entitled **"IMPLICATIONS OF TRADE AGREEMENTS ON INDIA'S TRADE IN BLACK PEPPER AND ITS PRODUCTS"** 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 to me any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Vellanikkara,
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CERTIFICATE

Certified that this thesis entitled **"IMPLICATIONS OF TRADE AGREEMENTS ON INDIA'S TRADE IN BLACK PEPPER AND ITS PRODUCTS"** is a bonafide record of research work done independently by **Mrs. SACHU SARA SABU (2017-21-011)** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, associateship or fellowship to her.

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We, the undersigned members of the advisory committee of **Mrs. SACHU SARA SABU (2017-21-011)**, a candidate for the degree of **Doctor of Philosophy in Agriculture**, with major field in Agricultural Economics, agree that the thesis entitled **"IMPLICATIONS OF TRADE AGREEMENTS ON INDIA'S TRADE IN BLACK PEPPER AND ITS PRODUCTS"** may be submitted by **Mrs. SACHU SARA SABU**, in partial fulfillment of the requirement for the degree.

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Psalm 118:1

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Introduction

1. INTRODUCTION

India, the 'land of spices', produces a wide variety of spices and holds a prominent position in the world spice production. India is one of the largest producer, exporter and consumer of spices in the world. The country produced about 10.12 million tonnes of spices from an area of 4.32 million hectares during 2019-20 (Spices Board, 2021). The major spices grown in the country are chilli, black pepper, ginger, turmeric, cardamom and garlic.

The spices form an indispensable element of international trade and has influenced the social, political and, economic developments across the globe. Developing countries including India, are the major suppliers for world spices trade (Jaffee, 2005) and India exported around 1.21 million tonnes and imported 0.24 million tonnes of spices in 2019-20 (Spices Board, 2021). Black pepper is one of the most traded spice across the world, both in terms of quantity and value. During 1960s, India pioneered in the production and export of black pepper in the world, with a share of more than 25 per cent in world production and 20 per cent in world export (Anju and Elsamma, 2015; Nagoor, 2010). After trade liberalization, India has been losing its competitiveness in the export of black pepper (Thomas and Sanil, 2019). Share of India in the exports of black pepper to the world has decreased as its monopoly as a supplier was lost to countries like Indonesia, Vietnam and Brazil. The country-wise exports of black pepper from Triennium Ending (TE) 1992 to TE 2017 is presented in Table 1.1. The world exports of black pepper increased from 1.61 lakh tonnes in TE 1992 to 2.86 lakh tonnes in TE 2017. With the exception of Vietnam and Sri Lanka, the share of other major producing countries in the world black pepper exports have declined during the period from TE 1992 to TE 2017. The exports from India as a share of world exports almost halved from 15.1 per cent in TE 1992 to 7.8 per cent in TE 2017.

During early 1980s, more than 75 per cent of the production of black pepper in India was exported, while it declined to 40 per cent and below in the last decade (Bhatt and Valasan, 2016). As per the IPC estimates, consumption of black pepper in India is growing at the rate of five to six per cent per annum. More than 80 per cent of the

black pepper produced in the country is consumed domestically and only 17 pe cent of the produce is exported (IPC, 2017).

Table 1.1 Dynamics in export of black pepper from major producing countries (TE 1992 to TE 2017)

(in tonnes)

Year	Brazil	India	Indonesia	Malaysia	Sri Lanka	Vietnam	Total
TE 1992	33756	24258	52926	25387	2265	15868	161168
	(20.9)	(15.1)	(32.8)	(15.8)	(1.4)	(9.8)	(100.0)
TE 2002	29667	23229	36237	22182	5415	55345	174799
	(17.0)	(13.3)	(20.7)	(12.7)	(3.1)	(31.7)	(100.0)
TE 2012	30849	20213	52029	12955	9263	117407	255850
	(12.1)	(7.9)	(20.3)	(5.1)	(3.6)	(45.9)	(100.0)
TE 2017	40799	22403	30151	10374	12501	153344	286483
	(14.2)	(7.8)	(10.5)	(3.6)	(4.4)	(53.5)	(100.0)

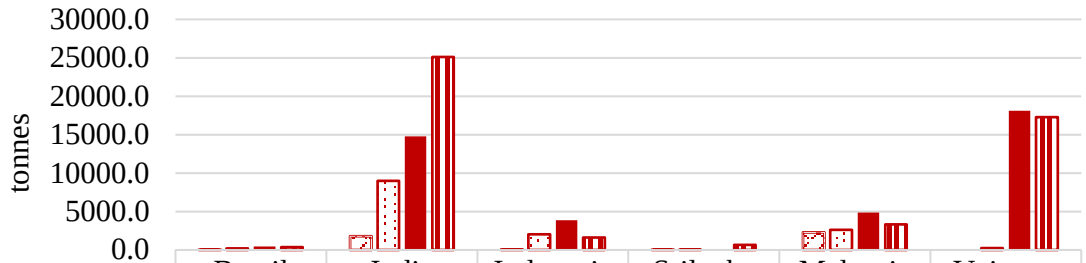
Source: Various issues of Pepper Statistical Yearbook, International Pepper Community
Note: Figures in parentheses indicate per cent to row totals

There has been a steady decline in the export of black pepper from India, whereas the domestic consumption and import of the commodity have shown increasing trends after 1990. Export certification procedures and food safety standards imposed by importing countries are also affecting the exports of black pepper from India (Aarati *et. al.*, 2012; Chaudhari *et al.*, 2012; Das, 2008). The notable feature in India's export of black pepper is the decline in the share of the commodity in the primary form and increase in the share of value-added products.

India was one of the major importers of black pepper accounting for a share of 7.4 per cent in the world black pepper imports, after USA (20.3 per cent) and Germany (10.9 per cent) during 2018 (WITS, 2019). The import of black pepper by the producing countries from TE 1992 to TE 2017 is presented in Figure 1. The imports of black pepper to the major producing countries have increased over the years. The increase in imports to India was significantly higher than all other producing countries in the world and it increased from 1,774 tonnes in TE 1992 to 25,125 tonnes in TE 2017. The growing imports coupled with the increased global production of black pepper has led to fall in prices of black pepper in the Indian market (GoI, 2019). For processing, value addition and re-export of black pepper, India has allowed duty free

imports of black pepper from other countries. The exporters specializing in value added products have been importing black pepper from Vietnam routed through Sri Lanka, taking advantage of the lower duty under the South Asian Free Trade Agreement (SAFTA), as it was cheaper than domestic black pepper.

Figure 1. Dynamics in import of black pepper by major producing countries (TE 1992 to TE 2017) (in tonnes)



	Brazil	India	Indonesia	Srilanka	Malaysia	Veitnam
TE 1992	37.3	1774.0	75.1	9.8	2273.7	0.0
TE 2002	199.4	8983.3	2051.3	32.0	2629.7	254.9
TE 2012	454.7	14777.7	3889.0	33.7	4864.0	18096.3
TE 2017	386.7	25125.3	1626.7	646.0	3314.3	17283.0

Source: Various issues of Pepper Statistical Yearbook, International Pepper Community

However, producers have raised the concern about duty free imports of black pepper for processing, value addition and re-export, as these imports have been depressing the prices of black pepper in the domestic market, mainly due to problems related to the implementation of the Rules of Origin. The higher production and supply of black pepper in the international market and also the increased imports of black pepper from other countries have reduced the prices of black pepper in the world as well as Indian markets (GoI, 2019). India's imports of black pepper have increased by 63 per cent to 17,500 tonnes in 2009-10 period, whereas the exports declined by 22 per cent to 19,500 tonnes for the same period (Reuters, 2010). India's import dependency in black pepper is unceasingly growing and the reliance of the producers on Indian market is also continuously increasing. Recently, Government of India imposed a Minimum Import Price (MIP) of ₹500 per kg on black pepper so to protect the domestic growers against the surge in imports from Vietnam (Krishnakumar, 2018). Sharp fluctuations in the quantity and value of import and export and unit value realizations have characterized black pepper trade in recent years.

The direction of black pepper exports from India is continuously changing because of the rising economic integration among different countries through regional and multilateral trade agreements. Earlier, USSR was the major trading partner for exports of black pepper from India and the country lost the market share of Russia for its traditional commodities including black pepper because of the altered economic relationship between India and Russia after trade liberalisation (Nagoor, 2010). After the collapse of USSR, the United States became the largest market for Indian black pepper (Jha, 2011). Even though, India is benefitting from some of the Free Trade Agreements (FTAs) that it has signed, some of the sectors in the country were adversely affected by these agreements (Saraswat *et. al.,* 2016). The FTAs such as the Indo-Sri Lankan FTA (ISLFTA), SAFTA and ASEAN-India FTA (AIFTA) have adversely impacted the Indian plantation sector, especially black pepper (EXIM Bank, 2020; Viswanathan and Sha, 2012). The exporters were making benefits from the tariff concessions in black pepper trade under ISLFTA and SAFTA, at the cost of local farmers. The duty free imported black pepper was again exported from India with export subsidies, so that the traders were earning profit from both ends (GoI, 2019). Another disadvantage of these FTAs was the circumvention of surplus from other countries through Sri Lanka into India. Sri Lanka produced an average of 7,000-8,000 tonnes of black pepper every year and the domestic consumption of black pepper in Sri Lanka was around 4,800 tonnes per year, with an exportable surplus between 2,300 and 3,300 tonnes. But Sri Lanka was annually exporting more than 5000 tonnes of black pepper to India (Yadav and Baghel, 2009). The higher quantity of black pepper exports from Sri Lanka to India indicates that the commodity from other countries were getting directed through Sri Lanka.

In AIFTA, black pepper was listed under special products, for which duties were reduced at a lesser pace than the sensitive and normal tracks (Pal and Dasgupta, 2009). Even though black pepper was listed as a special product in AIFTA, it was not sufficient to protect the domestic market from the surge in imports of black pepper to India (Francis, 2011). And also, ASEAN countries, especially Vietnam, is the major source for low-priced black pepper. Producers are concerned about the entry of cheaper products from trading partners such as ASEAN countries, especially Vietnam (Joseph, 2009). Black pepper has also been more susceptible to price variations and

the share of producers in the value chain was adversely affected because of AIFTA (Harilal, 2014).

Even though countries have been adopting many mechanisms to restrict trade, till the beginning of 1970s, tariffs were the principal mode of protectionism. With the successive rounds of General Agreement on Tariff and Trade (GATT), there was substantial reduction in the average tariff levels of goods in the developed country markets (WTO, 2012). When tariffs paled into insignificance, these countries resorted to a form of administered protection known as Non-Tariff Measures (NTM). With the inclusion of agriculture under the GATT in the Uruguay Round of the WTO negotiations and in regional and bilateral trade agreements, tariff rates have substantially decreased. Though the tariff levels have eased during the last two decades, international trade in agricultural commodities continue to be more susceptible to NTMs (UNCTAD, 2012; Bown and Crowley 2016).

The NTMs play an increasingly important role in agricultural trade, especially for commodities like spices. These barriers can significantly affect trade variables and create trade frictions between nations (Disdier and Tongeren, 2010). The NTMs take various forms like import licensing, Rules of Origin (RoO), Technical Barriers to Trade (TBT), Sanitary and Phytosanitary measures (SPS), import quotas, *etc*. The imposition of NTMs significantly reduced the volume of agricultural exports from developing countries to developed countries (Disdier *et al.*, 2008). Though concerns about food safety are often used as NTMs to agricultural trade in general and spice trade in particular (Henderson and Lorder, 2001; Henson and Jaffee 2007), the NTMs have been proliferating and the lack of transparency associated with the use of NTMs poses new challenges as they act as non- tariff barriers for trade (Hooker and Caswell 1999).

Similar to other agricultural commodities, the major non-tariff barriers to trade in black pepper include SPS and TBT measures (Henson and Loader 2001). Packaging, and labelling requirements along with SPS rules, though classified as non-protectionist policies (Deardorff 2012), have significantly affected the Indian spices trade. The prevailing standards and dimensions governing SPS compliance in Indian black pepper supply chain showed the lack of uniformity in food safety standards among the

importing countries (Aarathi *et al.,* 2012). This coupled with the issues relating to pesticide residues created significant barriers for trade in the commodity. The export rejections have always remained a significant issue associated with spices exports from India. This is more important in the case of exports to European Union, which has one of the most stringent terms of regulations on imported products (Jaffee and Henson, 2005). The impact of food safety standards imposed by USA and the European Union on spices exports from India were mostly due to non-compliance with required food safety parameters (Idris *et al.,* 2015). The AGMARK standards in India on pesticides residues for black pepper are less stringent when compared to the EU standards, but the US standards are more relaxed than the AGMARK standards. The physical and microbiological parameters for black pepper as per the AGMARK standards in India are on a higher side as compared to those of other countries. Also, the undefined microbiological parameters in other countries with reference to AGMARK standards create confusion for exporters (Aarathi *et al.* 2012). There is lack of unity among the major producing countries with respect to SPS standards and by creating a consensus among these countries, some of the constraints related to SPS measures could be addressed (Henson *et al.*, 1999). The developed countries have also progressively raised the norms for food safety and quality, which were very difficult to attain for most of the developing countries, leading to their exclusion from the export markets (Wilson and Otsuki, 2003). Thus, numerous trade related issues are affecting the competitiveness of Indian black pepper in the international market. Before identifying the measures to restore the black pepper exports from India, it is very much important to comprehend the current scenario, *i.e.,* where does India's black pepper stand in the global market? Hence, it is imperative to analyze the trade performance of Indian black pepper especially in comparison with the major suppliers in the world. Black pepper being one of the most traded spice, understanding the trade policies, tariff structures and trade barriers in international trade could offer better insights on the strategies needed for enhancing India's share in global trade of the commodity.

The trade liberalization policies as well as the proliferating trade agreements, including the RTAs, call for the assessment of the impact of multilateral and Regional Trade Agreements on the export as well as import scenario of Indian black pepper. The specific issues related to black pepper trade and trade agreements have not been

exhaustively studied. Hence, a comprehensive study on the implications of trade agreements on India's trade in black pepper and its products is needed to develop a better understanding of economic factors influencing the relative strengths, efficiency and competitiveness of India's black pepper trade.

In the above background, the study was aimed at analyzing the trade performance of Indian black pepper and its products. The dynamics in the trade policies and tariff structure of black pepper, impact of multilateral and regional trade agreements on Indian black pepper and the NTMs affecting black pepper exports from India were also studied. The study also estimated the measures of trade competitiveness of black pepper to determine the policies and factors influencing the development of the export capacity in the country. The constraints faced by the producers, exporters and market intermediaries, which in turn could aid in improving the export competitiveness of Indian black pepper once properly addressed, were also identified in the study.

The specific objectives of the study are

1. To analyze the trade performance of Indian black pepper and its products
2. To study the dynamics in the trade policies and tariff structure of black pepper
3. To analyse the impact of multilateral and Regional Trade Agreements on trade in black pepper
4. To ascertain the Non-Tariff Measures (NTM) affecting black pepper exports from India
5. To estimate the measures of trade competitiveness of Indian black pepper
6. To identify the constraints faced by producers and exporters in increasing the competitiveness and exports of black pepper

1.1 LIMITATIONS OF THE STUDY

The study relied on extensive trade related data and analytical models and, hence the data management and analysis were both time and resource consuming. There are differences in the data available from different sources, but efforts have been made to minimize the inconsistency in the data. The primary data collection in Wayanad district was delayed due to COVID19 induced travel restrictions. The normal

errors inherent in social surveys like bias in reporting the data, inadequacy of information; common limitations of statistical analysis *etc* might also have slightly affected the study. In spite of the above limitations, extreme care has been taken to ensure that such limitations do not affect the authenticity of the results or findings of the study.

1.2 PLAN OF THE THESIS

The thesis is organised into five chapters. The first chapter highlights the importance of the thesis, explaining the background of the research problem, its relevance and significance, objectives and major limitations. In the second chapter, a comprehensive review of previous studies related to the present research was iterated for providing the theoretical and empirical backgrounds of the study. The third chapter details the data sources, study area and research methodology, including the analytical tools employed in the study. The fourth chapter presents the results obtained from the analysis of collected information and discussed with logical reasoning, duly corroborated with the findings of the previous research works. The summary and conclusion as well as policy implications of the study are presented in the fifth chapter, followed by references, abstract and appendices.

Review of literature

2. REVIEW OF LITERATURE

A review of past research related to the present study helps in identifying the conceptual and methodological issues relevant to the study. This will enable the researcher to collect relevant data and subject them to sound reasoning and meaningful interpretation. This chapter attempts a brief review of the relevant literature on research related to the present study from the point of view of the objectives as well as the methodology. The reviews are presented under the following headings:

2.1. Indian black pepper trade
2.2. Trade performance
2.3. Trade policies and tariff structure
2.4. Multilateral and Regional Trade Agreements
2.5. Non-Tariff Measures
2.6. Trade competitiveness

2.1.INDIAN BLACK PEPPER TRADE

Cherian (1991) analysed the performance of India's export of spices and found that the country's competitive position in the world market for black pepper remained weak, owing to its higher prices. According to him, India's export performance and competitiveness in spices could be improved only if measures were taken to increase production and productivity, and to reduce the cost of production and exports.

Jeromi and Ramanathan (1993) noticed significant changes in the direction of black pepper exports from India during the period from 1975 to 1990. It was observed that about 44 per cent of India's black pepper exports were directed to Russia, which constituted about 82 per cent of total black pepper imports of that country.

Nicey (2003) studied the black pepper industry in Kerala by analysing the production, productivity, export and constraints faced by the industry. She pointed out that the absence of an integrated approach to boost exports and lack of coordinated publicity programmes affected the exports of black pepper from Kerala.

Parthapratim and Mitali (2008) reported that India had become a net importer of black pepper compared to ASEAN countries and domestic producers in India were finding it difficult to compete with black pepper imports from countries like Vietnam.

Joseph (2009) reported that compared to India, ASEAN countries like Malaysia, Indonesia and Thailand had much higher productivity of black pepper. And also, the production of black pepper in India was increasingly for domestic consumption rather than exports whereas, in ASEAN countries the production was mostly for the world market as their domestic consumption was very limited.

Nagoor (2010) opined that India's black pepper import dependency was continuously increasing and dependency of the black pepper producers on domestic market was rising. India allowed duty free import for value addition and re-export. However, the producers raised the concern for duty free import for value addition and re-export as such imports depressed the domestic prices especially whenever the implementation of the Rules of Origin (RoO) was weak. In 2009-10, the estimated black pepper imports to India increased by 63 per cent to 17,500 tonnes, while the exports fell by 22 per cent to 19,500 tonnes (Thomson, 2010).

Yogesh and Mokshapathy (2013) pointed out that the productivity of black pepper in India was one of the lowest in the world, which was about 306 kg/ha. It was found that the production of black pepper had significant influence on its export. The impressive gain in the share of world exports by other competitors, both in terms of quality and cost, was the major deterrent for exports from India.

Sabu (2015) reported that the share of black pepper export in production has declined in India. The country exported almost three-fourth of its production in TE 1972-73, while it declined to one-third share in TE 2002-03, which further increased to 42 per cent in TE 2012-13. These changes in export intensity of production could be attributed to the increasing domestic consumption of black pepper in India and increasing competition from other producers, especially, Vietnam. As per IPC estimates about 50 to 60 per cent of Indian production was consumed in the country.

Spices were one of the most important constituents of trade from India to various parts of Middle East and Europe even before the medieval period, some spices like black pepper gained prominence because of its varied usage in culinary, rituals, perfumery and medicines (Galli 2017; Van der Veen and Morales, 2015).

2.2.TRADE PERFORMANCE

The reviews on trade performance are presented under the following sub-headings:

2.2.1 Growth and instability in trade
2.2.2 Trade pattern and trade complementarity
2.2.3 Trade diversification
2.2.4 Dynamics in trade
2.2.5 Export supply and import demand functions

2.2.1 Growth and instability in trade

Mamatha (1995) estimated the growth rates of production and export of selected spices for the period from 1970-71 to1991-92, and the spices considered were black pepper, chillies, turmeric and ginger. She reported that the positive growth rates in production and export of the selected spices were due to the increased domestic production and demand in the international market.

Rajesh *et al.* (2002) studied the trend in export of major spices from India for the period from 1970-71 to 1999-00 and found that black pepper registered a positive Compound Annual Growth Rate (CAGR) of 2.38 per cent in quantity and 12.78 per cent in value. They also estimated the Coppocks instability index for exports of major spices from India, which showed a decline in fluctuation in export value and unit value, and increase in the variation in export quantity for black pepper.

Bastine *et al.* (2010) reported that the imports of black pepper from different countries have shown a discernibly increasing trend in recent decades. The imports increased from 1,473 tonnes in 1990 to 19,652 tonnes in 2005 and then declined to 13,120 tonnes in 2009 at a CAGR of about 18 per cent for both export quantity and export value. The growth in quantity of exports was found to higher during the period from 2000 to 2008. They also studied the instability in domestic and international

prices of black pepper and found that most of the price series of black pepper were showing high instability, with that of international prices showing considerable increase in the recent past.

Goel and Walia (2012) computed the CAGR of agricultural export, agricultural import and net agricultural export during the post-reform period (1991-92 to 2010-11). Their results showed that both agricultural export and import had increased after the liberalization, but the CAGR of agricultural imports (18 per cent) was greater than that of agricultural exports (13.4 per cent). Similarly, the net agricultural exports had grown at the rate of 10.9 per cent per annum. They concluded that lesser growth of agricultural exports may be due to hard competition from quality products and strict legislation relating to health and safety standards of the importing countries.

Jacob and Job (2015) studied the growth and instability in production and export of black pepper from India. The results showed a significant negative growth rate for area, production and export of black pepper during the period from 2005-06 to 2013-14. The negative growth rate of export quantity was attributed to the decrease in production of black pepper. The export quantity and value exemplified high instability, whereas the instability in area, production and productivity were comparatively low.

Sabu and Kuruvila (2016) analysed the price instability of black pepper in Indian and international markets during the pre-liberalisation and post-liberalisation periods. The study revealed that the magnitude of price instability of black pepper has increased significantly in Indian markets during the post-liberalisation period, whereas it has declined in the international markets. The main factors responsible for the increase in price instability of black pepper in India were identified as increasing domestic demand, fluctuating share in world exports, rising share in world imports, the lagged response of production to prices and the instability in rupee-US dollar exchange rates.

Indhushree and Kuruvila (2019) analysed the growth and instability in export of small cardamom from India during the period from 1970-71 to 2017-18. The results revealed that the growth rates in terms of export value, quantity and unit value were found to be negative, while the instability in export was higher during the pre-WTO period. The post-WTO period recorded positive and higher growth rate and

comparatively lower instability in export. The lower growth rate and higher instability in export of small cardamom during the pre-WTO period was due to increased domestic demand and stiff competition in international market, especially from Guatemala.

2.2.2 Trade pattern and trade complementarity

Kemal *et. al.* (2000) studied the degree of trade complementarity among SAARC countries and found that there is a lack of trade complementarity in bilateral trade of South Asia. The similarity of the pattern of comparative advantage in the region has been the main constraint for the growth of intra-regional trade. They also found that India had relative trade comparative advantage in most of the commodities than other SAARC countries. Among the SAARC countries, complementarity between India and Pakistan was found to be higher. Lack of trade complementarities raised questions on the prospects of SAFTA.

Many studies have pointed out the significant complementarity between India's service-oriented economy and ASEAN's light manufacturing driven economy (Bhattacharya and Arif, 2002; Kumar, 2002; Sen *et al.*, 2004)

Basu and Datta (2007) analysed the reasons behind persistent bilateral trade deficit of Bangladesh with India and found that Bangladesh had export similarity with India and hence faced stiff competition from India. The lack of similarity between Bangladesh's exports and India's imports restricted their trade complementarity.

Sarath (2010) identified the trade complementarity between India and ASEAN countries in the context of RTA for the period from 1990 to 2007. The results revealed that India's export intensity as well as import intensity with ASEAN was above one for most of the years. This meant that India's exports and imports were intense with ASEAN countries as compared to its trading pattern with rest of the world.

While focusing on trade between low-income countries and the BRICS (Brazil, Russian Federation, India and China), an International Monetary Fund (IMF) paper found strong economic complementarities between these two groups of countries based on complementarities in resource endowments and production structures. Using

a trade complementarity index, the paper showed that the export complementarity was higher between low income countries and China or India, than between low income countries and the United States or the European Union (IMF, 2011).

Malini and Preet (2019) analysed the Trade Complementarity Index (TCI) between Canada and India during the period from 2001 to 2015. The results showed that the trade complementarity has improved during the study period and it was more than 50 per cent for both the countries. The TCI indicated that bilateral trade between India and Canada was highly complementary. While considering Canada as an importer, they found the TCI to be higher than that of India (62 per cent in 2015). This means that Canada's import structure matched with the export structure of India. Alternatively, in the case of India as an importer, the TCI value was less than that for Canada (54 per cent in 2015).

2.2.3 Trade diversification

Mallika (2016) reported that for export of black pepper from India, there was high dependency on the developed countries such as USA, UK and Germany which increased the risk in India's black pepper trade. Hence the study suggested to reduce the geographical concentration of exports through diversification into new markets.

Indhushree *et. al.*, (2017) studied the commodity concentration and geographic concentration of fruit and vegetable exports from India during the period from 1988 to 2016 period using Gini concentration index and Hirschman index respectively. The results showed that there was declining trend in the commodity concentration in the export of both vegetables and fruits, indicating diversification in the export basket of these commodities and lesser dependence on the export of few commodities, thus reducing the risk of export fluctuations. The least geographic concentration was identified for dried onions and shelled walnuts exports indicating increased diversification of these commodities in terms of geographical coverage and thus limiting the possibility of risk from price variability of exports.

Veena (2017) estimated the geographic concentration of fishery sector exports from India using Hirschman index. She found that during the post-WTO period, the

increase in the number of export destinations has reduced the geographic concentration to 50.78 in 1998 and further down to 22.9 in 2009. This was attributed to the market access policies as part of WTO agreement, especially with regard to exports from developing countries.

Mohandas *et. al.*, (2018) analysed the performance of major vegetable exports from India in terms of diversification with respect to commodities and markets for the period from 1988 to 2016. They used Gini concentration index and Hirschman index to measure the commodity concentration and geographic concentration respectively in the export of vegetables from India. The results showed increased commodity as well as geographic diversification in the export of vegetables from India.

UNCTAD (2019) studied the export concentration of 173 countries using different measures of export concentration, namely the Hirschman index, the Gini coefficient and Theil's T index for the period from 1995 to 2017. The results showed that many developing economies were characterized by a highly concentrated export sector, as high export concentration is associated with low levels of development. In the developing world, export commodity dependence is pervasive and almost two-third of the developing countries were commodity-dependent, meaning that at least 60 per cent of their merchandise export revenues came from commodity exports.

2.2.4 Dynamics in trade

Jayesh (2001) used Markov chain analysis to study the direction of trade and changing pattern of black pepper and cardamom exports from India. The results indicated that exports of Indian black pepper were likely to be concentrated in USA and Russia. Similarly, cardamom export was likely to be concentrated in Japan and Saudi Arabia. He also suggested that a high dependence on one or two export markets would increase the trade risk in the long run. Hence, he proposed to evolve appropriate export promotion strategies to diversify the export of black pepper and cardamom to new markets.

Rajesh (2003) studied the direction of trade of major spices from India during pre-liberalization period (1981-82 to 1990-91) and post liberalization period (1991-92

to 2000-01). The results showed that USA had the highest retention power (*i.e.*, 0.8083) in the pre-liberalization period for black pepper as compared to the post-liberalization period (0.3188).

Tejaswi *et. al.*, (2006) analysed the direction of trade and the changing pattern of Indian coffee exports using Markov chain model. It was evident from the results that USA was the most reliable and loyal importing country and had the loyalty index with a probability of 80 per cent retention, followed by other countries, Russian Federation etc.

Sakamma (2009) studied the direction of trade and changing pattern of exports of major spices from India using Markov chain analysis. USA and Canada were found to be highly loyal markets for Indian black pepper as indicated by 81 and 64 per cent of retention of their previous shares of exports from India during pre-WTO period and USA continued to be the loyal importer of Indian pepper retaining 86 per cent of previous year's share of exports during the post-WTO period.

Angles *et. al.*, (2011) utilized the Markov chain model for the assessment of direction of trade in Indian turmeric. The results showed that the export share retention for Indian turmeric was high in minor importing countries (87 per cent), followed by UAE (49 per cent), Iran (41 per cent) and UK (35 per cent). The countries such as USA and Japan were not stable importers of Indian turmeric. The study concluded that strategies for export may be oriented towards these two countries and plans also need to be formulated for stabilizing the export of turmeric to other countries.

Sivasankari and Rajesh (2014) used the Markov chain analysis for categorising the major Indian black pepper export markets *viz*., USA, Germany, UK, Italy, Canada and other category according to their stability based on the magnitude of transition probabilities. It was found that the retention of previous year's export share for Indian black pepper was high (85 per cent) for minor importing countries (pooled under the category 'others'), followed by USA (78 per cent), Germany (41 per cent), Italy (33 per cent), Canada (16 per cent) and UK (11 per cent). The high retention probability of 'others' clearly showed the need to exploit the market potential of those countries.

Efforts were also needed to improve the efficiency of production to make the product acceptable and price competitive in the importing country group of others.

Joshi *et al.* (2015) analysed the stability of Indian spice exports using the Markov chain approach and found that the level of spice export stability was highly varied across export destinations. They observed that the countries which were stable destinations for Indian spices export were Canada for black pepper, UK for chilli, Bangladesh for turmeric, UAE for cumin and Malaysia for coriander. The transitional probability matrix indicated that most of the traditional importers have shown low retention probabilities which may be due to tough competition arising in spices trade and trade related barriers in the developed nations.

Mohandas *et. al.,* (2018) identified the major and consistent markets for vegetables exports from India using Markov chain analysis and found that the most stable markets for major vegetables exported from India were Mauritius, Oman, UAE, Pakistan, Nepal, and Belgium with retention probabilities of 97 per cent, 91 per cent, 81 per cent, 80 per cent, 79 per cent, and 60 per cent, respectively.

Ravi Kumar (2020) studied the direction of exports of major agricultural commodities *viz*., rice, maize, bengal gram, chillies and cotton from India. The dynamic nature of trade pattern of the selected commodities was analysed using Markov chain analysis by examining gains and losses with respect to export shares of major Indian agricultural commodities to different countries. He found that during the post-WTO regime, Saudi Arabia, Bangladesh, Pakistan, Malaysia and China were the loyal destinations for rice, maize, bengal gram, chillies, and cotton respectively. The increasing demand for the selected commodities in countries like Saudi Arabia and Côte d'Ivoire for rice; Malaysia for maize; Pakistan and Algeria for Bengal gram; USA and Sri Lanka for chillies, and Vietnam, Pakistan and Indonesia for cotton need to be explored for augmenting the exports. He also suggested that to achieve this goal, it was necessary to study the consumer preferences in newer markets, market intelligence and impediments for augmenting exports..

2.2.5 Export supply and import demand functions

Agbola and Damoense (2005) estimated the import demand functions for pulses in India and the results indicated that real GDP, relative price and urbanisation were the key determinants of import demand for pulses in India. The estimated long-run elasticities of import demand with respect to income and import price were 0.4 and −1.7 for chickpeas, 0.56 and −0.87 for lentils and 0.36 and 0.12 for total pulses, respectively. The estimated long-run elasticities of import demand with respect to urbanisation were 9.9 for chickpeas, zero for lentils and 7.2 for total pulses.

Kang and Kwon (2006) assessed the import demand and export supply functions for Korea based on the trans-log restricted profit (or GNP) function. Their findings showed that factor inputs, as well as outputs, were, in general, moderately price-elastic and substitutable among each other and there has been a rapid decline of export supply price-elasticity which could be attributed to the rapid growth of export share of GDP. It was concluded that larger the relative size of export sector and faster the rate of its growth, it would be harder to expand export production by drawing own resources from the domestic sector.

Sengupta and Roy (2011) predicted the export supply functions of various horticultural crops namely chilli, black pepper, banana, mangoes, coffee, fresh fruits, spices, tea and walnuts from India and also estimated the long run elasticity for various price and non-price factors. The results showed that production, world demand, relative export price and producer price had impact on exports of individual products over the long run. The producer prices, relative export price and world demand in the long run had significant impact on the exports of chilli and black pepper. Exports of banana and walnuts were found to have inverse relationships with producer prices in the long run, which indicated that rise in producer prices for these commodities created a disincentive to export over the long run. In the long run, exports of banana, coffee and spices were found to be having significant and positive impact on production, which indicated that an increase in production increases the export of these commodities. In the short run, with the exception of spices and walnuts, relative export price was the significant determinant of exports of horticultural products.

Shailza *et. al.,* (2015) attempted to estimate the demand and supply functions for export of coffee from India for the period from 1991 to 2011. The demand and supply functions were estimated for coffee using simultaneous equation model through two-stage least square method. They found that the demand for Indian coffee export was significantly affected by prices of its competitors and changes in its domestic production level. Export supply of coffee was significantly affected by positive supply shocks. Thus, export of coffee was more in years of higher production and lower in years of lower production.

Choubey (2017) examined the determinants of spices export from India and reported that the factors such as domestic price, exchange rate, world export prices and lagged domestic production influenced the export of spices and it was found to depend mainly on the crop and domestic consumption rather than on the international market signals. It was also found that in the case of Indian black pepper, the export prices for Canada and Italy were elastic, whereas the income elasticity of demand was found to be significant for Saudi Arabia and for other importers during the pre-liberalisation period. The study concluded that the major challenge for India's spices export was the emergence of new competitors with no or little domestic consumption of the commodity.

George and Cherian (2017) studied the global marketing challenges for producers of small cardamom from Kerala and reported that the market supply situation for cardamom did not solely rely on the export trade or on the volume of supply coming directly from the growers. They found that the quality parameters and the stringent standards fixed by India and most of the European and American countries were the most decisive factors determining the export supply of small cardamom.

Muhammed and Riaz (2018) analysed the impact of prices, income level, foreign exchange reserves, exchange rate and trade liberalization on 26 commodities of Pakistan for which the country was a net importer. They used import demand functions and the estimates revealed the inelastic response of the major commodities to their own prices. The results showed that imports prices, domestic income and exchange rate were the prominent determinants of imports having strong consumption and

production linkages. Based on the inelastic response of the major imports to own prices, they concluded that Pakistan was constrained by the natural resource endowments and technology in the production and availability of these products.

2.3. TRADE POLICIES AND TARIFF STRUCTURE

Desai (1970) examined the history of tariff policy and the process of tariff fixation in India. The study concluded that there was an inadequate formulation of the economic criteria for determining whether protection should be granted or continued and also what the level and duration of that protection should be.

Gang and Pandey (1998) showed the weak link between the scheduled and the actual tariff of Indian inter-industry manufacturing sector by comparing the scheduled rate to that of the collection rate or the realised rate. This was mainly due to the periodic exemptions granted from time to time by the government, leading to the problem of accounting the actual rates applicable to imported items.

In the Uruguay Round of negotiations, India had agreed to make adjustment in tariff rates for 3373 commodities at 6-digit HS level. In case of agriculture, though India did not commit for the tariffication program of reducing the tariff rates, India committed for binding of 673 lines under Agreement on Agriculture (AoA) at 6 digit of HS Classification. A large number of committed lines belonged to commodity groups like edible vegetables, animal or vegetable fats or oils; meat and edible meat, *etc*. India had bound 81 percent of the agricultural tariff lines at three levels, 100 percent for primary products, 150 for processed products and 300 percent for edible oils. In most of the cases, the existing tariff rates were much lower than bound rates (Gulati *et.al.*, 1999).

Encouragement of exports on one hand and import relaxation on the other formed the main theme of trade policy changes in India. Further, the trade policy that was earlier characterised only by short-term policies to combat exigencies was turned into a long-term consistent policy. The direction of the new trade policy was in terms of tariffication, decanalisation and removal of quantitative restrictions in India's trade. (Deshpande and Thippaiah, 2000).

The types of policies available to developing countries under the trade agreement may not be appropriate to the conditions of the agricultural sectors of those countries or sufficient to enable them to overcome the handicaps they face in international markets (Green and Priyadarshi, 2002).

The trade policy in India was generally considered to be inward looking until 1980s and these policies were based on the fear that liberalized trade in agricultural commodities like spices could lead to a secular deterioration in terms of trade (RBI, 2003). Since the economic reforms in 1991, foreign trade policies starting from the Exim Policy 1992-97, have explicitly tried to promote exports by rationalizing export procedures and documentation while liberalizing imports. These policies had direct impact on agricultural commodities in general and spices in particular (Patnaik, 1996).

The foreign trade policy (2015-2020) has sought to merge several export promotion schemes like Focus Products Scheme, Focus Market Scheme, Special Village and Agriculture Industry Scheme *etc*. into a single scheme namely, Merchandise Export Scheme from India (MEIS). Exported spice commodities were eligible for incentive duty credit under this scheme (GoI, 2015).

Though the tariff levels in India have eased during the last two decades, agricultural commodities continued to be more susceptible to trade barriers (Bown and Crowley 2016). With the signing of the WTO agreement, India was obliged to reduce or discard several protective trade policies. Spices were considered as sensitive products, the imports of which were monitored so that appropriate tariff measures could be implemented in case of import surges. This was indicative of the domestic trade protection offered to this sector (Thomas and Sanil, 2019).

2.4. MULTILATERAL AND REGIONAL TRADE AGREEMENTS

The intertwining of national interests at the multilateral and regional level has acquired a new intensity in the 1990s. Mainsfield and Reinhardt (2003) argued that multilateral trade negotiations motivated countries to conclude RTAs because with the expansion of WTO membership, individual countries' ability to influence the content and pace of MFN liberalisation reduced and the large membership made it difficult for

countries to have a coordinated strategy. As the formation of regional blocks lead to growth in negotiating power at the multilateral level, countries wanted to become a part of a regional grouping to increase their leverage in the multilateral negotiations. A trend that had rapidly gained momentum was the proliferation of regional and bilateral trade agreements among countries that reduced barriers to trade on a reciprocal and preferential basis for each other (Batra, 2006).

Batra (2007) estimated the trade potential for India with its trading partners in the world and specifically with the SAARC countries using the gravity model. The estimates indicated a positive trade potential for the SAARC region as a whole. Among the SAARC countries, potential trade between India and Pakistan was estimated to be more than US$ 6.5 billion of the actual trade between these economies.

The RTAs contain complicated Rules of Origin (RoO) and value addition norms, which in turn reduced the transparency and created the "spaghetti bowl" problem, as highlighted by Bhagwati, 1993. The large number of RTAs with possible overlapping of agreements with different preferential tariff rates and a plethora of RoOs and value addition norms, created major trade facilitation problems for developing countries (World Bank, 2005). The widespread adoption of RTAs, along with the RTA-specific barriers and concessions were expected to make the trade system even more complex. The division of the world into mega trade blocs was to result in the marginalisation of weak countries (Parthapratim, 2008).

Predicting the impact of the FTA in precise terms is a difficult task. The theory of customs Union (Viner, 1950) explained that the net welfare outcome of an FTA depends on the balance between trade creating and trade diverting influences of tariff reduction. The theoretical developments and empirical evidences suggested that FTAs, especially the ones between developing countries, were mutually beneficial. The extent of benefit varies between countries, between sectors within countries and also across time (Joseph, 2009).

In the study by Jeromi (2007), it was argued that in the absence of safety nets, trade liberalization could lead to economic decline of export oriented agricultural

sector in developing countries. Bellmann *et al.* (2010) also concluded that poorer developing countries could be the worst affected from global economic slowdown.

Joseph (2009) reported that productivity along with cost of production and exchange rate determines the required level of tariff, and tariff alone cannot protect any crop in the domestic market. He expressed the productivity of plantation crops in competing ASEAN countries as percentage of India's productivity in 2007 and found that the productivity of black pepper in Malaysia and Indonesia was higher by 208 per cent and 451 per cent respectively, and that of Vietnam was higher by 600 per cent. Even though, India maintained an effective applied tariff rate of 70 per cent for black pepper during the period, country faced import competition. Hence, tariff as a measure of protection was concluded as having obvious limits, especially for plantation crops.

Disdier and Marette (2010) explored the link between gravity and welfare framework for measuring the impact of tariff barriers on the imports of crustacean products by Canada, Japan, US and EU. The gravity equation showed a negative impact on imports, whereas the welfare evaluations in most cases showed an increase in both domestic and international welfare, which could be attributed to stricter standards.

Smitha (2011) studied the sectoral impact of ASEAN-India Free Trade Agreement (AIFTA) and reported that there was significant increase in the export of animal and vegetable oils, coffee, tea and spices from Indonesia, Malaysia and Vietnam to India due to tariff reduction and increased market access provided to these countries. She concluded that even though these products were listed as Special Products under AIFTA, India's tariff reduction commitments could adversely affect these commodities in the future.

Veeramani and Saini (2011) analysed the impact of the ASEAN-India Preferential Trade Agreement on plantation commodities like coffee, tea and black pepper using SMART and gravity models. The study revealed that the agreement might cause a significant increase in India's imports of plantation commodities from the ASEAN countries, which was mostly to be driven by trade creation rather than trade diversion. The percentage increase in imports was found to be lowest in black

pepper when compared to tea and coffee. The proposed tariff reduction could lead to some loss of tariff revenue to the government. However, the gains in consumer surplus outweighed the loss in tariff revenue, resulting in a net welfare gain.

Sarath and Sudarsan (2012) examined the impact of India-ASEAN FTA on India's fishery sector using SMART simulation model. The results showed that tariff elimination led to reasonable trade creation and marginal welfare increase with nominal tariff revenue decline. The study also revealed that India-ASEAN FTA may not lead to large-scale import of marine products to India as the country has taken adequate precaution to protect its marine sector from large-scale dumping.

Tharian and Joby (2014) analysed the tariff policies on rubber and rubber products under the AIFTA. In this Free Trade Agreement (FTA), the tariff lines were listed under six categories *i.e.,* Normal Track 1 (NT-1), Normal Track 2 (NT-2), Sensitive Track (ST), Special Products (SP), Highly Sensitive List (HSL) and Exclusion List (EL). Based on the destination-wise classification of tariff lines into three groups (tariff elimination, tariff reduction and exclusion list), as well as the implementation period and tariff reduction commitments, they conducted the analysis. It was found that more than 52 per cent of India's tariff lines on rubber and rubber products were categorised under tariff elimination (NT-1 and NT-2), 40.23 per cent under tariff reduction (ST), and the remaining 6.89 per cent were excluded from tariff reduction.

Harilal (2014) opined that the spices especially black pepper became more vulnerable to price fluctuations and the share of producers in the value chain was adversely affected by the implementation of ASEAN-India free trade agreement. A similar conclusion was put forth earlier by Harilal and Joseph (1999) in their analysis of India-Sri Lanka Free Trade Agreement. The study also highlighted the role of factors beyond the control of primary producers of commodities like the relative value of currency and rates of inflation, which could determine the gains from such regional trade agreements.

Joby and Tharian (2016) analysed the external trade data of Natural Rubber (NR) for the period from 2000-01 to 2014-15. The results revealed that India provided

ample protection to NR production under various RTAs. India's exports and imports of rubber and rubber products under RTAs grew at the rates of 16.8 per cent and 26.3 per cent respectively during the period under study.

2.5. NON-TARIFF MEASURES (NTMs)

UNCTAD (1994) examined the Non-Tariff Barriers (NTBs) imposed by the US, EU and Japan on the agricultural imports from India. NTBs largely prevalent in US were in the form of tariff quota, seasonal tariff low rates, seasonal tariff high rates and import monitoring, while NTBs in the form of import license, bilateral quota and regulation for environmental protection were imposed by EU. Japan was found resorting to quotas for sensitive products and product characteristic requirements to protect human health and non-automatic license. It was found that the NTBs in US, EU and Japan were mostly for agricultural commodities (GoI, 1999).

From the 1960s to 1980s, despite high tariffs on agricultural products, most developing countries had negative total protection rates on agriculture, a result of both direct protection, including tariffs and taxes on agricultural products, and indirect protection caused by protection of industry and exchange rate overvaluation (Schiff and Valdes 1992; World Bank 1986). The average agricultural tariff in developing countries significantly declined from 30 percent in 1990 to 18 percent in 2000. These reductions were complemented by elimination of import licensing, most export taxes, and many quantitative restrictions (World Bank 2001)

A number of countries have suggested that importers were increasingly using Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary (SPS) measures as disguised protectionism. This point was raised in several FAO country case studies (FAO, 2000). On the other hand, a number of countries have indicated that consumer safety and the protection of traditional food applications were increasingly important for them (WTO, 2000).

Ganslandt and Markusen (2001) explained how standards and technical regulations have both trade-impeding and demand-enhancing effects in the

international trade, the former by raising the costs of exporters and the latter by certifying quality and safety to consumers.

The major NTBs to trade in spices include TBT and SPS (Henson and Loader, 2001). Packaging, and labelling requirements along with SPS rules, though classified as non-protectionist policies, significantly affected spice trade from India (Deardorff, 2012).

Though there exist spikes in tariff rates, on an average, the tariffs were on the lower side in most developed countries. The level of protection in these countries was being maintained by various NTMs like standards, technical barriers, trade restrictive anti-dumping rules, *etc*. Developed countries were imposing NTMs on products which were of export interest to the developing countries and these measures provided much higher level of protection because they were much more restrictive, opaque and difficult to measure (Parthapratim, 2008).

Disdier and Tongeren, (2010) opined that NTMs play an increasingly important role in agricultural trade, especially in commodities like spices. The NTMs take various forms like import licensing, rules of origin, sanitary and phytosanitary rules, import quotas, technical barriers, etc. These barriers could significantly affect trade variables and create trade frictions between nations.

TRALAC (2010) found that the exports from developing and least developed countries (LDC's) were vulnerable to NTMs, especially to TBT and SPS regulations. Among the broad categories including agriculture, manufacturing and natural resources, agriculture was the most affected, with most of the world agricultural trade subject to forms of SPS and TBT (UNCTAD, 2017).

Gupta and Garg (2012) found that one of the major challenges for India consequent to the dismantling of Quantitative Restrictions (QRs) on imports was to raise the level of productivity and quality standards to international competitive levels, which in turn had variations and might lead to trade conflicts and disputes.

Sanchita (2014) reported that India's trade was facing problems because of circumvention of RoO in India-Nepal and India-Sri Lanka FTAs. She identified

problems related to RoO in FTA such as change in tariff classification or value addition, origin of a product, and high cost and time taken in obtaining RoO certificate. According to MoCI (2013), the issuance of RoO certificate for FTAs by Export Inspection Council to Indian exporters had been quite low.

Even though the General Agreement on Tariffs and Trade (GATT) and the agreements under World Trade Organization (WTO) have contributed significantly to the reduction of tariffs among WTO members, NTMs *viz.*, TBT, SPS and other technical measures that allow countries to impose restrictions on the imports have been extensively used over the years (Ghodsi *et al.*, 2015).

Mohan (2016) reported that even with a high share of agriculture in Gross Domestic Product and in exports, the costs associated with complying with NTMs in agriculture have a relatively higher overall economic impact in developing countries than in high-income countries. The prevalence of various types of NTMs differs across economic sectors, and agriculture tends to be regulated by SPS and export measures (UNCTAD, 2017).

2.6. TRADE COMPETITIVENESS

The Policy Analysis Matrix (PAM) is a computational framework used to measure the input use efficiency in production, comparative advantage, and the degree of government interventions (Monke and Scott, 1989). It can be used to calculate important indicators for trade policy analyses like the Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), and Domestic Resource Cost Ratio (DRCR).

Selvaraj *et. al.*, (1999) analysed the protection for various crops in Tamil Nadu using NPC, EPC, and DRCR. It was concluded that sugarcane and groundnut were highly protected and had comparative disadvantage domestically when compared to global trade, while rice and cotton were disprotected.

Datta (2000) estimated the international competitiveness of basmati and non-basmati rice exports from India during the post-WTO period using PAM for the years from 1994-95 to 1998-99. The global competitiveness measures namely NPC, EPC,

ESC and DRCR were found to be less than unity, which indicated that India was competitive in the export of basmati and non-basmati rice. For basmati rice, the export competitiveness showed an increasing pattern, but it decreased in the case of non-basmati rice. He found that there was increase in private and social profitability for export of rice in nominal terms between the two periods.

Jayesh (2001) calculated NPC to study the export competitiveness of Indian black pepper. The estimated NPC values were found to be lesser than unity (0.849) for Calicut and (0.817) Sirsi markets, indicating that the Indian black pepper was competitive in the international market and was an efficient export-oriented commodity.

Batra and Khan (2005) analysed the RCA of India and SAARC member nations for 2000 and 2003 period. The results showed that India had comparative advantage in 41 out of the 97 sectors of the HS-2 classification and India was able to meet the import demand for the region.

Reddy *et al.* (2005) assessed the export competitiveness of medium-quality Indian rice, and the concomitant welfare effects of rice trade liberalization using PAM. The results revealed that liberalization had benefitted the rice sector in terms of giving farmers a better deal. Consumers have to pay a higher price because of the limited domestic supply. The positive impact on the farming community led to increase in rice production and also increased the export prospects of rice.

Katti *et. al.,* (2010) examined the pattern of RCA indices for India and Sri Lanka with respect to trade in services, namely transportation, travel and other services during the years from 2001 to 2006. They found that India was not having comparative advantage in transportation and travel, but other services showed comparative advantage.

Veeramani and Saini (2011) estimated RCA indices to understand the relative importance of India and ASEAN in world export markets of tea, coffee and black pepper. The results showed that India, Indonesia and Vietnam had comparative

advantages in all the three commodities. Vietnam recorded the highest RCA index in black pepper and also held the top position in export share in the world market.

Bastine *et al.*, (2012) estimated the NPC for black pepper in India for the years 2009-10, 2010-11 and 2011-12 as 0.973, 0.966 and 0.899 respectively and found that India was competitive in black pepper production and export. The (1-EPC) values though positive were only marginal, indicating the sensitivity of the domestic producers against their foreign competitors. The DRCR values of less than one indicated efficient and internationally competitive production.

Deepika (2015) while studying the factors affecting export competitiveness of plantation commodities in India found that even though the tariff barriers were very limited, the non-tariff barriers retarded the competitiveness of plantation commodities from India. A wide difference in the rules and procedures adopted by different organizations and countries while importing black pepper had created confusion for the Indian exporters. The major non-tariff barrier found to affect tea and coffee was the need for certification.

Joby and Tharian (2015) identified the relative advantage/disadvantage of selected rubber products exported from India using RCA. The export performance of the four selected products of rubber revealed varied market orientation and concentration of exports. China dominated in the export markets of rubber and was having comparative advantage in the four selected products. However, it was found that except in the case of exports of other pneumatic tyres of rubber to the US, India could not achieve its export potential.

Makama *et al*. (2016) studied export competitiveness of Indian rice using PAM and found that social revenues were much higher than the private revenues. It was concluded that the rice producers were dis-protected and hence the export competitiveness was high. The domestic resources were efficiently used and country had comparative advantage in the production of rice.

Suresh and Mathur (2016) analysed the comparative advantage of India's exports using RCA index. The results showed that the RCA was improving for cotton,

maize, and certain fruits and vegetables over time, but declining for some spices, rice and wheat. For some of the spices, India was gradually losing its comparative edge, mainly to the ASEAN countries.

Naik and Nethrayini (2018) studied the export competitiveness of Indian coffee using NPC and found that it was perfectly competitive with NPC values less than unity till 2000. From 2000 onwards, the NPC values for coffee was more than unity which indicated that domestic prices for coffee in India were higher than the international prices. Even though there has been an overall increase in domestic consumption of coffee in India, the per capita consumption of coffee was still very low in the country when compared to other countries.

Thasnimol (2019) analysed the export competitiveness of coconut oil in Kerala using PAM. The results indicated that the production of coconut oil in Kerala lacks comparative advantage and the state was not able to use the available resources efficiently. The trade indicators derived from PAM indicated that private competitiveness and private profitability were mainly the results of extensive support by the government through different programmes and policies.

Indhushree (2020) estimated the export competitiveness of Indian small cardamom using PAM. The results revealed that the commodity was less competitive in the international market, but the country was having comparative advantage in production. She concluded that with increased domestic market orientation, India has lost its export competitiveness in small cardamom, and the share of India in world exports declined drastically due to stiff competition from Guatemala.

Methodology

3. METHODOLOGY

This chapter consists of the details of the methodology adopted in the present study including the types of data, description of the study area, sampling design and different tools of analyses employed to address the aims of the present research. This section is organized under the following sub-headings:

3.1. Types of data

3.2. Sources of data and period of study

3.3. Area of the study

3.4. Sampling design

3.5. Analyses of data

3.1. TYPES OF DATA

The study is based on both primary and secondary data. The data on production, export, import, tariff structure, costs incurred on shipping and handling, prices of Indian and world black pepper, and other published data from various sources were collected to analyze the trade performance, trade competitiveness and trade policies of black pepper and also the impact of multilateral and regional trade agreements on trade. To find the constraints faced by producers and exporters in increasing the competitiveness and exports of black pepper, primary data from selected farm households, village traders and wholesalers in Idukki and Wayanad districts of Kerala state, and also from exporters of black pepper were collected.

3.2 SOURCES OF DATA AND PERIOD OF STUDY

The details of the secondary data along with the time periods for which the data were collected and the sources of data are presented in Table 3.1. The time series data on black pepper production in the world and India from 1990-91 to 2018-19 were collected from Spices board, Kochi and International Pepper Community. The annual data on export and import of black pepper from India and world during the period from 1988 to 2019 were collected from World Integrated Trade Solutions (WITS). The annual and monthly data on export and import (quantity, value and unit value), and export, import and domestic prices were collected from the Ministry of Commerce and

Table 3.1. Details of secondary data with sources and time period

Sl. No.	Secondary data	Time period	Sources
1	Time series data on black pepper production in India and world	1990-91 to 2018-19	Spices Statistics, Spices Board, Kochi Pepper Statistical Yearbook, International Pepper Community
2	Time series data on export and import of black pepper in India and world	1988 to 2019	World Integrated Trade Solutions (WITS)
3	Annual data on import and export of black pepper and its products in India (quantity, value and unit value)	1996-97 to 2018-19	Export-Import data bank, Ministry of Commerce and Industry, GoI Directorate of Economics and Statistics, GoI
4	Monthly data on import and export of black pepper and its products in India (quantity, value and unit value)	2007-08 to 2018-19	Export-Import data bank, Ministry of Commerce and Industry, GoI Directorate of Economics and Statistics
5	Country-wise import and export of black pepper in India (quantity, value and unit value)	1988 to 2019	World Integrated Trade Solutions (WITS)
6	Export prices, import prices and domestic prices	1990-91 to 2018-19	Market Review and Weekly Prices Bulletin, International Pepper Community
7	Data on costs incurred on shipping and handling	1990-91 to 2018-19	United Nations Conference on Trade and Development (UNCTAD) database
8	Data on Tariff and Non-Tariff Measures	1994 onwards	WITS Agricultural Market Access Database Global anti-dumping database Market Access Maps World Bank TPP database World Bank TBT databases Centre for WTO Studies, IIFT

Industry, Government of India, and, Market Review and Weekly Prices Bulletin published by the International Pepper Community. From the UNCTAD database, costs incurred on shipping and handling were collected. The data on tariff and NTMs were also collected from WITS, Market Access Maps, World Bank database, Agricultural Market Access database, Global Anti-dumping data base and the website of the Centre for WTO studies, Indian Institute of Foreign Trade (IIFT), New Delhi.

3.3. AREA OF THE STUDY

The micro-level study was conducted in Idukki and Wayanad districts, which accounted for about 51.9 per cent and 12.4 per cent respectively of the area under black pepper in Kerala State in TE 2018-19

Figure 2 Map of the study area

3.3.1. Description of the selected districts

Idukki and Wayanad are the high range districts of Kerala characterized by the cultivation of spices and plantation crops. Farming is the major source of livelihood for the people in these districts and animal husbandry forms the major additional source of income for the farmers. The districts were having the appropriate agro-climatic conditions for the cultivation of spices and plantation crops, and the major crops cultivated are black pepper, cardamom, coffee, tea, coconut and rubber.

3.3.1.1. Land use pattern

The land use pattern of Idukki and Wayanad districts in TE 2017-18 are presented in Table 3.2. The total cropped area of Idukki district was 62 per cent of the geographical area, whereas for Wayanad, it was 81 per cent. The share of net sown area in the geographical area was higher in Wayanad (53 per cent) when compared to Idukki (47 per cent). The forest land accounted for 45 per cent and 37 per cent of the area of Idukki and Wayanad districts respectively.

Table 3.2. Land use pattern of Idukki and Wayanad districts in TE 2017-18

Particulars	Area in hectares			
	Idukki		Wayanad	
Total geographical area	4,36,328	(100.0)	212966	(100.0)
Forest	1,98,413	(45.47)	78787	(37.00)
Land put to non-agricultural uses	14,125	(3.24)	12053	(5.66)
Barren and uncultivable land	1,453	(0.33)	87	(0.04)
Permanent pastures and grazing land	0	(0.00)	0	(0.00)
Land under miscellaneous tree crops	159	(0.04)	46	(0.02)
Cultivable wasteland	2,154	(0.49)	1048	(0.49)
Fallow other than current fallow	1,160	(0.27)	1068	(0.50)
Current fallow	1,677	(0.38)	2536	(1.19)
Marshy land	0	(0.00)	0	(0.00)
Still water	10,480	(2.40)	4047	(1.90)
Water logged area	0	(0.00)	19	(0.01)
Social forestry	1,144	(0.26)	64	(0.03)
Net area sown	2,05,563	(47.11)	113209	(53.16)
Area sown more than once	65,375	(14.98)	58467	(27.45)
Total cropped area	2,70,938	(62.10)	171676	(80.61)

Source: Agricultural Statistics 2015-16 to 2017-18, Directorate of Economics and Statistics, GoK
Note: Figures in the parentheses show per cent to the total geographical area

3.3.1.2 Cropping pattern

The cropping pattern in selected districts are presented in Table 3.3. The major crops in Idukki are black pepper, rubber and cardamom, whereas in Wayanad, coffee, arecanut, rubber and black pepper were the major crops. In the major black pepper growing districts *viz*., Idukki and Wayanad, black pepper accounted for about 16 and 7 per cent of the total cropped area respectively.

Table 3.3 Cropping pattern in Idukki and Wayanad districts (TE 2017-18)

Sl. No.	Crops	Area in ha	
		Idukki	**Wayanad**
1	Black pepper	43672 (16.12)	11282 (6.57)
2	Cardamom	31380 (11.58)	4120 (2.40)
3	Clove	785 (0.29)	28 (0.02)
4	Nutmeg	3451 (1.27)	129 (0.08)
5	Coffee	12725 (4.70)	67422 (39.27)
6	Cocoa	9411 (3.47)	666 (0.39)
7	Tea	21970 (8.10)	5306 (3.09)
8	Arecanut	2063 (0.76)	12562 (7.32)
9	Coconut	16175 (5.97)	11031 (6.43)
10	Tapioca	6922 (2.55)	1847 (1.08)
11	Ginger	548 (0.20)	2130 (1.24)
12	Turmeric	188 (0.07)	169 (0.10)
13	Fruits	34972 (12.91)	24412 (14.22)
14	Vegetables	6575 (2.43)	1873 (1.09)
15	Rubber	40590 (14.98)	10797 (6.29)
16	Others	39510 (14.58)	17902 (10.42)
Gross Cropped Area		**270938 (100.00)**	**171676 (100.00)**

Source: Agricultural Statistics 2015-16 to 2017-18, Directorate of Economics and Statistics, GoK
Note: Figures in parentheses indicate per cent to gross cropped area

3.3.1.3 Block-wise distribution of area under black pepper in Idukki and Wayanad districts

The block-wise distribution of area under black pepper in Idukki (Table 3.4) and Wayanad (Table 3.5) in TE 2017-18 are discussed below. As evident from Table 3.4, the area under black pepper was highest in Nedumkandam and Azhutha blocks of Idukki district and these blocks together accounted for about 45 per cent of the area under black pepper in the district. In the case of Wayanad district (Table 3.5), Panamaram block accounted for about 40 per cent of the total area under black pepper in the district.

Table 3.4 Block-wise area of black pepper in Idukki district (TE 2017-18)

Sl. No.	Name of block	Area in ha	Per cent to the district total
1	Adimaly	6996	16.02
2	Devikulam	1911	4.37
3	Azhutha	8360	19.14
4	Nedumkandam	11253	25.77
5	Kattapana	7312	16.74
6	Idukki	6049	13.85
7	Thodupuzha	148	0.34
8	Elamdesam	233	0.53
	Block total	**42263**	**96.77**
	Municipalities total	**1409**	**3.23**
	District total	**43672**	**100.00**

Source: Agricultural Statistics 2015-16 to 2017-18, Directorate of Economics and Statistics, GoK

Table 3.5 Block-wise area of black pepper in Wayanad district (TE 2017-18)

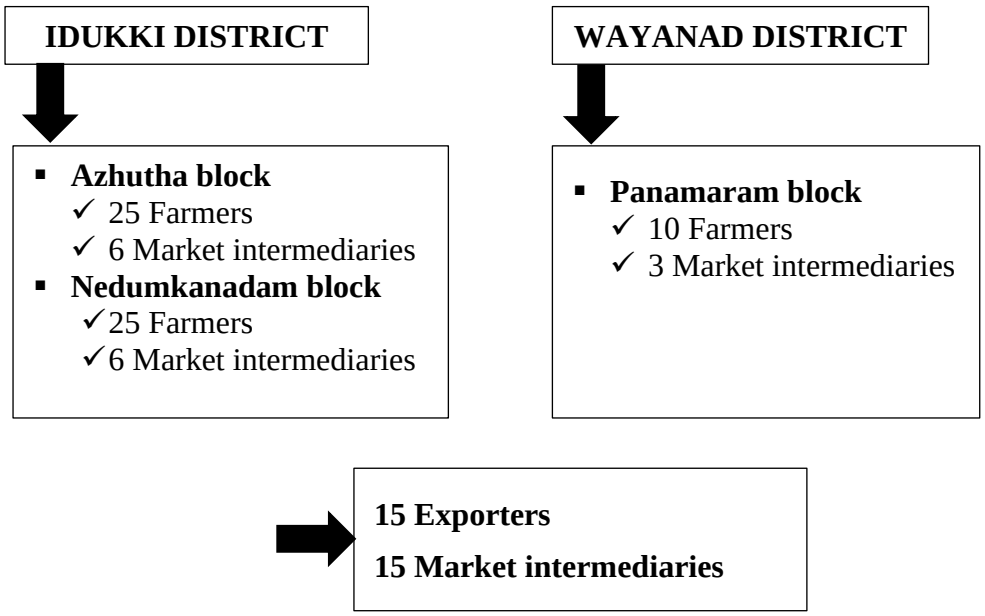
Sl. No.	Name of block	Area in ha	Per cent to the district total
1	Panamaram	4478	39.69
2	Kalpetta	1536	13.62
3	Mananthavady	2546	22.57
4	Sulthanbathery	2138	18.95
	Block total	**10698**	**94.82**
	Municipalities total	**584**	**5.18**
	District total	**11282**	**100.00**

Source: Agricultural Statistics 2015-16 to 2017-18, Directorate of Economics and Statistics, GoK

3.4. SAMPLING DESIGN

The micro-level study was conducted in Idukki and Wayanad districts, which were purposively selected as these districts accounted for about 52 and 12 per cent respectively of the area under black pepper in Kerala State during TE 2018-19. The farmers in the study area with black pepper as the main crop in the total cropped area were selected for the study. From Idukki district, 50 farmers were selected and 10 were selected from Wayanad district, making a total sample size of 60. Data was collected from 15 exporters and 15 market intermediaries (village traders and wholesalers). Pretested interview schedules were used for the collection of primary data from farmers, exporters and market intermediaries. The information regarding the socio-economic profile of farmers and data on the production, input use, costs of cultivation/production, price of output, farm and non-farm income, consumption expenditure, marketing aspects and constraints faced by the producers were collected from the farm households. The data on quantity and value of transactions per year, marketing cost, marketing margin, factors influencing export decisions, GST on exports, constraints for exports and related aspects were collected from intermediaries and exporters.

Figure 3 Distribution of samples



3.5 ANALYSES OF DATA

The analytical tools used in the present study are explained under the following sub-headings:

3.5.1 Import and export performances

3.5.2 Dynamics in tariff structure

3.5.3 Impact of multilateral and regional trade agreements

3.5.4 Export competitiveness

3.5.5 Constraints faced by producers, exporters and market intermediaries

3.5.1 Import and export performances

3.5.1.1 Compound Annual Growth Rate (CAGR)

The CAGR was used to find out the trend in the export and import of Indian black pepper and its products during the period from 1990-91 to 2018-19. The growth in export and import of black pepper in terms of quantity, value and unit value were analysed by using the exponential growth function of the form (Gujarati and Sangeetha, 2007),

$Y = \alpha\beta^t e_t$

$\ln(Y) = \ln(\alpha) + t\ln(\beta)$

where,

Y = Quantity/Value/Unit value of export/import of black pepper

α = Intercept

β = Regression coefficient

t = Time variable

e = Error term

CAGR = r = (Antilog(β) – 1) x 100

Significance of CAGR was tested using t statistics, $t = \frac{r}{\text{Standard Error (SE) of } r}$

where, $SE(r) = \frac{100[\beta * SE(\ln(\beta))]}{\ln(e)}$

3.5.1.2 Instability analysis

The degree of variation involved in the export and import of black pepper was examined using instability index. Coppock's Instability Index was used in the study for the analysis of instability in trade of black pepper.

3.5.1.2.1 Coppock's Instability Index

The instability in trade of black pepper was measured using Coppock's Instability Index (CII). The CII formula is expressed as the antilog of the square root of the logarithmic variance (Coppock, 1966)

$$CII = \text{Antilog}(\sqrt{[U\log - 1]}) \times 100$$

where, $U\log = \frac{1}{(N-1)} \Sigma (\log Y_{t+1} - \log Y_t - M)^2$

$$M = \frac{1}{(N-1)} \Sigma (\log Y_{t+1} - \log Y_t)$$

N = Number of years

Y= Value/Volume of annual export or import of black pepper

M = Arithmetic mean of the differences between logs of Y_t and Y_{t+1}, Y_{t+1} and Y_{t+2} *etc.*

U log = Logarithmic variance of the series

3.5.1.3 Trend breaks

The analysis of trend breaks identify the number of breaks present in a given series. For this purpose, approach followed by Bai and Perron (1998, 2003) was used, which provides a comprehensive treatment of various issues in the context of multiple structural changes in a single (linear) equation framework. Their approach uses sequential procedure and it begins with the testing for a single break. If the test rejects the null hypothesis that there is no structural break, then the sample is split into two and the test is reapplied to each sub-sample and this sequence continues till each sub-sample test fails to find evidence of a break.

Consider the following multiple linear regression model with m breaks (m+1) with h as the minimum length assigned to a segment:

$$y_t = x_t' \beta + z_t' \delta_j + u_t \qquad t = T_{j-1} + 1, \ldots\ldots\ldots, T_j$$

For $j = 1, \ldots \ldots, m + 1$.

Where:

y_t = dependent variable at time *t*

$x_t(p \times 1)$ and $z_t(q \times 1)$ = vectors of covariates

$\beta \; and \; \delta_j \; (j = 1, \ldots, m + 1)$ = corresponding vectors of coefficients

u_t = disturbance at time *t*.

The indices $(T_{1,\ldots,}T_m)$, or the break points, are explicitly treated as unknown ($T_0 = 0$ and $T_{m+1} = T$ are assumed). The purpose is to estimate the unknown regression coefficients together with the break points, when T observations on $(y_t, x_{t,}z_t)$ are available. This is a partial structural change model since the parameter vector β is not subject to shifts and is estimated using the entire sample. When $p = 0$, a pure structural change model in which all the coefficients are subject to change is obtained. The variance of u_t need not be constant and therefore, breaks in variance are permitted provided they occur at the same dates as the breaks in the parameters of the regression. The multiple linear regression (i) may be expressed in matrix form as,

$$Y = X\beta + \bar{Z}\delta + U$$

Where:

$Y = (y_1, \ldots, y_T)'$

$X = \quad (x_{1,\ldots,}x_T)'U = (u_{1,\ldots,}u_r)'$

$\delta = (\delta_1', \delta_2', \ldots, \delta_{m+1}')'$

$\bar{Z}$ = the matrix which diagonally partitions Z at $(T_1, \ldots, T_m)$, i.e. $\bar{Z} = diag(Z_1, \ldots, Z_{m+1})$ with $Z_i = (zr_{i-1} + 1, \ldots zr_i)'$.

True value of a parameter is denoted with a 0 superscript. In particular, $\delta^0 = (\delta_1^{0'}, \ldots., \delta_{m+1}^{0'})' and \; (T_1^0, \ldots, T_m^0)$ are used to denote, respectively, the true values of the parameters δ and the true break points. The matrix $\bar{Z}^0$ is the one which diagonally partitions Z at ($T_1^0, \ldots, T_m^0$). Hence, the data-generating process is assumed to be

$$Y = X\beta^0 + \bar{Z}^0\delta^0 + U$$

The method of estimation considered is thus based on the least-squares principle. For each m-partition $(T_1, \ldots, T_m)$, the associated least-square estimates of $\beta \; and \; \delta_j$ are obtained by minimizing the sum of the squared residuals,

$$(Y - X\beta - \bar{Z}\,\delta)'(Y - X\beta - \bar{Z}\,\delta) = \sum_{i=1}^{m+1} \sum_{t=T_{i-1}+1}^{T_i} [y_t - x_t'\beta - z_t'\delta_i]^2$$

Let $\hat{\beta}(\{T_j\}) and\ \hat{\delta}(\{T_j\})$ denote the estimates based on the given m-partition $(T_1, \dots, T_m)$ denoted $\{T_j\}$. Substituting these in the objective function and denoting the resulting sum of squared residuals as $S_T(T_1, \dots, T_m)$, the estimated break points $(\hat{T}_{1,} \dots\dots, \hat{T}_{m,})$ are such that $(\hat{T}_{1,} \dots\dots, \hat{T}_{m,}) = argmin_{T_{1,\dots\dots\dots T_m}} S_T(T_{1,\dots\dots,} T_m)$, where the minimization is taken over all partitions $(T_{1,\dots\dots} T_m)$, such that $T_i - T_{i-1} \geq q$.[2] Thus, the break-point estimators are global minimizers of the objective function. The regression parameter estimates are the estimates associated with the m-partition $\{\hat{T}_j\}, i.e. \hat{\beta} = \hat{\beta}(\{\hat{T}_j\}), \hat{\delta} = \hat{\delta}(\{T_j\})$. Since, the break points are discrete parameters and can only take a finite number of values, they can be estimated by a grid search. This method becomes rapidly computationally excessive when m>2. Instead of a dynamic programming algorithm that allows computation of estimates of the break points as global, minimizers of the sum of squared residuals can be devised to efficiently estimate the optimal break points for the series starting from one to the maximum allowed by T and h.

3.5.1.4 Region/country-wise trade pattern

The United Nations International Trade Statistics database (UN COMTRADE) and UNCTAD Trade Analysis Information System database (TRAINS) in World Integrated Trade Solutions (WITS), the software developed by the World Bank, and the Market Analysis Tools Portal developed by International Trade Centre were used for the data visualization of trade pattern. The region/country-wise exports and imports of black pepper and the details on products exported along with the corresponding export or import share were visualized using these softwares.

3.5.1.5 Trade complementarity indices

Trade complementarity indices (TCIs) measure the extent to which two countries are “natural trading partners” in the sense that what one country exports overlaps with what the other country imports (Michaely, 1996). The Trade

Complementary Index (TCI) was first proposed by Kojima Kiyoshi and perfected by Peter Drysdale in 1967. The model can be described as:

$$C_{ab}^{k} = RCA_{xa}^{k} \times RCA_{mb}^{k}$$

Where, C_{ab}^{k} is the complementarity index between country *a* and country *b* for commodity k; RCA_{xa}^{k} indicates the comparative advantage of country *a* in commodity *k* by way of exports, and RCA_{mb}^{k} shows the comparative disadvantage of country *b* in commodity k by way of imports, the equations of which are given below:

$$RCA_{xa}^{k} = \frac{(X_a^k / X_a)}{(X_w^k / X_w)}$$

Where, X_a^k and X_w^k are the export value of commodity k of country *a* and the world's total respectively; X_a and X_w are the total export values of country *a* and the world

$$RCA_{mb}^{k} = \frac{(M_b^k / M_b)}{(M_w^k / M_w)}$$

Where, M_b^k and M_b are the import value of commodity k of country *b* and the world's total respectively; M_w^k and M_w are the total import values of country *b* and the world.

In fact, RCA_{xa}^{k} is the revealed comparative advantage index proposed by Balassa, and the greater the value, the more the comparative advantage that country *a* has in commodity k, whereas the greater the value of RCA_{mb}^{k}, the more commodity k that country *b* imports, hence, more comparative disadvantage that country *b* has in the commodity k. When country *a* has a comparative advantage in commodity k, for which country *b* has a comparative disadvantage, it means that the two countries have trade complementarity in commodity k, the degree of which can be measured by their product C_{ab}^{k} . If $C_{ab}^{k} > 1$, it indicates that the two countries have trade complementarity in commodity k, and the greater the value, the higher the degrees of complementarity. If $C_{ab}^{k} < 1$, it means that the complementarity is low, and the smaller that value, the lower will be the degree of complementarity.

3.5.1.6 Commodity diversification index

The commodity diversification index measures the sectoral concentration of country's exports. It states the degree to which a country's exports are dispersed across

different economic activities or commodities. Increased commodity diversification reduces the risk of the country in export earnings. Gini concentration index (Gini, 1921) was used to measure the concentration in the export of black pepper from India. The value of index ranges from 0 to 100. A higher value indicates that the country is increasingly dependent on a small number of products.

Gini Concentration Index = $100\sqrt{\sum_{i=1}^{n}(\frac{X_{it}}{X_t})^2}$

Where,

X_{it} is the value of exports of black pepper product 'i' from India in year 't'

X_t is the value of export of all black pepper products from India in year t

The lower the value of the commodity concentration index, the more evenly are the exports distributed and vice-versa. A declining trend of index indicates greater diversification of exports (Joshi *et. al.*, 2004).

3.5.1.7 Geographic diversification index

If a country is too much dependent on few exports markets or is exporting the major share of exports only to few countries, the fluctuations in those limited markets will affect the earnings from export and make the export income unstable. The Hirschman Index (Mikic and Gilbert, 2009) was used to measure the geographic concentration in the export of black pepper from India.

$$\text{Hirschman Index, HI} = 100\sqrt{\sum_{i=1}^{n}(X_{it}/X_t)^2}$$

where,

X_{it} is the value of exports of black pepper from India in year t to the i^{th} market

X_t is the total value of export of black pepper from India in year t and

n is the number of countries importing the commodity from India

Hirschman index varies from 0 to 100. A value of the index close to zero indicates increased diversification and the value of the index will be higher when a country exports only to few markets.

3.5.1.8 Decomposition models

The Hazell's decomposition model (Hazell *et. al.*, 1990) was used to find out the source of growth and variability in black pepper exports from India. The export

quantity and export unit values were first detrended using the linear relations of the form

$$Y_t = a + b_t + e_t$$

where,

'Y_t' is the dependent variable (export quantity and export unit value), 't' is the time and 'e_t' is the random variable residual with zero mean and variance σ^2

The detrended time series data of the form was used for decomposition

$$Y^*_t = e_t + \bar{Y}$$

where,

'Y^*_t' is the detrended export quantity or unit value

and '$\bar{Y}$' is the mean of export quantity/unit value

The components of average export value were estimated as,

$$EV = \bar{Q}_I \Delta\overline{UV} + \overline{UV}_I \Delta\bar{Q} + \Delta\bar{Q}\Delta\overline{UV} + \Delta Cov\,(Q, UV) \text{ (Method I) or}$$

$$= \bar{Q}_{II} \Delta\overline{UV} + \overline{UV}_{II} \Delta\bar{Q} + (-\Delta\bar{Q}\Delta\overline{UV}) + \Delta Cov\,(Q, UV) \text{ (Method II)}$$

where,

$\bar{Q}_I$ = Average of export quantity of black pepper in first period,

$\bar{Q}_{II}$ = Average of export quantity of black pepper in second period,

$\overline{UV}_I$ = Average of unit value of export in first period,

$\overline{UV}_{II}$ = Average of unit value of export in second period,

$\Delta\bar{Q}$ = Change in export quantity ($\bar{Q}_{II} - \bar{Q}_I$), and

$\Delta\overline{UV}$ = Change in unit value of export ($\overline{UV}_{II} - \overline{UV}_I$).

The components of change in average export values were estimated as shown in Table 3.6. There are four sources of change in the difference in value of exports between two periods. $\Delta\overline{UV}$ and $\Delta\bar{Q}$ arise from the changes in the export unit value and export quantity. These are the pure effects and they arise even if there are no other sources of change. The term $\Delta\overline{UV}.\Delta\bar{Q}$ is the interaction effect, which arises from the simultaneous occurrence of changes in export quantity and export unit value. Obviously, this term will be zero if either export quantity or export unit value remains unchanged. The last term $\Delta\, Cov(Q, UV)$ arises from changes in the variability of

export quantity and export unit value and from changes in the correlation between export quantity and export unit value.

Table 3.6 Components of change in average export value of black pepper

Sources of change in export value	Components of change		
Description	**Symbol**	**Method I (%)**	**Method II (%)**
Change in mean export unit value	$\Delta\overline{UV}$	$\bar{Q}_I\Delta\overline{UV}$	$\bar{Q}_{II}\Delta\overline{UV}$
Change in mean export quantity	$\Delta\bar{Q}$	$\overline{UV}_I\Delta\bar{Q}$	$\overline{UV}_{II}\Delta\bar{Q}$
Interaction between change in mean quantity and mean unit value	$\Delta\overline{UV}.\Delta\bar{Q}$	$\Delta\bar{Q}\Delta\overline{UV}$	$-\Delta\bar{Q}\Delta\overline{UV}$
Change in quantity-unit value covariance	$\Delta Cov\,(Q,UV)$	$\Delta Cov\,(Q,UV)$	$\Delta Cov\,(Q,UV)$

3.5.1.8 Markov chain analysis

Markov chain analysis is employed to analyze the structural change in any system whose progress through time can be measured in terms of single outcome variable (Dent, 1967). In the present study, the dynamic nature of trade patterns, that is the gains and losses in export of Indian black pepper in major importing countries was examined using the Markov chain model. The Markov chain analysis involves developing a transitional probability matrix 'X', whose elements, X_{ab} indicate the probability of exports switching from country 'a' to country 'b' over time. The diagonal element X_{ab} where a=b, measures the probability of a country retaining its market share or in other words, the loyalty of an importing country to a particular country's exports (Atkin and Blandford, 1982).

In the context of the current application, there are some major importing countries for black pepper. The average export to a particular country was considered to be a random variable which depends only on its past exports to that country and can be denoted algebraically as,

$$E_{bt} = \sum_{i=1}^{n} E_{at-1} * X_{ab} + e_{jt}$$

where,

E_{bt} = Exports from India to b^{th} country during the year t

E_{at-1} = Exports to a^{th} country during the year t-1

X_{ab} = The probability that exports will shift from a^{th} country to b^{th} country

e_{jt} = The error term which is statistically independent of E_{at-1}, and

n = The number of importing countries.

The transitional probabilities X_{ab}, which can be arranged in a (c x n) matrix, have the following properties,

$$\sum_{a=1}^{n} X_{ab} = 1, \text{ Where } 0 \leq X_{ab} \leq 1$$

Thus, the expected export shares of each country during period t were obtained by multiplying the exports to these countries in the previous period (t-1) with the transition probability matrix.

The transition probability matrix is estimated in the linear programming (LP) framework by a method referred to as Minimisation of Mean Absolute Deviation (MAD). the LP formulation is stated as

Min, OX* + Ie

Subject to,

BX* + V = Y

GX* = 1 ; X* > 0

where,

X* = vector of the probabilities X_{ab}

O = vector of zeros

I = appropriately dimensional vector of areas

e = vector of absolute errors (|U|)

Y = vector of exports to each country ; V = vector of errors

B = block diagonal matrix of lagged values of Y

G = grouping matrix to add the row elements of X arranged in X* to unity

3.5.1.9 Export supply and import demand functions

The import demand of Indian black pepper in importing countries and export supply of black pepper from India were expressed in import demand and export supply functions, and estimated using simultaneous equation model by Two-stage Least Square method. The simultaneous equation model (Two-stage Least squares (2SLS)) was used to estimate the price and income elasticities of Indian black pepper trade.

The import demand function can be expressed in terms of Gross Domestic Product (GDP) of the importing country, import price and domestic price of the commodity, and a dummy variable which represents the influence of RTAs (Before-

2000 and After-2000). The import demand equation is specified as follows (Khan, 1975, Carone, 1996 and Sultan, 2011),

$$\log X_k^s = \alpha_0 + \alpha_1 \log(P_{mk}) + \alpha_2 \log(P_{dk}) + \alpha_3 \log(Y_k) + \alpha_4 \log(D) + U$$

Where, X_k^s = Quantity of black pepper imported to other countries from India

P_{mk} = Import price of black pepper

P_{dk} = Domestic price of black pepper

Y_k = GDP of the importing country

D is a dummy variable which takes value of '0' for years before 2000 and '1' for the years after 2000

U = Error term

Since the equation is specified in logarithms, α_1, α_2, α_3, and α_4 are elasticities of import price, domestic price, GDP and dummy variable of import-demand function, respectively. The coefficient of import price (α_1) is expected to have a positive sign, while that of α_2 *i.e.,* coefficient of domestic price is expected to be negative. That means, as the import price of black pepper increases and domestic price of black pepper decreases, the quantity of black pepper imported to other countries from India will increases. The coefficient of GDP of the importing country is expected to take positive sign, as the GDP of the importing country increases, their demand for Indian black pepper will also increases. The dummy variable is expected to have a positive effect because the proliferation of RTAs started after 2000 which increased the trade between countries.

The export supply in the exporting country is affected by international price and lagged domestic production. The export supply equation is specified as follows (IMF, 2010 and Shailza *et. al.,* 2015)

$$\log X_k^s = \beta_0 + \beta_1 \log(P_{ik}) + \beta_2 \log(Y)_{t-1} + \beta_3 \log(D) + V$$

Where, X_k^s = Quantity of black pepper exports from India

P_{ik} = International price of black pepper

$(Y)_{t-1}$ = lagged domestic production

D is a dummy variable which takes value of '0' for years before 2000 and '1' for the years after 2000

V = Error term

β_1, β_2, and β_3 are elasticities of international price of black pepper (MG1 New York), lagged domestic production of black pepper and dummy variable that shows the effect of RTAs. β_1 and β_2 are expected to take positive signs because when the price of black pepper in the international market and domestic production increases, India will export more black pepper to the world. The domestic production variable is used as an explanatory variable which reflects the exporter's ability and willingness for exports. Here, lagged domestic production is taken as explanatory variable, because the effect of increased domestic production in the current year will show the effect on export in the next year. The dummy variable is expected to have a negative effect on export supply of black pepper from India. Because of the increasing number of regional trade agreements after 2000, more number of black pepper suppliers were originated in the international market, that affected the export supply of black pepper from India.

3.5.2 Dynamics in the tariff structure

3.5.2.1 Average Tariffs

Tariffs can be aggregated by simple averages or by using weighted averages. Simple averages are calculated by adding the tariffs on all lines and dividing by the number of those tariff lines (UNCTAD, 2012). The weighted averages of tariffs are estimated as:

$\bar{\tau} = \sum_k w_k \tau_k$

Where *k* is an index given for imported goods and w_k is the weight given to tariff *k* in the average. A widely used approach is to weigh goods with their share in the country's overall imports.

3.5.2.2 Tariff Dispersion

The dispersion of tariff around a mean provides a real picture of a given tariff structure. In general, higher the dispersion, more will be the distortion. The dispersion of tariff can be captured by using standard deviation or the coefficient of variation of tariff rates around the averages (UNCTAD, 2012). The standard deviation is defined as,

$$\sigma = \sqrt{\frac{1}{N}\sum_{k=1}^{N}(\tau_k - \bar{\tau})^2}$$

Where,

N = number of tariff lines

τ_k = tariff rate of imported good

$\bar{\tau}$ = average tariff

The coefficient of variation (CV) can be defined as the standard deviation divided by the average tariff.

CV = $\frac{\sigma}{\bar{\tau}}$, Where σ is the standard deviation and $\bar{\tau}$ is the average tariff.

3.5.2.3 Most Favoured Nation, preferential and applied tariff rates

3.5.2.3.1 Most-Favoured Nation (MFN) tariffs

The MFN tariffs are tariffs that countries agree to impose on imports from other members of the WTO, unless the country is part of a preferential trade agreement, such as a free trade area or customs union. This means that, in practice, MFN rates are the highest or the most restrictive tariff that WTO members charge one another.

3.5.2.3.2 Preferential tariffs

Virtually all countries in the world have joined in at least one preferential trade agreement, under which they promise to give another country's products lower tariffs than their MFN rate. In a customs union or a free trade area, the preferential tariff rate is zero on essentially all products. These agreements are reciprocal *i.e.*, all parties agree to give each other the benefits of lower tariffs. Some agreements specify that members will receive a percentage reduction from the MFN tariff, but not necessarily zero tariffs. Preferences therefore differ between partners and agreements.

3.5.2.3.3 Applied tariffs

When governments negotiate tariff reductions in the GATT/WTO, their commitments take the form of MFN tariff bindings. The bound MFN tariff levels, which are listed in a country's tariff schedule, indicate the upper limit at which the government is committed to set its applied MFN tariff. For a given tariff line, the bound tariff must thus be higher than or equal to the applied MFN tariff, which should be

higher than or equal to the preferential tariff, if any. For developed countries, bound tariffs are typically identical or very close to applied tariffs. For developing countries, however, there is often "water" in the tariff, which means that bound rates are typically above applied tariffs and have therefore limited effects on trade flows, even if they are fundamental in WTO negotiations. It is important in applied analysis to apply the right tariffs to the right imports (e.g. not to apply MFN tariffs to imports from preferential partners).

3.5.2.4 Import penetration

The Import penetration rate shows to what degree domestic demand (the difference between GDP and net exports) is satisfied by the imports (Mikic and Gilbert, 2009).

$$\frac{\sum_s M_{sd}}{GDP_d - \sum_s X_{ds} + \sum_s M_{sd}} \times 100$$

Where,

d is the country under study

s is the set of all other countries

X is exports, M is imports

GDP is Gross Domestic Product

3.5.3 Impact of regional and multilateral trade agreements

3.5.3.1 Partial equilibrium analysis – SMART model

The partial equilibrium SMART model was developed by UNCTAD and the World Bank during 1980s, mainly to assess the impact of GATT rounds. The major advantages of partial equilibrium model include its application at a fine level of detail within a given sector and the simplicity of its computation. The partial equilibrium approach assumes that the sector under consideration has no linkage with other sectors of the economy, which is not an unreasonable assumption for primary commodities with relatively weak inter-sectoral linkages (Veeramani and Saini, 2011).

The SMART model is one of the analytical tools available in the WITS for simulation purposes (Lierd and Yeats, 1986). The model focuses on one importing

market and its exporting partners and assesses the impact of a tariff change scenario by estimating new values for a set of variables.

The core assumption of this partial equilibrium model is the Armington assumption, i.e. the imports from different countries are imperfect substitutes. When it comes to export supply elasticities, SMART can either be solved with perfectly elastic export supplies, i.e. world prices of each variety are given, or by assuming upward-sloping export supply curves (Jammes and Olarreaga, 2005).

The SMART model can be used to evaluate the impact of a given trade policy change, measured in tariff, on trade creation effects, trade diversion effects, tariff revenue, consumer surplus and welfare.

3.5.3.2.1 Trade creation

Trade creation captures the trade expanding aspects of liberalization that leads to the displacement of inefficient producers in a given preferential trading area. It is assumed that there is full transmission of price changes when tariff or non-tariff distortions (ad valorem equivalents) are reduced or eliminated. Laird and Yeats (1986) derived the equation that can be used to estimate the trade creation effects.

$$TC_{ijk} = \eta_i^m M_{ijk} \frac{\left(1 + t_{ijk}^1\right) - \left(1 + t_{ijk}^0\right)}{\left(1 + t_{ijk}^0\right)}$$

Where TC_{ijk} is the sum of trade created in millions of dollars over *i* commodities affected by the tariff change

η_i^m is the elasticity of import demand for commodity *i* in the importing country from the relevant trading partner

M_{ijk} is the current level of import demand of the given commodity *i*

t_{ijk}^0 and t_{ijk}^1 represent tariff rates for commodity *i* at the initial and end periods respectively

Trade creation depends on the current level of imports, the import demand elasticity and the relative tariff change

3.5.3.2.2 Trade diversion

The trade diversion as opposed to trade creation can expand or contract trade globally. Trade diversion is the phenomenon that occurs in a free trade area whereby

efficient producers from outside the free trade area are displaced by less efficient producers in the preferential area. A preferential tariff reduction granted by country *l* to partner country *i* will induce substitution of imports away from other countries. This trade diversion is calculated in SMART using the elasticity of substitution.

$\text{TD} = \left(\frac{M_k^i M_k^l}{M_k^i + M_k^l}\right) \sigma \frac{dt_k^i}{t_k^i}$ if $-dM_k^l \leq M_k^l$

Where, TD is the trade diversion

M_k^i is the import from preferred country

M_k^l is the imports from MFN countries

σ is elasticity of substitution

dt_k^i is tariff reductions applied on good *k* to partners *i*

t_k^i is tariff rates for commodity *k*

The SMART model is typically used to analyse the effects of a tariff change that provides a more favourable treatment for one trading partner. For example, granting 'country A' a lower tariff compared to 'country B' changes the relative prices of two goods. The consumption of the good from 'country A' will increase, whereas the imports from 'country B' will decrease. This effect is called as trade diversion (UNCTAD, 2012).

Trade creation happens when the lower price of the commodity coming from 'country A' enables consumers to reach a higher composite quantity. Keeping the expenditures constant, consumers will be able to import more of the commodity coming from 'country A'. In SMART, exporter A will enjoy both a positive diversion effect and a positive creation effect, whereas exporter B will suffer from a negative diversion effect and yet no trade creation effect.

The SMART model also calculates the effect of trade policy changes on tariff revenue, consumer surplus and welfare. The change in tariff revenue is calculated as the difference between the old tariff revenue (initial ad valorem tariff multiplied by initial import value) and the new tariff revenue (new ad valorem tariff multiplied by new import value) (UNCTAD, 2012).

3.5.3.2 Gravity model

The gravity model of trade is a widely acclaimed empirical tool for modelling bilateral trade (Zhang and Christensen, 1995). The gravity model is an alternative approach to SMART model simulation, as it doesn't rely on elasticity parameter values. The simplest gravity model predicts that the trade between two countries will be proportional to the product of their gross domestic products and inversely proportional to the physical distance between them. The gravity model in its original form as applied to international trade (Tinbergen, 1962; Poyhonen, 1963) is given the by equation:

$T_{ab} = \alpha Y_a Y_b / D_{ab}$

where, T_{ab} is the value of the bilateral trade between countries 'a' and 'b'

Y_a and Y_b are the national incomes of country 'a' and 'b', respectively measured in terms of GDP

D_{ab} is the measure of bilateral distance between the capital cities of the countries 'a' and 'b'

α is the constant of proportionality

The panel data on black pepper imports to India from ASEAN countries during the period from 2000 to 2019 were used for gravity analysis. This data showed zero trade flow between India and ASEAN countries in some of the years. Ignoring the zeros induces a selection bias if the zero trade flows are not random, as is usually the case (Veeramani and Saini, 20111). Helpman *et al* (2008) has proposed a theoretical model rationalizing the zero trade flows and suggested estimating the gravity equation with a correction for the probability of countries to trade. Heckman sample selection model was used to assess whether selection bias was present, identify factors contributing to the selection bias, and to control for this bias.

The Heckman sample selection model has two stages: an equation for selection of trade partners in the first stage, and a trade flow equation in the second. The selection equation estimates the probability of India and individual ASEAN countries engaging in trade (as the dependent variable) on a set of independent variables (GDP, distance, language, colony and AIFTA dummy). The Inverse Mills ratio (IMS) is estimated using a probit model (selection equation) and it explains that part of the error

term which captures the difference in outcome variables due to the selection and not the programme itself (Sachu *et. al*, 2020). In the second stage, the intensity of bilateral trade is determined *i.e.*, outcome variable is regressed with treatment dummy variable and a set of control variables, including IMS as an explanatory variable to minimise the effect of endogeneity.

The selection model is specified as follows:

$$SM = \log \alpha + \beta_1 \log (D_{ab}) + \beta_2 \log (Y_b) + \beta_3 \log (LANG) + \beta_4 \log (COL) + \beta_5 \log (AIFTA) + u_{ab}$$

where, SM = 1 if 'country b' reports positive export value to India, and 0 otherwise

Y_b is the GDP of the b^{th} Indian trade partner

D_{ab} denotes the distance between India 'a' and country 'b' and was measured as the seaport distance between two countries

LANG is a dummy that takes a value of 1 if India and country b share a common official language; 0 otherwise

COL is a dummy that takes a value of 1 if India and country b have ever had a colonial link; 0 otherwise

AIFTA is a dummy that takes a value of 1 for years with AIFTA; 0 otherwise

u_{ab} is error term

The outcome equation is specified as follows:

$$\log (T_{ab}) = \log \alpha + \beta_1 \log (D_{ab}) + \beta_2 \log (Y_b) + \beta_3 \log (LANG) + \beta_4 \log (COL) + \beta_5 \log (AIFTA) + \beta_6 \log (C_a) + v_{ab}$$

where, T_{ab} is the value of the black pepper imports to India from the b^{th} Indian trade partner (ASEAN countries) and v_{ab} is error term

3.5.3.3 Interrupted Time Series Analysis (ITSA)

The interrupted time series analysis (ITSA), also known as quasi-experimental time series analysis, is a method of statistical analysis involving tracking a long-term period before and after a point of intervention to assess the intervention's effects. With this design, outcomes are measured at different time points before and after implementing an intervention, allowing the change in level and trend of outcomes to be compared, to evaluate the intervention effects (Ewusie *et. al.*, 2020). Here, the effect

of ISLFTA and SAFTA on black pepper imports to India from Sri Lanka were analysed using ITSA.

The single-group ITSA regression model was used with two interventions (ISLFTA and SAFTA) (Huitema and McKean 2000a; Linden and Adams 2011; Simonton 1977a; Simonton 1977b):

$$Y_t = \beta_0 + \beta_1 T_t + \beta_2 D_{1t} + \beta_3 D_{1t} T_t + \beta_4 D_{2t} + \beta_5 D_{2t} T_t + \varepsilon_t$$

Y_t is the aggregated outcome variable measured at each equally spaced time point t,

T_t is the time since the start of the study,

D_{1t} / D_{2t} is a dummy (indicator) variable representing the intervention (pre-intervention period 0, otherwise 1), Here D_{1t} is ISLFTA dummy taking 0 for years without ISLFTA and otherwise 1; D_{2t} is SAFTA dummy taking 0 for years without SAFTA and otherwise 1

$D_{1t}T_t$ / $D_{2t}T_t$ is an interaction term.

β_0 represents the intercept or starting level of the outcome variable.

β_1 is the slope or trajectory of the outcome variable until the introduction of the intervention.

β_2/β_4 represents the change in the level of the outcome that occurs in the period immediately following the introduction of the intervention (compared with the counterfactual).

β_3/β_5 represents the difference between preintervention and postintervention slopes of the outcome.

Thus, significant p-values in β_2/β_4 indicates an immediate treatment effect, or in β_3/β_5 to indicate a treatment effect over time (Linden and Adams 2011)

3.5.4 Export competitiveness

The export competitiveness of a commodity exported from a country suggests whether the country has an advantage in the export or import of that commodity, which would be useful in formulating commodity specific policies on production, export and tariffs. The concept of competitive advantage is more descriptive which provide “a

basic explanation of the international pattern of specialization in production and trade" (UNIDO, 1986). On the other hand, it also plays an important role in prescriptive or normative economics by providing guidelines for government policies on resource allocation and trade. Thus, assessing a country's comparative advantage in black pepper export can provide useful information for decision making regarding efficient resource allocation and trade of black pepper. The export competitiveness of black pepper was assessed using Revealed Comparative Advantage (RCA), Policy Analysis Matrix (PAM) and the competitiveness ratios *viz*., Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC) and Domestic Resource Cost Ratio (DRCR) (Gotsch *et al.*, 2003).

3.5.4.1 Revealed Comparative Advantage (RCA)

The Revealed Comparative Advantage (RCA) is used to understand the relative importance of India and other black pepper producing countries in the world black pepper export markets. The revealed comparative advantage is an index used in international trade for calculating the relative advantage or disadvantage of a certain country in a certain class of goods or services as evidenced by trade flows. The RCA of country 'a' in commodity 'g' is defined as $\mathrm{RCA}_{ag} = \frac{(X_{ag}/X_a)}{\sum_a X_{ag}/\sum_a X_a}$.

The numerator of the RCA index represents the value share of black pepper 'g' in the overall export basket of country 'a'. The denominator represents the value-share of g in total world exports. If the RCA index of a commodity is greater than 1, it implies that the country holds a comparative advantage in that commodity (Balassa, 1965).

3.5.4.2 Policy Analysis Matrix (PAM)

The PAM was first constructed by Monke and Pearson in 1989, which is used as a tool for analysis of the entire production system. PAM helps in analyzing the effectiveness of the regulations in the agricultural sector and the role of the state in these regulations (Monke and Pearson, 1989). In this matrix, private and social prices of inputs used in production and output produced are compared for the evaluation of the effects of the state policy. The private prices are the current market prices and social prices are shadow prices or true prices without any market distortions or government interventions (Yao, 1997).

A matrix is a collection of numbers or symbols that follows certain relationship across rows and columns. In PAM matrix, two accounting identities are there – profitability and divergence. Profitability is the relationship across the column of the matrix and divergence is the relationship down the rows.

Table 3.7 Policy Analysis Matrix

	Revenue	**Costs**		**Profits**
		Tradable Input	**Domestic Factor**	
Private	O	P	Q	R = O - (P+Q)
Social	S	T	U	V = S - (T+U)
Divergences	W	X	Y	Z = W - (X+Y)

Table 3.7 shows different components in a PAM table. PAM table consists of revenue, cost and profits measured in both social and private prices. PAM was mainly constructed for calculating the private profitability, social profitability and divergence. Private profitability (R) is the difference between observed revenue (O) and the costs (P+Q). It is calculated at the first row of the PAM table, which measures the competitiveness of the system at actual market prices.

Social profitability (V) is social opportunity cost which measures the efficiency and comparative advantage of the system. It is the difference between revenue (S) and the cost at social prices (T+U). A positive social profit indicates that the country uses scarce resources efficiently and has a static comparative advantage in the production of that commodity at the margin. Also, negative social profits suggest that the sector is wasting resources that could have been utilized more efficiently in some other sector. Divergence is calculated for the measurement of the transfer effects of policies. By contrasting revenues (first row) and costs (second row) before and after the imposition a policy, one can explain the impact of that policy. That is to say, the difference between the private and social values of revenue, costs and profits can be explained by policy intervention. Thus, important indicators for policy analysis viz; Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC) and Domestic Resource Costs (DRC) can be calculated using the PAM framework.

3.5.4.3 Nominal Protection Coefficient (NPC)

The Nominal Protection Coefficient is the simplest indicator of export competitiveness and domestic protection, which measures the degree of protection or otherwise, provided to the domestically produced commodities. The domestic price used in this computation is the wholesale price, while the world reference price is the international price adjusted for transport, marketing and processing cost necessary to make the commodity comparable. NPC is mathematically defined as,

$$NPC_k = {P_k^d}/{P_k^w} = {O}/{S}$$

where,

NPC_k = Nominal protection coefficient of commodity *k*

P_k^d = Domestic price of commodity *k*

P_k^w = World reference price of commodity *k*, adjusted for transportation, handling and marketing expenses.

If the NPC is greater than one, then it indicates that the commodity is protected compared to the situation that would have prevail under free trade. If however, the NPC is less than one, then the commodity is not protected. NPC equal to one indicates that domestic price is equal to its border price (CIF or FOB) and no protection is given to the commodity.

3.5.4.4 Effective Protection Coefficient (EPC)

The Effective Protection Coefficient for black pepper is defined as the ratio of value added in private prices (O-P) to the value added in social prices (S-T). The formula of EPC can be written as

$$EPC_k = \frac{Q_i(P_i^d - \sum A_{ki} * P_i^d)}{Q_i(P_k^w - \sum A_{ki} * P_i^w)}$$

where,

EPC_k = Effective Protection Coefficient for black pepper

Q_k = Quantity of black pepper produced

A_{ki} = Quantity of i^{th} input required to produce a unit of black pepper

P_k^d = Domestic price of black pepper

P_k^w = World reference price of black pepper

P_i^d = Domestic price of i^{th} traded input

P_i^w = World reference price (Border equivalent) of i^{th} traded input, adjusted for transportation, handling and marketing expenses.

The whole expression in *Qi* above can cancel out and be reduced to value added as:

$$EPC_k = \frac{V_k^d}{V_k^w}$$

V_k^d = Value added at domestic prices

V_k^w = Value added at world reference prices

i.e., EPC = (O-P)/(S-T)

An EPC value of greater than unity suggests that government policies provide positive incentives to producers, and a less than unity value indicates that producers are not protected through the policy interventions.

3.5.4.4 Domestic Resource Cost Ratio (DRCR)

The Domestic Resource Cost is the most widely used and comprehensive measure of resource efficiency in an economy. It is used to compare the relative efficiency or comparative advantage among agricultural commodities and is defined as the shadow value/price of non-tradable factor inputs (land, labour and non-traded capital) used in an activity per unit of tradable value/price added *i.e.* U/(S-T). It is the value of domestic resources needed to earn or save a unit of foreign exchange through the production or export of the commodity under consideration. Symbolically,

$$DRCR = \frac{\sum A_{ij} P_j^s}{P_i^w - \sum A_{ij} P_j^w}$$

Where,

A_{ij} = Quantity of the j^{th} input required to produce a unit of black pepper

P_i^s =Shadow price (opportunity cost or social price) of j^{th} non-traded input;

P_i^w = World reference price of commodity *i*, adjusted for transportation, handling and marketing expenses;

P_j^w= World reference price of j^{th} traded input, adjusted for transportation, handling and marketing expenses.

The non-traded inputs are those inputs which are not usually traded internationally. Those considered here are the human labour, and farm yard manure. The traded inputs however, are the inputs that are traded in the international market and they include seed, fertilizer and chemicals. The DRC decision rule is; when DRC value is less than unity, the input is efficiently used for production. When the estimated DRCR value is greater than unity, then the input is inefficiently used for production.

3.5.5 Constraints faced by producers, exporters and market intermediaries

3.5.5.1 Garrett ranking technique

The Garrett ranking technique was used to identify the problems faced by producers, exporters and intermediaries in increasing the competitiveness and exports of black pepper. Firstly, major constraints faced by the respondents in export of black pepper were identified. Then identified constraints were ranked by each respondent, and the rank given to different problems were converted into percentage using the formula:

$$\text{Per cent position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

Where, R_{ij} = Rank given for i^{th} constraint by j^{th} respondent

N_j= Number of constraint ranked by j^{th} respondent

As the rank is an interval on a scale, 0.5 is subtracted from each rank to get the midpoint that best represents the interval. Then, Garrett scores were obtained by converting the percentage positions into scores on a scale of 100 points referring to the table given by Garrett and Woodworth (1969). The mean score level was calculated from the obtained scores, and based on this mean score level, problems were ranked.

3.5.5.2 Correspondence analysis

To identify the constrains and problems faced by the exporters, traders and farmers engaged in the export of black pepper, correspondence analysis was employed. Correspondence analysis is linear multivariate descriptive statistical method that graphically represents the rows and columns of categorical data matrix in the same low dimensional space (Prasad, 1994). It facilitates a multidimensional representation of

the dependence between rows and columns of a two-way contingency table. Thus, with correspondence analysis, it is possible to analyse the contingency table such as a two-way table (simple correspondence analysis) or a multi-way table (multi correspondence analysis), where the data matrix has non negative values.

Steps for analytical procedure (Singh *et al.*, 2015) are as follows:

Step 1: First test the independence of categorical variables with chi square test statistics and if test is significant, then go for next step

Step 2: Develop correspondence matrix $m_{ij} = \left(\frac{n_{ij}}{n_{...}}\right)$

Step 3: Develop row profile *i.e.* (m_{ij}/row mass)

Step 4: Develop column profile *i.e.* (m_{ij}/column mass)

Step 5: Analyze weighted χ^2 distance = D = $D_r^{-1/2}(M - rc^T)D_C^{-1/2}$

Step 6: Carry out singular value decomposition (SVD) or dimension reduction technique

Step 7: Calculate overall fit measures and correspondence maps

Results and discussion

4. RESULTS AND DISCUSSION

This chapter deals with the research findings and the relevant discussions of the results obtained in the study. The present study entitled “Implications of trade agreements on India’s trade in black pepper and its products” examined the trade performance of Indian black pepper and its products, studied the dynamics in the trade policies and tariff structure, assessed impact of multilateral and regional trade agreements on trade, determined the Non-Tariff Measures affecting black pepper exports from India, estimated the measures of trade competitiveness and identified the constraints faced by producers and exporters in increasing the exports and competitiveness of black pepper from India. Based on the objectives of the study, data pertinent to the present study were collected from various sources and analysed using appropriate tools. The results of the study are discussed under the following headings:

4.1 Trade performance of Indian black pepper and its products

4.2 Dynamics in the trade policies and tariff structure

4.3 Impact of multilateral and Regional Trade Agreements on black pepper trade

4.4 Non-Tariff Measures (NTM) affecting black pepper exports from India

4.5 Measures of trade competitiveness

4.6 Constraints faced by producers and exporters

4.1 TRADE PERFORMANCE OF INDIAN BLACK PEPPER AND ITS PRODUCTS

Through the openness of trade in Indian agriculture and greater integration of Indian commodity markets with the international markets, there is increased dependence of many spices especially, black pepper on global markets, directly or indirectly. This along with the dynamic policy environment calls for an analysis on the trade performance of Indian black pepper. The study examined the export and import performance of black pepper and its products by analyzing the growth and instability in trade, changing patterns of international trade, different components of change in export growth, extent of export diversification, dynamics in trade and export supply and, import demand functions.

Traditionally, India had been a major producer and exporter of black pepper. Indian black pepper earns a premium price in the world markets because of its preference and intrinsic qualities. India's share in global exports of black pepper has decreased from around 25 per cent in 1988 to five per cent in 2019, both in quantity and value terms (Figure 4). On the other hand, the share of Indian black pepper imports in the world imports of black pepper has increased over the years. The share of black pepper imports to India in quantity terms has increased from 3.5 per cent in 1988 to 6.8 per cent in 2019, whereas in value terms it increased from 1.5 per cent to 6.6 per cent during the same period (Figure 5). The export, import and Balance of Trade (BoT) of black pepper in India for different periods are presented in Table 4.1. Black pepper exports from India decreased from 32,980 tonnes in TE1990 to 18,210 tonnes in TE2019 and in between there was a slight increase in export quantity from 29,240 tonnes in TE2000 to 31,540 tonnes in TE2010. The value of exports has increased from 869.12 lakh US$ in TE1990 to 1,015.09 lakh US$ in TE2019. The reason for the increase in value of exports was due to the increase in unit value of exports from 2.59 US$/kg in TE 1990 to 5.57 US$/kg in TE 2019. The value of export varied much on the basis of unit value realization rather than the variation in the quantum of exports. The imports of black pepper to India have increased over the years from 1190 tonnes in TE1990 to 30,140 tonnes in TE2019. Similarly, the value of imports has also increased from 18.47 lakh US$ in TE1990 to 1,415.90 lakh US$ in TE2019. The unit value of imports of black pepper has increased three-fold in TE 2019 as compared to TE1990. The trade balance was positive in TE1990, TE2000 and TE2010 in both quantity and value terms, but in TE2019, India had a negative trade balance (-400.81 lakh US$ and -11930 tonnes), since the country became a net importer of black pepper.

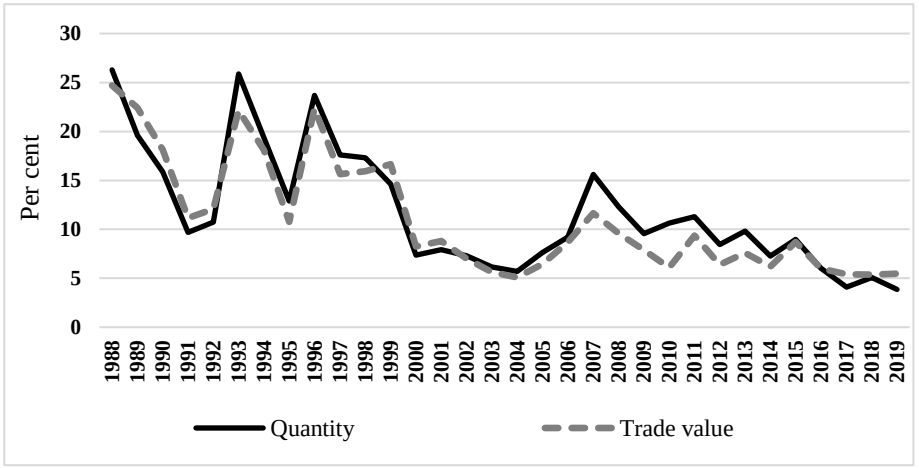
4.1.1 Classification of data

Based on the availability of data, trade performance of black pepper was analysed for 31 years from 1988 to 2019, which were further divided into five sub-periods. The analysis was also carried out for the overall period. The main consideration behind dividing the total period of 31 years into sub-periods was to find out the disaggregated performance of export and import (quantity, value and unit value terms) of black pepper over time. Three sub-periods used for analysis were decadal

Table 4.1 Export, import and Balance of Trade (BoT) of Indian black pepper

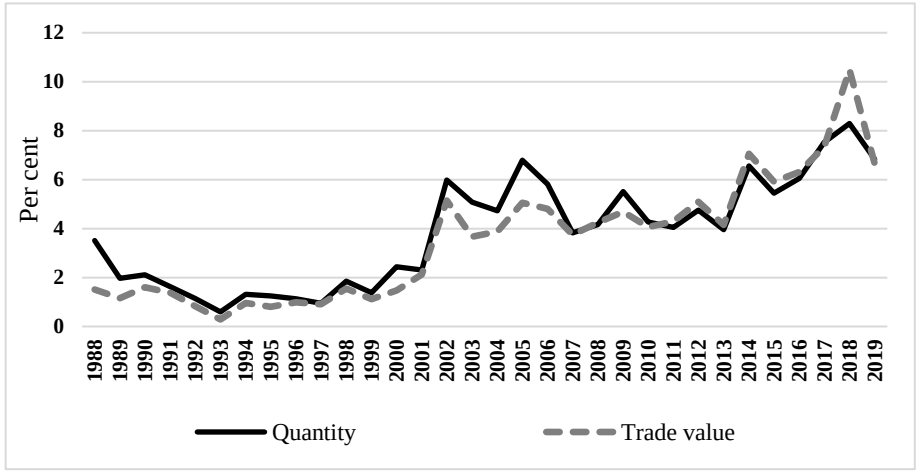
Trienniums	Export			Import			BoT	
	Value (1000 US$)	Quantity (tonnes)	Unit Value (US$/kg)	Value (1000 US$)	Quantity (tonnes)	Unit Value (US$/kg)	Quantity (tonnes)	Value (1000 US$)
TE 1990	86912.40	32,980	2.59	1847.54	1190	1.59	31,790	85065
TE 2000	130303.68	29,240	4.42	13224.21	4180	3.36	25,060	117079
TE 2010	89879.81	31,540	2.90	46843.37	15,030	3.16	16,510	43036
TE 2019	101509.15	18,210	5.57	141590.47	30,140	4.7	-11,930	-40081

Figure 4 Dynamics in share of Indian black pepper exports in world exports of black pepper



Note: Estimated using data from WITS.org

Figure 5 Dynamics of share of Indian black pepper imports in world imports of black pepper



Note: Estimated using data from WITS.org

sub-periods (1990-1999, 2000-2009 and 2010-2019) and the entire period was also divided into two sub-periods based on the trend break analysis.

Structural break analysis by Bai and Perron (1998) was used to find out the breaks in data and to identify the significant shift in India's black pepper trade. The breaks occur due to changes in the mean or variability of the series within the period. In this study, structural break analysis was carried out for exports as well as imports of black pepper, in terms of quantity, value and unit value, to identify the single most significant year of break in exports and imports.

For computation of the break points, the *strucchange* package in *R Studio* software was used and the following *m* breakpoints were obtained. The package was set to obtain the optimal breakpoints with either uniform or non-uniform periods in between the breaks. The optimal breakpoints were decided based on a two-step validity test on the Residual Sum of Squares (RSS) and the Bayesian Information Criteria (BIC). The lowest value of RSS was considered as optimal in the first step. In case the optimal breakpoints found in step one coincided with the lowest BIC, this was taken as the optimal breakpoint and therefore, the lowest BIC held the precedence on validity.

Table 4.2 and Table 4.3 show the estimated number of break points in both export and import of Indian black pepper. For quantity and value of exports, optimal breakpoints coincided with m=3, with the minimum BIC of 17.23 and 56.29 respectively, whereas for unit value of exports, m=4 had the minimum BIC of 29.6. The three break points identified for the quantity of exports were 2000, 2005 and 2015, while for value of exports the breakpoints were 1995, 2000 and 2006. The four break points identified in unit value of exports were 1996, 2000, 2006 and 2010. From these results, the single most significant break year in exports of black pepper was identified as 2000. This year could be considered as the most significant year in the transition phase for international trade in agriculture. Even though the implementation of WTO Agreement on Agriculture was started in 1995, the tariff reduction commitments began only after 2000 (GoI, 2019). Therefore, the entire data on exports in terms of quantity, value and unit value was divided into two sub-periods *viz*., pre-2000 and post-2000 for the analyses.

Table 4.2 Estimated number of breakpoints in quantity, value and unit value of black pepper exports from India

Particulars	Quantity					Value					Unit Value				
	m=1	**m=2**	**m=3**	**m=4**	**m=5**	**m=1**	**m=2**	**m=3**	**m=4**	**m=5**	**m=1**	**m=2**	**m=3**	**m=4**	**m=5**
Breakpoints	2015	2000	**2000**	1992	1992	2006	2000	**1995**	1995	1995	2010	1994	1996	**1996**	1991
		2005	**2005**	2000	2000		2006	**2000**	2000	2000		2010	2000	**2000**	1996
			2015	2005	2005			**2006**	2005	2005			2010	**2006**	2000
				2015	2009				2010	2010				**2010**	2006
					2015					2015					2010
RSS	2.820	2.186	**1.349**	1.118	1.054	8.496	6.367	**4.574**	3.824	3.252	3.715	3.182	1.995	**1.600**	1.491
BIC	26.94	25.73	**17.23**	18.12	23.17	62.24	59.94	**56.29**	57.49	59.23	35.77	37.74	29.74	**29.60**	34.28

Table 4.3 Estimated number of breakpoints in quantity, value and unit value of black pepper imports to India

Particulars	Quantity					Value					Unit Value				
	m=1	**m=2**	**m=3**	**m=4**	**m=5**	**m=1**	**m=2**	**m=3**	**m=4**	**m=5**	**m=1**	**m=2**	**m=3**	**m=4**	**m=5**
Breakpoints	2001	1997	1997	**1993**	1993	2001	1996	1997	1993	**1993**	2001	1996	1997	**1993**	1993
		2001	2001	**1997**	1997		2001	2001	1997	**1997**		2001	2001	**1997**	1997
			2013	**2001**	2001			2010	2001	**2001**			2010	**2001**	2001
				2013	2006				2010	**2006**				**2010**	2006
					2013					**2010**					2010
RSS	6.019	3.210	2.020	**1.309**	1.271	23.45	8.736	5.137	3.416	**2.651**	5.429	3.522	2.978	**1.974**	1.793
BIC	51.21	38.03	30.14	**23.18**	29.18	94.73	70.06	60.00	53.88	**52.69**	47.91	40.99	42.56	**36.32**	40.182

In the case of imports of black pepper, quantity and unit value showed optimal breakpoint at *m*=4 and the corresponding minimum BIC values were 23.18 and 36.32 respectively. The value of imports had optimal break point at *m*=5, with the minimum BIC of 52.69. The four break points identified in the quantity of black pepper imports to India were 1993, 1997, 2001, and 2013, which were similar to that of the unit value of imports for the first three break points (1993, 1997 and 2001) and the fourth break point was identified as 2010. The five break points identified in the value of imports were 1993, 1997, 2001, 2006 and 2010. The single most significant year of break in imports of black pepper was identified as 2001. This year coincided with the removal of quantitative restrictions and, India signed a free trade agreement with Sri Lanka in the same year (Panagariya, 2004). So, for the analysis of import of black pepper to India, the data was divided into two sub-periods *viz*., pre-2001 and post-2001.

4.1.2 International classification of black pepper

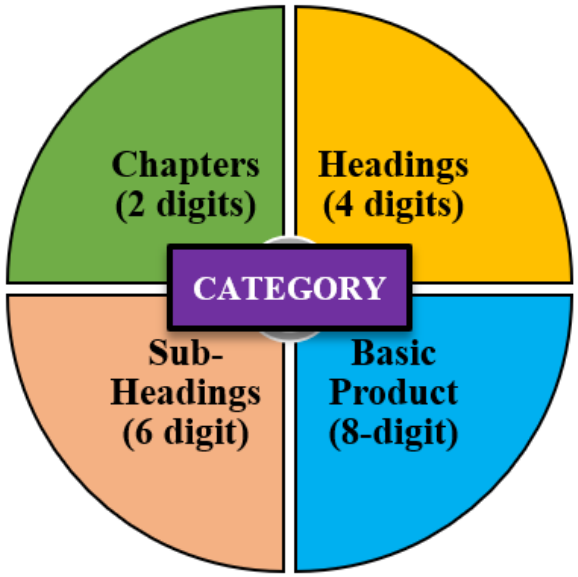
In international trade, countries trade by using a common trade classification for the tradable products. This is important both from the industry perspective (e.g., checking the tariff rates applied by an importer on the product from various partner countries) as well as for several key government functions (e.g., anti-dumping investigations, rules of origin compliance verification). The most commonly used code of product classification is Harmonized System (HS). The Harmonized Commodity Description and Coding System generally referred to as Harmonized System (HS) is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). It comprises of more than 5,000 commodity groups; each identified by a six-digit code, arranged in a legal and logical structure and is supported by well-defined rules to achieve uniform classification. The system is used by more than 200 countries and economies as a basis for their customs tariffs and for the collection of international trade statistics. Over 98 per cent of the merchandise in international trade is classified in terms of the HS (WCO, 2019). The advantage of using the HS is that the traders from across the countries can assure themselves that the same product is being discussed.

The HS classifications are arranged in 2-digits (Chapters), 4-digits (Heading), 6-digits (Sub-Heading) and 8-digits or 10-digits (actual product at national tariff line).

Figure 6 HS classification for black pepper

Code	Description
09	Coffee, tea, mate and spices

Code	Description
0904	Pepper of the genus *Piper*; dried or crushed or ground fruits of the genus *Capsicum* or of the genus *Pimenta pep*



Code	Description
090411	Black pepper neither crushed nor ground
090412	Crushed or ground black pepper
090421	Fruits of the genus *Capsicum* or of the genus *Pimenta*: dried, neither crushed nor ground
090422	Fruits of the genus *Capsicum* crushed or ground

Code	Description
09041110	Pepper long
09041120	Light black pepper
09041130	Black pepper garbled
09041140	Black pepper ungarbled
09041150	Dehydrated green pepper
09041160	Pepper pinheads
09041170	Freeze dried green pepper
09041180	Frozen pepper
09041190	Other pepper neither crushed nor ground

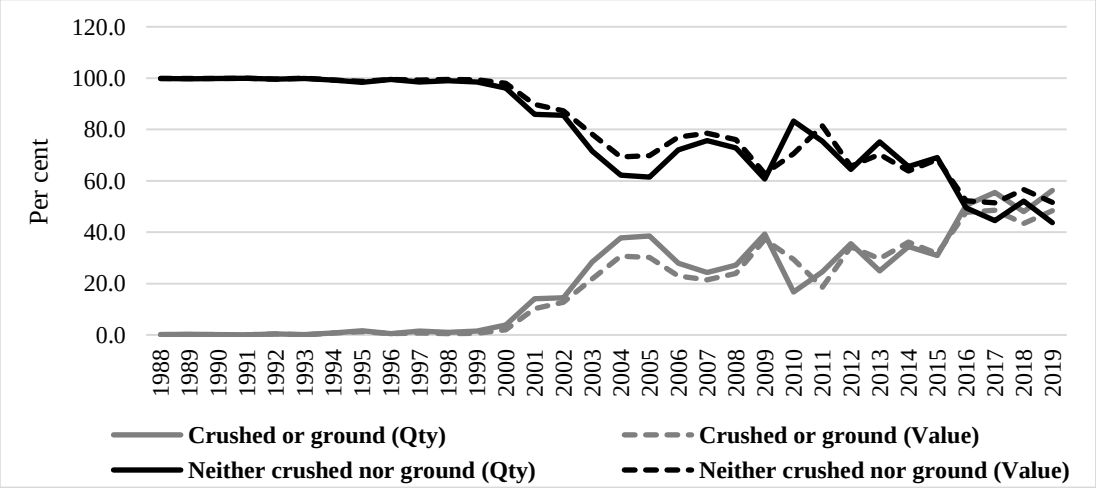
Source: WITS

The classifications are harmonized across all the countries in the world upto 6-digit level. Above that level the tariff lines are presented at 8-digit (e.g., in India) in some countries and at 10-digit (e.g., in USA) in some other countries. Figure 6 presented below shows the HS classification for black pepper. Black pepper and its products are included in chapter 09 (Coffee, tea, mate and spices) under the heading of 0904 Pepper of the genus *Piper*; dried or crushed or ground fruits of the genus *Capsicum* or of the genus *Pimenta pep.* Black pepper is traded under two sub-headings; 90411, Black pepper neither crushed nor ground and 90421, Crushed or ground black pepper. The trade data of black pepper for the study, which was collected from WITS software was categorized upto 6-digit level *i.e.,* upto sub-headings. The annual and monthly data on exports and imports of black pepper collected from the Ministry of Commerce and Industry, Government of India were classified upto the 8-digit level.

4.1.2. Dynamics in pattern of Indian black pepper trade

Black pepper is internationally traded as black pepper neither crushed nor ground and crushed or ground black pepper. Until 2000, majority of the black pepper exported from India was black pepper neither crushed nor ground *i.e.,* nearly 100 per cent share in the total black pepper exports from India. Later, India also started exporting black pepper as crushed or ground black pepper, 56.3 per cent of the total black pepper exports is in the form of crushed or ground pepper and the remaining 43.7 per cent was exported as pepper neither crushed nor ground in 2019(Figure 7).

Figure 7 Dynamics in share of black pepper neither crushed nor ground and crushed or ground black pepper in total black pepper exports from India

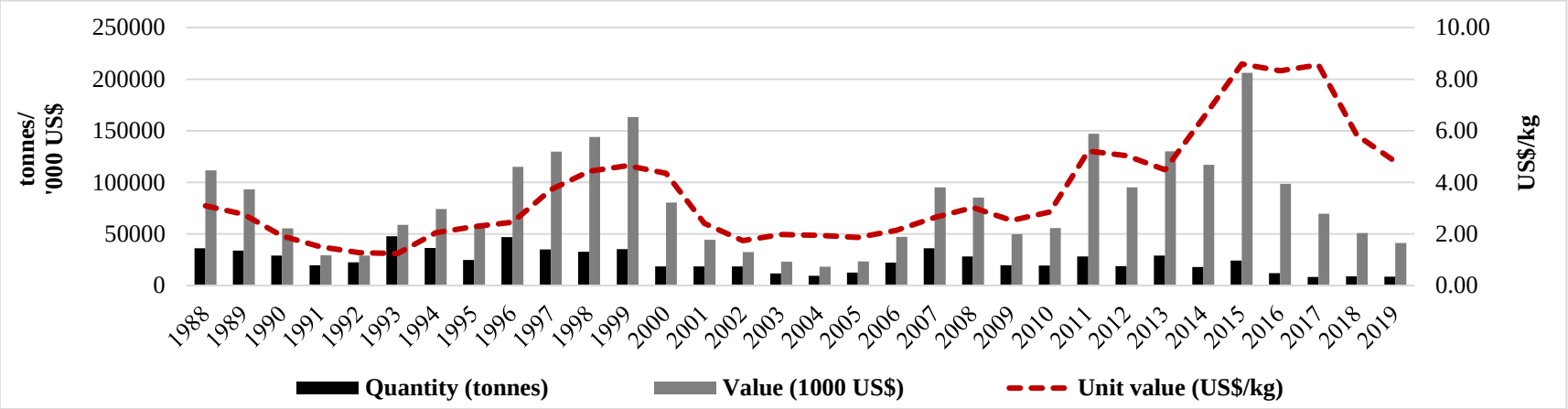


Source: Estimated using data from WITS

It could be observed from Figure 8 that exports of black pepper neither crushed nor ground from India decreased from 36,132 tonnes in 1988 to 8,588 tonnes in 2019 in terms of quantity, and from 1,117.12 lakh US$ to 412.75 lakh US$ in value terms during the same period. Between 1993 and 2000, and also after 2010, the export unit value of black pepper neither crushed nor ground showed an increasing trend and hence the value of exports from India were also very high during these periods. The export unit value of black pepper neither crushed nor ground crossed the US$ 8.5 mark in 2015. The export of crushed or ground black pepper from India has increased tremendously over the years both in terms of quantity and value, with quantity increasing from 53 tonnes in 1988 to 11,054 tonnes in 2019, whereas the value increased from 1.66 lakh US$ to 386.84 lakh US$ during the same period. There was a substantial increase in export quantity and value of crushed or ground black pepper after 2000. This increase could be attributed to the devaluation of rupee and liberalisation policies implemented in India. And also, the demand for crushed or ground black pepper has increased in the international market especially USA, the major importer of black pepper in the world. Hence, exporters in India started specializing in value addition of black pepper and they imported black pepper from Sri Lanka and Nepal (Krishnakumar, 2018). From 2006, the unit value started increasing, whereas the quantity of exports exhibited a stagnant pattern and consequently, the value of exports increased (Figure 9).

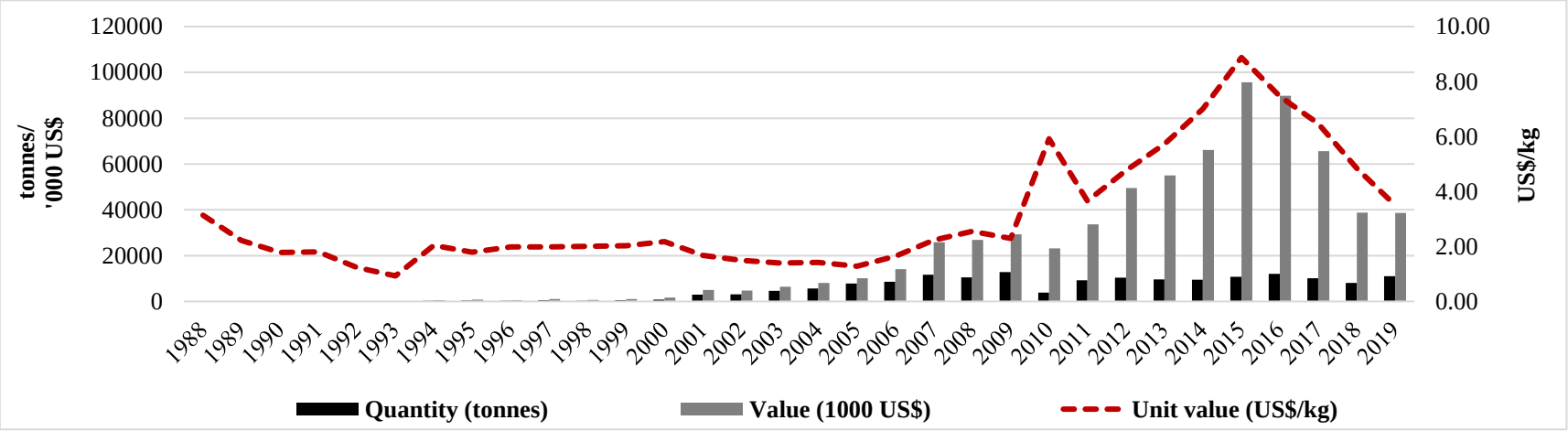
Under the category of exports of neither crushed nor ground black pepper, different products such as pepper long, light black pepper, black pepper garbled, black pepper ungarbled, dehydrated green pepper, pepper pinheads, freeze dried green pepper, frozen pepper, and other pepper neither crushed nor ground are included. The products of black pepper exported from India are presented in Table 4.4. During TE 1999-00, India mostly exported black pepper as black pepper neither crushed nor ground. Among the different products in the category of black pepper neither crushed nor ground, the exports of garbled black pepper contributed the maximum share in all the Trienniums, both in quantity and value terms. Even though garbled black pepper contributed the maximum share in the product categories under pepper neither crushed nor ground, the share of it has decreased from 73 per cent in TE 1999-00 to 46 percent in 2019-20 in quantity terms and from 74 per cent to 48 per cent in value terms during

Figure 8 Export of black pepper neither crushed nor ground from India



Source: Estimated using data from WITS

Figure 9 Export of crushed or ground black pepper from India



Source: Estimated using data from WITS

Table 4.4 Dynamics in export of black pepper and its products from India

Commodities	HS code	Values (Rs. Lakh)			Quantity (tonnes)		
		TE 1999-00	TE 2009-10	TE 2019-20	TE 1999-00	TE 2009-10	TE 2019-20
Pepper long	09041110	470.17 (0.79)	259.74 (0.79)	499.49 (1.50)	400.96 (1.17)	204.25 (0.76)	105.46 (1.28)
Light black pepper	09041120	9392.68 (15.73)	215.44 (0.65)	1390.93 (4.19)	5157.74 (15.09)	169.72 (0.63)	363.43 (4.40)
Black pepper garbled	09041130	44357.23 (74.31)	25734.24 (78.11)	15975.56 (48.07)	24938.89 (72.98)	22127.64 (82.04)	3835.64 (46.40)
Black pepper ungarbled	09041140	1754.72 (2.94)	606.52 (1.84)	2094.22 (6.30)	993.23 (2.91)	478.61 (1.77)	391.04 (4.73)
Dehydrated green pepper	09041150	642.57 (1.08)	1703.79 (5.17)	5166.93 (15.55)	275.85 (0.81)	781.53 (2.90)	662.29 (8.01)
Pepper pinheads	09041160	1679.69 (2.81)	89.52 (0.27)	660.31 (1.99)	1242.46 (3.64)	148.08 (0.55)	283.29 (3.43)
Freez dried green pepper	09041170	408.84 (0.68)	586.73 (1.78)	1299.07 (3.91)	93.89 (0.27)	126.39 (0.47)	78.99 (0.96)
Frozen pepper	09041180	4.52 (0.01)	60.04 (0.18)	22.74 (0.07)	2.25 (0.01)	37.00 (0.14)	12.59 (0.15)
Other pepper neither crushed nor ground	09041190	986.01 (1.65)	3688.79 (11.20)	6124.47 (18.43)	1069.21 (3.13)	2898.66 (10.75)	2532.95 (30.64)
Black pepper neither crushed nor ground	090411	59694.91 (100.00)	32944.82 (100.00)	33233.72 (100.00)	34173.73 (100.00)	26971.89 (100.00)	8265.68 (100.00)
Crushed or ground black pepper	090412	373.21	12110.97	29277.35	458.55	10825.11	9357.09
Pepper oil	33012935	22.65	2000.3	3400.01	0.94	136.31	101.95
Pepper oleoresins	33019013	6582.42	11969.973	35893.05	629.51	1377.68	1442.58

Source: Export-Import data bank, GoI

Note: Values in parentheses indicate share in per cent to the total

the same period. In between, there was an increase in the share of black pepper garbled in both quantity and value terms during TE 2009-10. The decrease in share of garbled black pepper was due to the increasing shares of dehydrated green pepper and other pepper neither crushed nor ground. The usage of dehydrated green pepper has increased in the European market because of its natural green colour and the fresh flavor (IPC, 2019).

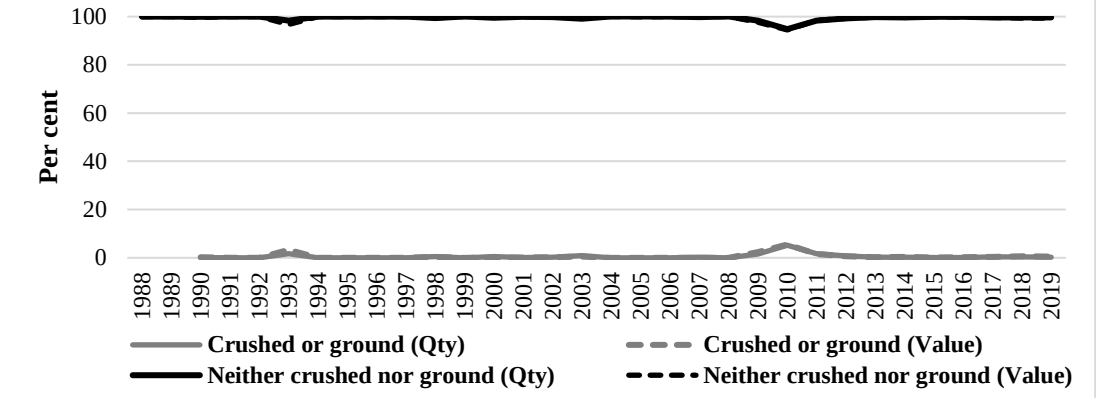
India is one of the major producers of pepper oil and pepper oleoresin in the world. Pepper oil and oleoresin are value added products of black pepper. Pepper oleoresin is a concentrated, resinous extract obtained by conventional solvent extraction or supercritical fluid extraction (IPC, 2019). As the name implies, pepper oleoresin consists of a blend of the essential oil, resinous matter of the spice and related compounds like the pungent alkaloid, piperine. Pepper oleoresin has a relatively full flavour profile characteristic of pepper as compared to pepper oil. 90 per cent of the global pepper oleoresin is produced in India (IPC, 2018). The advantages of using oleoresins in flavours and seasonings are manifold, it enhances the visual appeal and flavour, and increases the shelf life of the products. They are more economical than whole or ground spices as less quantity can give the same effect (Yogesh and Mokshapathy, 2014).

Pepper oil and oleoresin exports from India has increased tremendously after the liberalisation. The export of pepper oil from India has increased from 0.94 tonnes in TE1999-00 to 101.95 tonnes in TE2019-20 in terms of quantity, and the export value increased from 22.65 lakh Rupees to 3400 lakh Rupees during the same period. The export of pepper oleoresin increased from 629.51 tonnes to 1442.6 tonnes in terms of quantity and 6582.42 lakh Rupees to 35,893.05 lakh Rupees in terms of value respectively, from TE1999-00 to TE2019-20. Pepper oleoresin from India is exported to various countries in America, Europe and Asia. In 2018, the top five countries of destination for pepper oleoresin from India were United States of America, Germany, France, China and Netherlands and the export quantities to these countries were 381, 162, 103, 96 and 89 tonnes respectively (IPC, 2019).

India imported black pepper as black pepper neither crushed nor ground and also as crushed or ground black pepper. During most of the years, almost 100 per cent

of the black pepper import to the country was in the form of black pepper neither crushed nor ground (Figure 10). Among the top producers, India is the only country which imports substantial quantities of black pepper. The trade balance in the case of pepper has shown a declining pattern and the country became a net importer in both value and quantity terms in some of the recent years.

Figure 10 Dynamics in share of black pepper neither crushed nor ground and crushed or ground black pepper in total black pepper imports to India

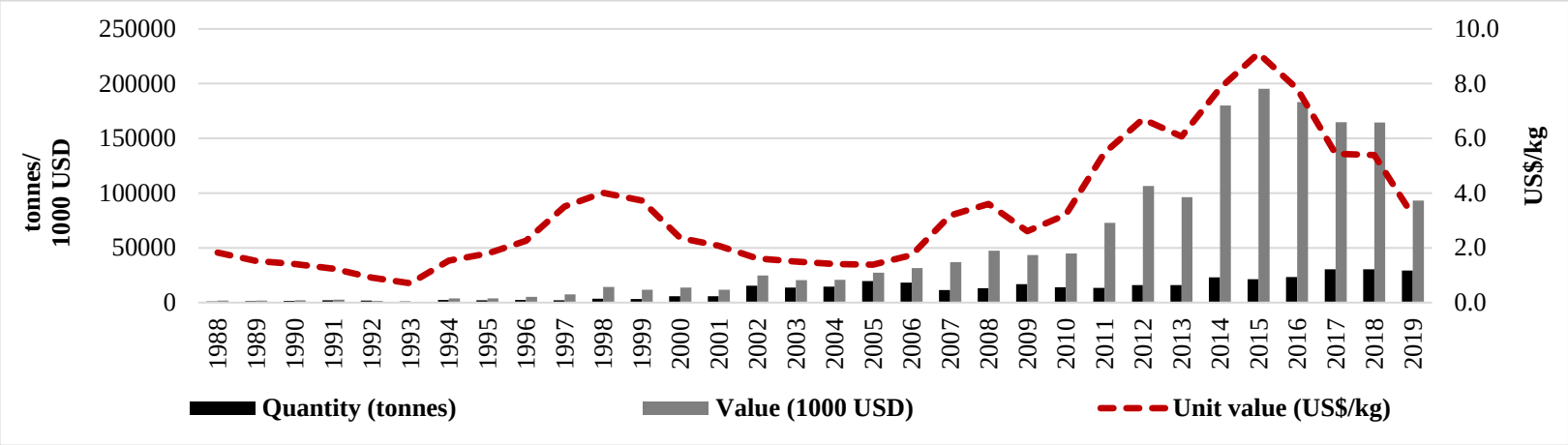


Source: Estimated using data from WITS

The import of black pepper to India has increased over the years and it is visible from Figure 11 and Figure 12. Black pepper import to India as black pepper neither crushed nor ground has increased from 932 tonnes in 1988 to 29,269 tonnes in 2019 in terms of quantity, and from 17 lakh US$ to 931.47 lakh US$ in terms of value for the same period. The share of crushed or ground black pepper in total import of black pepper to India was less than one per cent during the entire period from 1988 to 2019, with the exception of the year 2010.

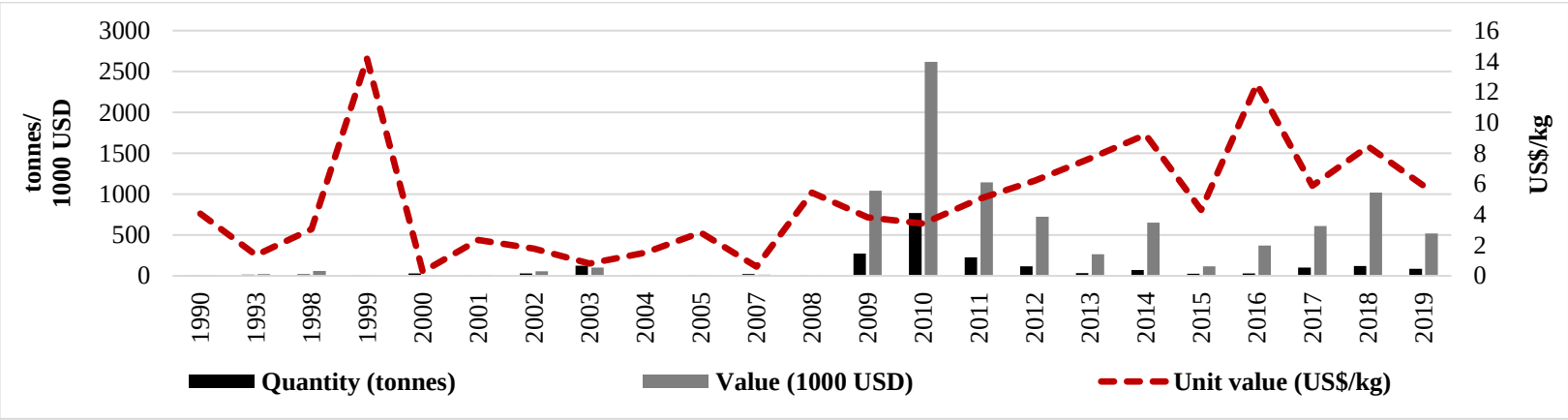
The details of the products of black pepper imported to India in different trienniums are presented in Table 4.5. During TE1999-00, among the different products of black pepper neither crushed nor ground, India largely imported black pepper garbled (36.78 per cent), light black pepper (30.43 per cent) and pepper long (20.62 per cent), which together contributed a share of 88 per cent in total black pepper imports. Even though garbled black pepper contributed the maximum share in the products of black pepper neither crushed nor ground during TE1999-00, the share has decreased in the later trienniums. The imports of light black pepper contributed the maximum share in TE2009-10 and TE2019-20, in quantity as well as value terms. The imports of pepper oil and pepper oleoresin to India were very low till 2010.

Figure 11 Dynamics in Import of black pepper neither crushed nor ground to India



Source: Estimated using data from WITS

Figure 12 Dynamics in import of crushed or ground black pepper to India



Source: Estimated using data from WITS

Table 4.5 Dynamics in Import of black pepper and its products to India

Commodities	HS code	Values (Rs. Lakh)			Quantity (tonnes)		
		TE 1999-00	TE 2009-10	TE 2019-20	TE 1999-00	TE 2009-10	TE 2019-20
Pepper long	09041110	947.68 (20.62)	308.10 (1.62)	2003.60 (2.36)	774.56 (26.89)	787.78 (5.68)	1574.44 (5.44)
Light black pepper	09041120	1398.77 (30.43)	9455.89 (49.61)	36014.49 (42.34)	730.99 (25.37)	6559.69 (47.31)	12034.94 (41.61)
Black pepper garbled	09041130	1690.60 (36.78)	1713.56 (8.99)	14472.0 (17.01)	1055.18 (36.63)	1270.22 (9.16)	5723.97 (19.79)
Black pepper ungarbled	09041140	343.99 (7.48)	4746.88 (24.90)	10839.50 (12.74)	190.18 (6.60)	3650.98 (26.33)	3181.47 (11.00)
Dehydrated green pepper	09041150	-	-	120.15 (0.14)	-	-	86.78 (0.30)
Pepper pinheads	09041160	6.49 (0.14)	7.26 (0.04)	503.20 (0.59)	21.00 (0.73)	18.00 (0.13)	257.26 (0.89)
Freeze dried green pepper	09041170	-	0.32 (0.002)	9.02 (0.011)	-	0.03 (0.000)	0.35 (0.001)
Frozen pepper	09041180	-	2.14 (0.01)	48.01 (0.06)	-	1.23 (0.01)	11.33 (0.04)
Other pepper neither crushed nor ground	09041190	213.51 (4.64)	2820.99 (14.80)	21057.65 (24.75)	123.02 (4.27)	1570.68 (11.33)	6053.10 (20.93)
Black pepper neither crushed nor ground	090411	4596.72 (100.00)	19061.56 (100.00)	85064.64 (100.00)	2880.93 (100.00)	13864.39 (100.00)	28923.62 (100.00)
Crushed or ground black pepper	090412	13.05	384.22	467.73	10.15	239.20	112.02
Pepper oil	33012935	0.22	45.09	412.28	0.09	1.88	14.91
Pepper oleoresins	33019013		2.22	2464.04		0.15	76.58

Source: Export-Import data bank, GoI
Note: Values in parentheses indicate share in per cent to the total

Subsequently, the imports of pepper oil and pepper oleoresin have increased and currently India is importing 14.91 tonnes of pepper oil and 76.58 tonnes of pepper oleoresin which were valued at 412.28 lakh Rupees and 2464.04 lakh Rupees respectively.

4.1.3. Growth rates in export and import of Indian black pepper

The Compound Annual Growth Rates (CAGRs) were estimated using exponential growth functions for quantity, value and unit value of export and import of black pepper and its products for the period from 1988 to 2019, and the results are presented in Table 4.6 and Table 4.7.

The volume of exports of black pepper has slowed down substantially in the last decade which is evident from the negative growth rate of the export quantity. The highest growth rate in export quantity of black pepper was witnessed during 2000-2009 period, whereas the growth in export value was found to be highest during 1990s. After 1985, the export unit value of black pepper started increasing due to which the value of exports also increased and this trend continued up to 1998-99. This increase could be attributed to the devaluation of rupee and liberalisation policies implemented in India (Sabu *et al*, 2020a). The growth in export value was found to be more dependent on growth in export unit value rather than growth in export quantity. Even though there was an increase in the growth of export quantity during the 2000-2009 period, the export value growth substantially decreased in magnitude during the same period due to the decline in unit value. The increase in unit value growth during 2010-2019 period resulted in the growth of export value as the growth in unit value more than offset the decline in export quantity. While considering the pre and post-2000 periods, it was clearly evident that the growths in quantity, value and unit value of black pepper exports in post-2000 were only marginal.

The export growth of black pepper products such as black pepper neither crushed nor ground and crushed or ground black pepper were estimated and the results were found to be slightly unusual. Till 2000, nearly 100 per cent of the black pepper export from India was black pepper neither crushed nor ground. Even then the growth rates in quantity and value of crushed or ground black pepper were significantly higher than that of black pepper neither crushed nor ground. The reason behind this was that

the quantity and value of export of crushed or ground black pepper were very low, *i.e.*, 10 tonnes and 18,221 US$ respectively, at the beginning of nineties, which increased to as high as 746.6 tonnes and 16,23,224 US$ during 2000. In the case of black pepper neither crushed nor ground, export quantity and export value during nineties showed fluctuating pattern without any discernible trend growth or trend decline. Consequently, the export of black pepper neither crushed nor ground has shown only low or moderate growth in nineties. The black pepper neither crushed nor ground had a similar growth pattern of total black pepper exports till 2000, as the major share of total black pepper exports during that period was accounted by black pepper neither crushed nor ground. The growth rate of crushed or ground black pepper was higher in the pre-2000 period compared to post-2000 period, with the exception of unit value. It was found that the growth in export value of crushed or ground black pepper was mainly due to growth in export quantity rather than unit value.

It could be observed from Table 4.6 and Table 4.7 that the growth in imports of black pepper was higher than the export growth in all the periods and after nineties the growth rate of black pepper imports has considerably increased. One of the major finding is that the growth in import quantity of black pepper to India was higher during 2010-2019 period, whereas the import value growth was found to be higher during nineties which clearly indicates India has been importing more black pepper in the recent years. India is importing black pepper as black pepper neither crushed nor ground and only a negligible quantity of black pepper is imported to India as crushed or ground black pepper. It is evident from the results that the black pepper neither crushed nor ground had a similar growth pattern of total black pepper imports.

The increasing consumption and declining production of black pepper in India have made the commodity more domestically oriented. The imports have registered a higher growth rate of 13 per cent in terms of quantity and 20 per cent in terms of value during the period from 1988 to 2019. It could be observed that India is progressively becoming import oriented in black pepper. India's increasing import orientation could be clearly attributed to the decrease in area and production from 2000 to 2018 (Cariappa, 2020).

Table 4.6 Growth in export of black pepper from India (CAGR in per cent per annum)

Year	Black pepper neither crushed nor ground			Crushed or ground black pepper			Total black pepper		
	Export Quantity	**Export Value**	**Export Unit Value**	**Export Quantity**	**Export Value**	**Export** Unit Value	**Export Quantity**	**Export Value**	**Export Unit Value**
1990-1999	4.36	20.02*	15.00*	46.70*	52.51*	3.96	4.53	20.10*	14.89*
	(7.36)	(9.45)	(7.36)	(28.11)	(32.22)	(6.52)	(7.32)	(9.42)	(7.32)
2000-2009	5.68	4.99	-0.65	29.82*	34.47*	3.58	8.70	9.53**	0.76
	(10.54)	(16.05)	(7.31)	(12.15)	(8.32)	(6.16)	(14.48)	(7.81)	(7.90)
2010-2019	-12.59	-6.99	6.40	5.65	5.51	-0.13	-7.10	4.22	12.19*
	(6.69)	(11.63)	(8.34)	(7.67)	(11.82)	(8.10)	(10.85)	(16.77)	(6.33)
Pre-2000	-0.45	6.72	7.19**	31.81*	31.60*	-0.15	-0.23	6.82	7.07**
	(5.30)	(9.45)	(7.15)	(17.71)	(21.65)	(5.17)	(5.23)	(9.44)	(7.11)
Post-2000	-2.21	6.82**	9.23*	5.45*	16.49*	10.46*	0.33	9.53*	9.17*
	(4.29)	(5.95)	(2.77)	(3.62)	(4.92)	(3.84)	(3.36)	(5.38)	(2.99)
Over all (1988-2019)	-3.20*	0.78	4.11*	23.41*	29.13*	4.63*	-0.42	4.59*	5.03*
	(1.72)	(2.82)	(1.85)	(5.15)	(4.78)	(1.99)	(1.91)	(3.32)	(2.29)

Note: 1. * denotes significant at one per cent level, ** denotes significant at five per cent level, *** denotes significant at ten per cent level
2. Values in parentheses denote Standard Errors

Table 4.7 Growth in import of black pepper to India (CAGR in per cent per annum)

Year	Black pepper neither crushed nor ground			Crushed or ground black pepper			Total black pepper		
	Import Quantity	Import Value	Import Unit Value	Import Quantity	Import Value	Import Unit Value	Import	Import Value	Import Unit Value
1990-1999	9.04**	28.74*	18.07*	-13.87	-3.87	11.62	9.02**	28.67*	18.02*
	(8.80)	(19.91)	(10.41)	(40.90)	(42.45)	(25.18)	(8.67)	(19.61)	(10.30)
2000-2009	9.51**	15.36*	5.34	-6.06	9.75	16.83	9.82**	15.81*	5.45
	(9.93)	(4.92)	(8.68)	(60.97)	(68.43)	(24.47)	(9.87)	(4.89)	(8.69)
2010-2019	10.70*	10.49***	-0.19	-14.56	-9.76	5.61	10.09*	18.56**	7.69
	(2.80)	(11.29)	(9.50)	(20.66)	(19.29)	(9.81)	(3.66)	(13.03)	(11.08)
Pre-2001	12.23*	22.62*	9.25**	5.13	7.44	2.20	12.25*	22.60*	9.22**
	(5.89)	(11.90)	(7.79)	(33.70)	(28.36)	(17.13)	(5.83)	(11.74)	(7.74)
Post-2001	5.61*	15.73*	9.58*	21.36**	36.36*	12.37*	5.62*	15.75*	9.60*
	(2.64)	(3.57)	(4.15)	(24.27)	(27.77)	(6.22)	(2.61)	(3.53)	(4.15)
Over all (1988-2019)	12.28*	18.55*	5.58*	18.57*	26.92*	7.04*	12.37*	20.03*	6.82*
	(2.01)	(2.31)	(2.07)	(10.23)	(10.72)	(3.67)	(2.58)	(2.63)	(2.51)

Note: 1. * denotes significant at one per cent level, ** denotes significant at five per cent level, *** denotes significant at ten per cent level
2. Values in parentheses denote Standard Errors.

India being a large consumer of black pepper and because of the increasing domestic demand over the years, only limited quantities were being exported from the country in comparison to its competitors in recent years (Sabu *et. al.,* 2020b). The productivity of black pepper in India was one of the lowest in the world mainly because the intensive cultivation practices were not in vogue, and people had been growing pepper in a casual way (plant and forget). As a result, there was a wide gap existing between the productivity in India which was about 320 kg/ha and that of other countries like Thailand, which was as high as 4500 kg/ha (Ravindran, 2000).

4.1.4 Instability in export and import of Indian black pepper

The results of the analyses of instability in export and import of Indian black pepper and its products in terms of quantity, value and unit value, estimated using Coppocks Instability Index are presented in Table 4.8 and 4.9. The results showed that the instabilities in quantity and value of exports of black pepper in the recent decade have increased as compared to nineties, whereas the instabilities in quantity and value of black pepper imports have decreased over the decades. The instability in unit values of both black pepper exports and imports have decreased over the years. From the instability indices of black pepper products, it could be observed that the trade in crushed or ground pepper exhibited considerably higher instability when compared to pepper neither crushed nor ground. The instabilities in quantity and value of exports of crushed or ground pepper were substantially higher during the pre-2000 period as compared to the post-2000 period, while the instability in unit value showed only a slight increase after 2000. In the case of pepper neither crushed nor ground, the export instabilities in terms of quantity and unit value have decreased after 2000, whereas the instability in value has increased slightly. The instabilities in quantity, value and unit value of import of black pepper and its products have shown significant decrease in the post-2000 period.

The main factors responsible for the decline in growth rates and increase in instability of black pepper exports were increasing domestic demand, decreased production, competition from new entrants including ASEAN countries, fluctuating share in world exports, rising share in world imports, and the lagged response of production to prices (Thomas and Sanil, 2019 and Sabu *et. al.*, 2020b)

Table 4.8 Instability in export of black pepper from India (Coppock's instability index)

Year	Black pepper neither crushed nor ground			Crushed or ground black pepper			Total black pepper		
	Export Quantity	Export Value	Export Unit Value	Export Quantity	Export Value	Export Unit Value	Export Quantity	Export Value	Export Unit Value
1990-1999	49.19	49.22	25.94	207.15	241.11	36.41	48.50	48.91	25.83
2000-2009	41.96	59.30	28.18	50.14	40.67	19.24	29.52	48.83	29.12
2010-2019	55.62	78.96	38.71	41.64	40.80	35.34	51.83	65.82	20.90
Pre-2000	50.67	59.06	28.82	192.09	226.14	35.81	58.54	49.67	28.76
Post-2000	46.92	62.56	27.54	49.11	32.81	37.81	49.15	34.67	24.79
Over all 1988-2019	49.42	62.98	30.60	115.30	116.37	37.23	43.70	55.41	27.20

Note: Estimated using data from WITS

Table 4.9 Instability in import of black pepper to India (Coppock's instability index)

Year	Black pepper neither crushed nor ground			Crushed or ground black pepper			Total black pepper		
	Import Quantity	Import Value	Import Unit Value	Import Quantity	Import Value	Import Unit Value	Import Quantity	Import Value	Import Unit Value
1990-1999	59.22	108.25	38.88	1443.37	1358.89	119.73	58.21	105.50	38.10
2000-2009	44.99	30.95	30.31	3308.27	1925.56	211.40	45.20	30.73	30.12
2010-2019	17.97	47.71	41.88	153.49	187.04	87.85	15.20	38.12	33.30
Pre-2000	56.79	94.46	41.37	2580.29	1346.47	327.78	92.16	56.05	40.85
Post-2000	34.56	36.76	34.65	1268.13	925.39	119.54	36.20	34.52	34.47
Over all 1988-2019	45.09	64.13	37.95	1864.56	1109.94	220.52	44.60	60.80	35.31

Note: Estimated using data from WITS

4.1.5 Diversification of Indian black pepper exports

Export diversification is the change in the composition of a country's existing export product mix or export destinations (Ali *et. al*., 1991; Berthelemy and Chauvin, 2000). The more diversified and unrelated a country's exports, the less volatile its earnings will be. Put differently, a more diversified export portfolio will have a more stable stream of export revenues (Samen, 2010). A country whose exports are comprised of a larger number of products and that trades with a larger number of trading partners has a lower export concentration, *i.e.,* more diversified exports (UNDP, 2011). The commodity concentration and geographic concentration of exports were considered to be the major contributing factors in the instability of export earnings (Mohandas *et. al.,* 2018). A lower concentration or wider variety of exports will lead to increased stability or growth in export earnings.

Exports are diversified in two main areas: commodity and geography (Hinlo *et. al.,* 2017). Commodity diversification is attained by changing or expanding the existing basket of exported commodities. Meanwhile, geographic diversification is an expansion in the set of markets entered. Geographic diversification in some way can be viewed as another international diversification strategy to some degrees and could be defined as expansion across borders of global regions and countries into different geographic locations or markets (Hill *et. al*., 1992). By diversifying export portfolios, developing countries can potentially access a more stable revenue stream than of concentrating in just a few products or markets. Demand shocks are usually and perfectly correlated across sectors and countries and hence diversified economies have scope to offset income losses in one area with potential gains, or at least stability in another (Shepherd, 2009).

4.1.5.1 Commodity diversification

The commodity diversification indices for the exports of black pepper from India estimated using Gini Concentration Index (GCI) are presented in Table 4.10. Commodity diversification means value addition of a commodity by not only changing its original form through processing but also by packaging and branding or other efforts to enhance the product value (Jana, 2006 and Singh, Boukerrou and Miller, 2009). With regard to the commodity concentration index, countries that have lower

concentration rates have more diversified exports. A country with an index closer to zero has higher commodity diversification. The average value of the concentration index for black pepper was 54.1 for the period from 1996-97 to 2019-20. During the period from 2000-01 to 2009-10, the average concentration index for black pepper was 52.6, which declined to 48 during the period from 2010-11 to 2019-20. The declining commodity concentration index for black pepper implies increasing product diversification in the export basket of black pepper and this declining trend as indicated by the negative slope of the fitted trend line is shown in Figure 13.

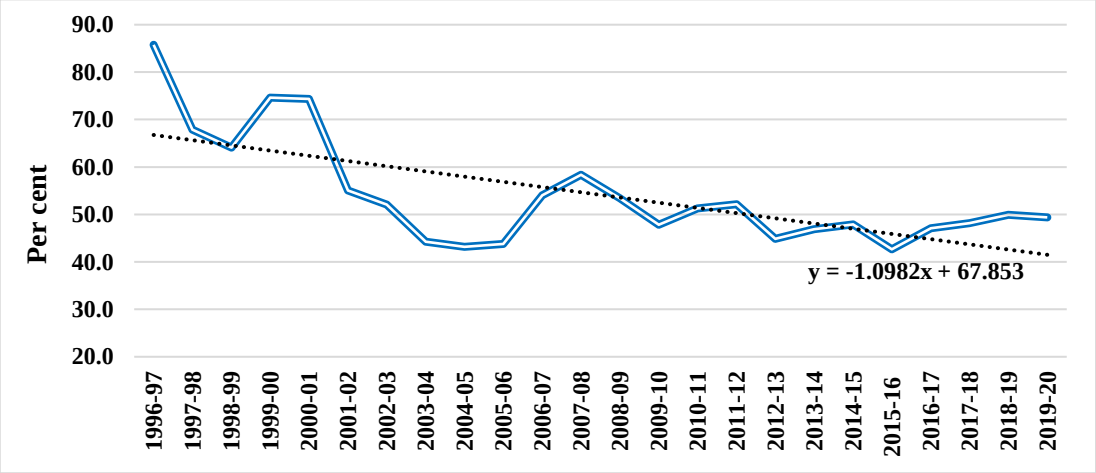
Table 4.10 Commodity concentration of Indian black pepper exports

Year	Gini Concentration Index
1996-97	85.75
1997-98	67.86
1998-99	64.11
1999-00	74.60
2000-01	74.33
2001-02	55.06
2002-03	52.10
2003-04	44.28
2004-05	43.16
2005-06	43.77
2006-07	54.00
2007-08	58.33
2008-09	53.44
2009-10	47.83
2000-01 to 2009-10	52.6
2010-11	51.28
2011-12	52.13
2012-13	44.89
2013-14	46.90
2014-15	47.89
2015-16	42.65
2016-17	47.09
2017-18	48.18
2018-19	49.93
2019-20	49.41
2010-11 to 2019-20	48.0
Overall	**54.1**

Note: Estimated using data from Export-Import data bank, GoI

Generally, commodity diversification is governed by two main forces, which are demand/consumption factors and production/supply factors. Demand factors include the growing population, rising per capita income, urbanization and trade liberalization leading to change in the consumption pattern. (Joshi *et. al.*, 2007). The commodity price shocks are also associated with over dependence on few commodities (IMF, 2003).

Figure 13 Trend in commodity concentration of black pepper exports from India



Note: Estimated using data from Export-Import data bank, GoI

4.1.5.2 Geographic diversification

Geographic diversification is measured using Hirschman Index that measures the concentration, which is the opposite of diversification. The geographic concentration in the export of black pepper and its products for each year from 1988 to 2019 was computed using the Hirschman Index. An index value close to zero implies that the exports from a country are not concentrated on few countries and hence, the export structure of the country is well diversified (Kadyrova, 2011). The index value of 40 and above is considered to indicate higher degree of concentration (OECD Secretariat, 2018; Mohandas *et. al.*, 2018). Table 4.11 shows the estimated Hirschman indices for the export of pepper neither crushed nor ground and crushed or ground pepper. The results showed that the export of crushed or ground pepper was more concentrated compared to pepper neither crushed nor ground in all the periods. The average concentration indices for the export of both black pepper neither crushed nor ground and crushed or ground black pepper were greater than 40, which indicated

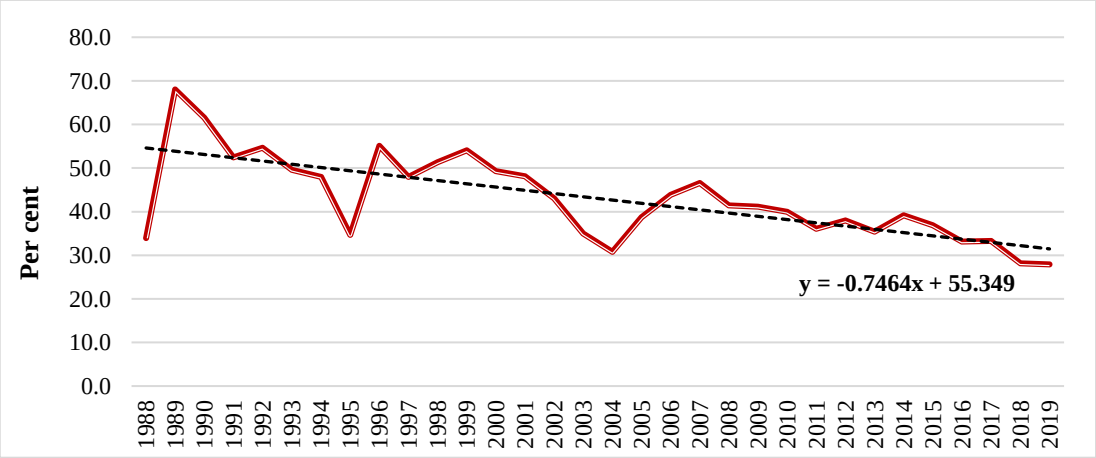
Table 4.11 Geographic concentration of Indian black pepper exports
(Hirschman index)

Year	Black pepper neither crushed nor ground	Crushed or ground black pepper
1988	33.92	45.43
1989	68.02	40.40
1990	61.57	42.74
1991	52.43	39.95
1992	54.62	55.04
1993	49.57	43.91
1994	47.95	61.69
1995	34.70	60.02
1996	55.08	54.10
1997	47.96	52.83
1998	51.37	77.65
1999	54.06	79.43
2000	49.32	52.99
2001	48.13	70.58
2002	43.04	56.37
2003	34.96	70.01
2004	30.78	55.92
2005	38.69	55.29
2006	43.87	49.75
2007	46.57	52.14
2008	41.44	50.19
2009	41.12	56.93
2010	39.96	59.35
2011	36.10	55.68
2012	37.98	61.88
2013	35.43	64.84
2014	39.12	60.39
2015	36.89	67.01
2016	33.11	66.07
2017	33.27	60.42
2018	28.12	54.94
2019	27.90	57.55
1990-1999	50.9	56.7
2000-2009	41.8	57.0
2010-2019	34.8	60.8
Pre 2000	50.8	54.3
Post 2000	37.7	59.2
Overall	43.0	57.2

Note: Estimated using data from WITS

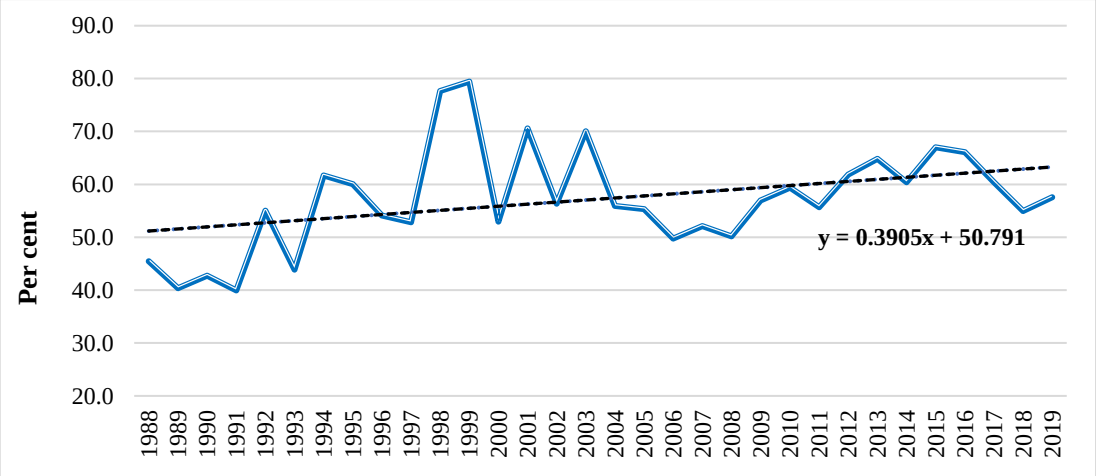
India's dependence on few countries or export markets in the export of these commodities, which in turn increased the risk for the exports due to price variability on in those few markets. A high level of dependence of domestic exports on few trading partners make countries vulnerable to future instability in the domestic market (Hinlo *et. al*., 2017). The average value of geographic concentration index for the export of pepper neither crushed nor ground after 2000 has declined when compared to the corresponding figures in the pre-2000. But, the concentration index for the crushed or ground pepper exports has increased in the post-2000 period. After 2010, India has expanded the number of markets to which pepper neither crushed nor ground was exported, while the exports of crushed or ground pepper was concentrated in few markets during the same period.

Figure 14 Trend in geographic concentration of export of Indian pepper neither crushed nor ground



Note: Estimated using data from WITS

Figure 15 Trend in geographic concentration of export of crushed or ground pepper from India

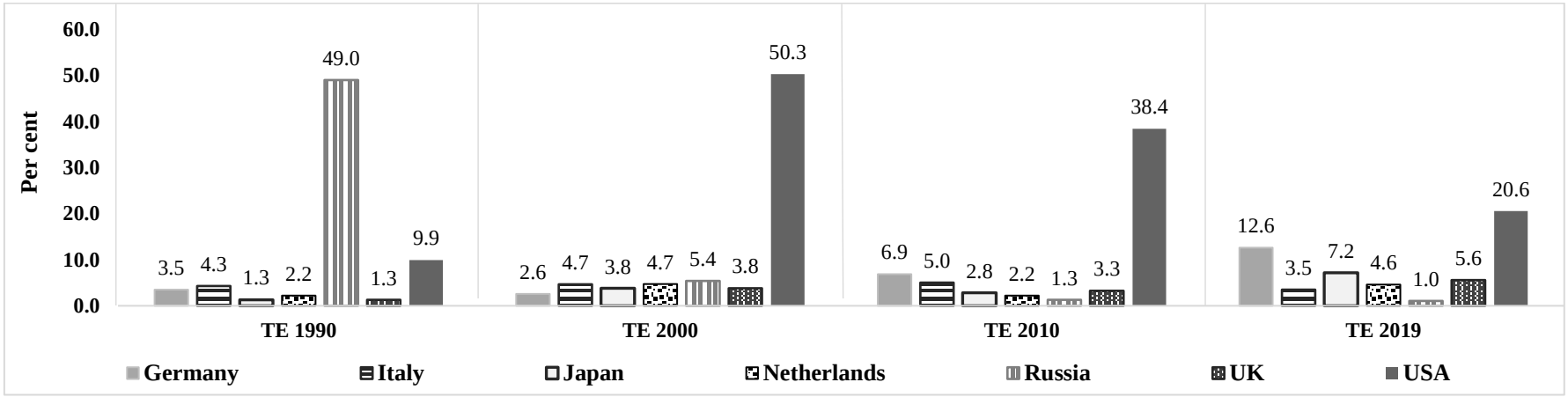


Note: Estimated using data from WITS

It could be observed from Figure 14 and 15 that the geographic concentration indices of pepper neither crushed nor ground have decreased over the years whereas, that of crushed or ground pepper have increased. The geographic concentration index for the export of crushed or ground pepper from India has always remained above 40 per cent, denoting the higher level of concentration and uneven distribution of export markets, which could result in higher instability and risks in export earnings. However, India's export of pepper neither crushed nor ground was dispersed across different destinations as the concentration index was below 40 since 2010 and subsequently the value reached below 30 per cent during the last five years. An exporting country should reduce dependence on a few sources of demand through geographic diversification which will then mitigate future risks (Hinlo *et. al*., 2017). These risks include economic risks like volatility in foreign exchange earning which have adverse macroeconomic effects on growth, import and export capacity, foreign exchange cash flow and inflation. Once able to reduce vulnerability and mitigate risks, then countries will achieve allocative efficiency with stable export earnings (Samen, 2010).

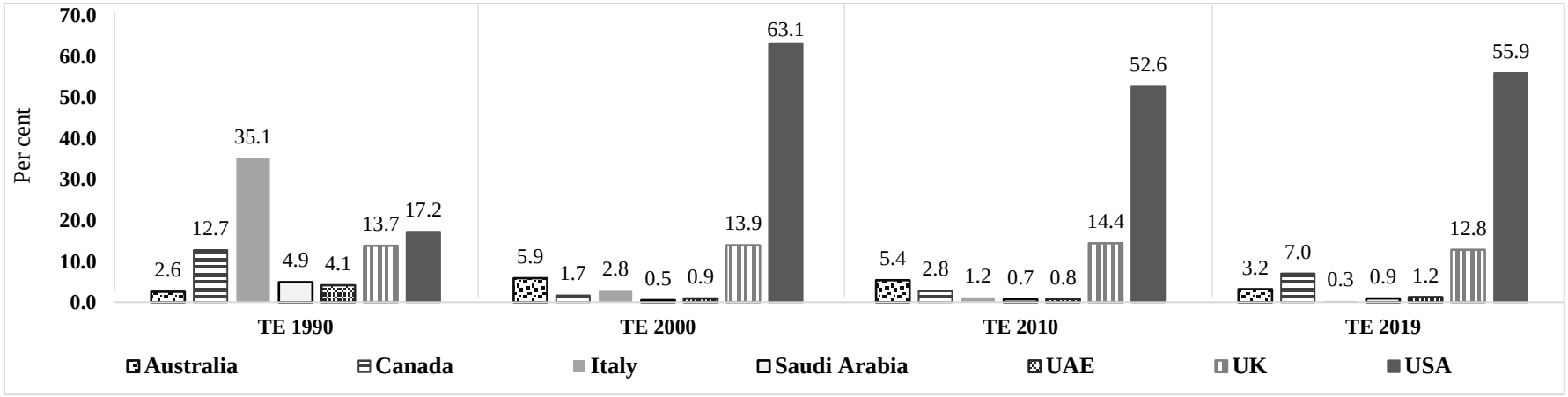
During the period from 1990 to 2019, the estimated geographical concentration indices for the export of pepper neither crushed nor ground from India showed a steady and gradual decline (Figure 15). The decline in the concentration indices may be due to the insufficient export quantity of black pepper and the resultant scarcity of the commodity in the international markets as well as different destinations. While examining the country-wise exports from India, in the 1970s, USSR was the largest importer of Indian black pepper. But the disintegration of USSR in 1990s, made a big blow to the Indian black pepper exports. Likewise, the economic crisis in the European Nations followed by the foreign exchange crisis made the same impact (Raju, 2000; Burger and Smith, 2000). India exported nearly 50 per cent of black pepper neither crushed nor ground to USSR in TE 1990 and USA in TE 2000. Later, India diversified the export of pepper neither crushed nor ground to different markets across the globe and hence the share of major importers such as Russia and USA have decreased to more than half in the latest decade. Thus, the decreased concentration index in the recent years could be attributed to the decreasing share of major importers and the entry into new markets such as Germany, Japan and UK.

Figure 16 Dynamics in share of different countries in the Indian exports of pepper neither crushed nor ground



Note: Estimated using data from WITS

Figure 17 Dynamics in share of different countries in the Indian exports of crushed or ground pepper

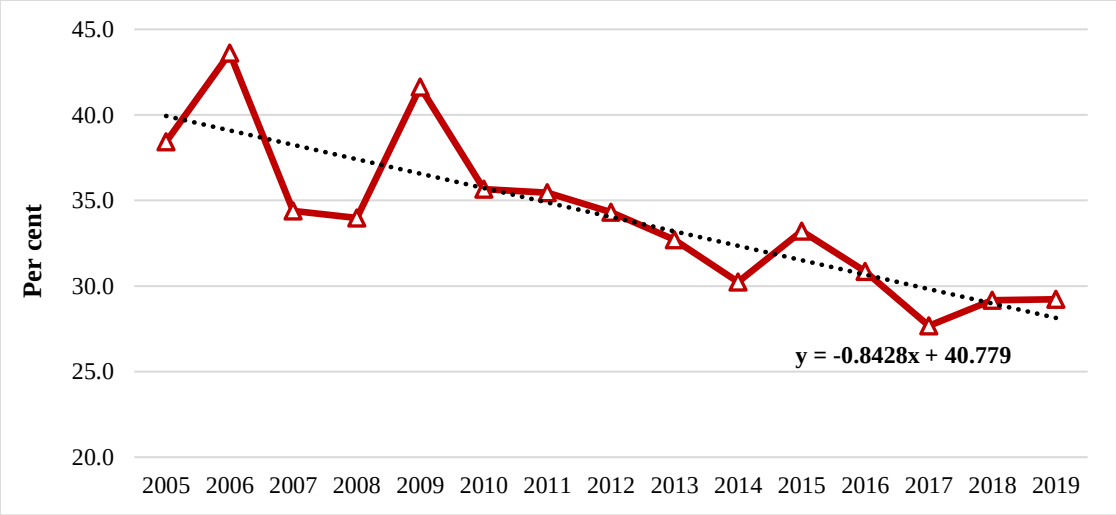


Note: Estimated using data from WITS

It could be concluded that India is getting advantage of the potential trading relationships, which helped in reducing the risk associated with unstable prices and trade shocks.

It could be observed from Figure 17 that during TE 1990, the major shares of crushed or ground pepper export from India were to Italy (35.1 per cent), USA (17.2 per cent) and UK (13.7 per cent), all of which reduced tremendously in TE 2019. During 1990s, Italy was the major importer of crushed or ground pepper from India, but since 2000, Italy's share has declined substantially. USA became the major importer of crushed or ground pepper from 2000 onwards and India exported more than 50 per cent of the exports to USA, which was well reflected in the higher value of the geographic concentration indices. During the period from 1988 to 2019, Indian crushed or ground pepper exports have witnessed a decrease in diversification of export destinations. Low diversification in exports has been interpreted as an indication of vulnerability as the exporters will be increasingly exposed to any economic shocks in few export markets.

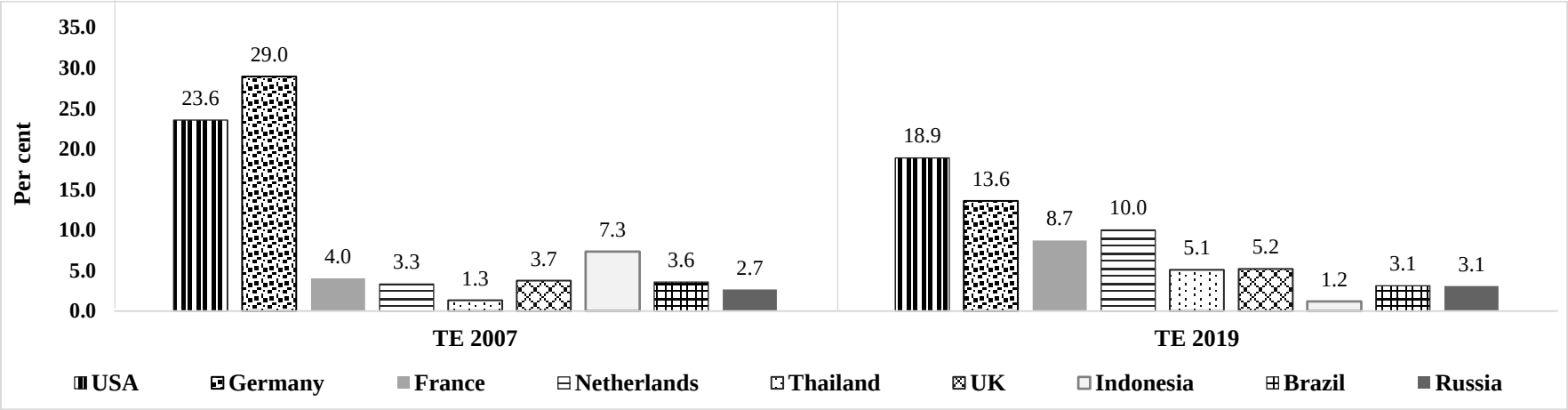
Figure 18 Trend in geographic concentration of pepper oil export from India



Note: Estimated using data from WITS

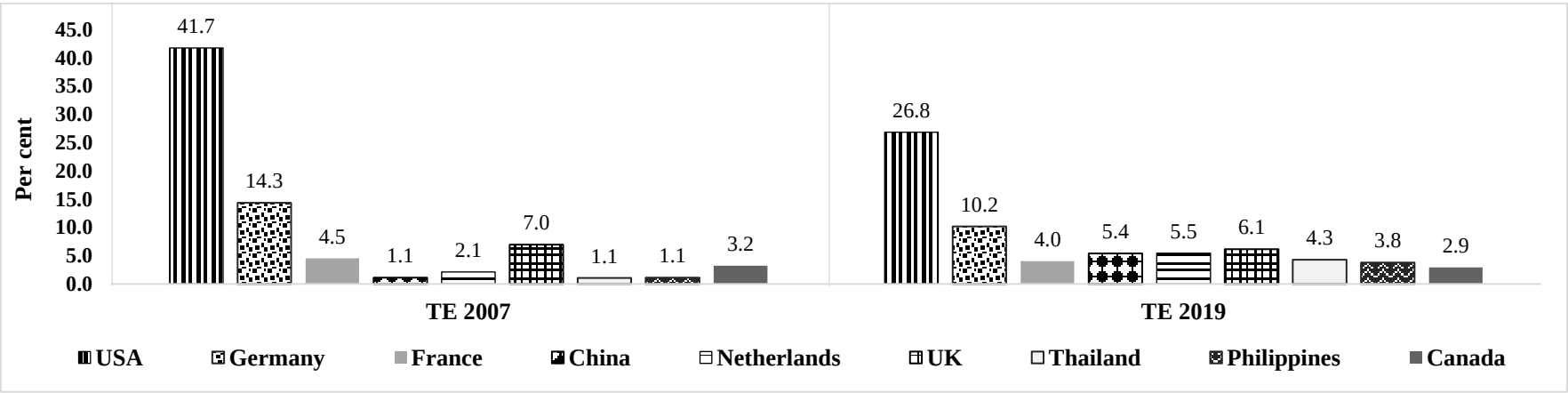
Exports of black pepper oil and oleoresins from India have increased tremendously after 2000. The geographic concentration indices for the export of pepper oil and oleoresins from India during the period from 2005 to 2019 were calculated and are depicted in Figure 18 and 19.

Figure 20 Dynamics in share of different countries in the Indian export of pepper oil



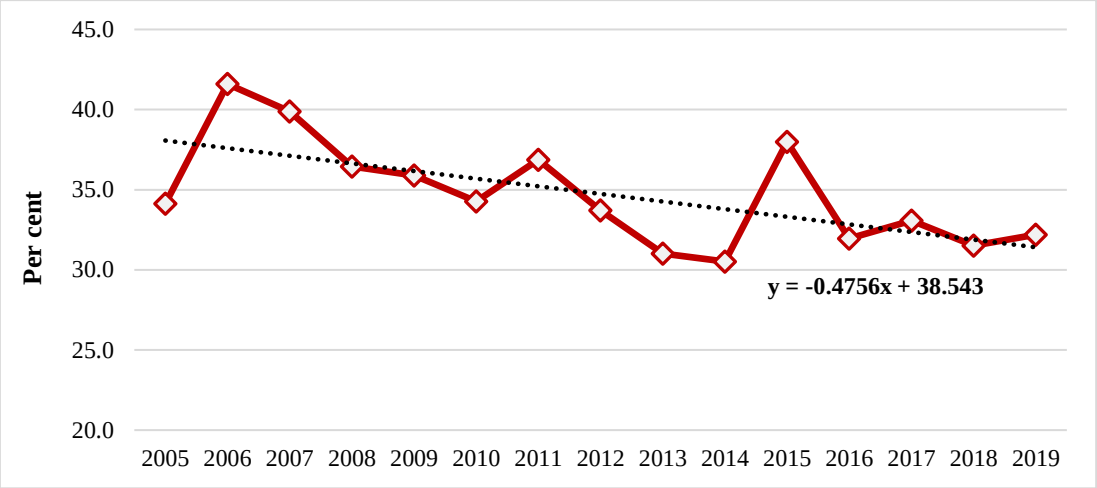
Note: Estimated using data from WITS

Figure 21 Dynamics in share of different countries in the Indian exports of pepper oleoresin



Note: Estimated using data from WITS

Figure 19 Trend in geographic concentration of pepper oleoresin export from India



Note: Estimated using data from WITS

The concentration indices for the export of pepper oil was below 40 per cent after 2005, with the exception of 2006 and 2009. But, in 2006 and 2009 there were only slight increases in the concentration indices, just crossing the 40 per cent mark. This indicates a more geographically diversified export of pepper oil from India. The concentration index has decreased from 40 per cent in 2005 to 30 per cent in 2019 (Figure 18), which means India was not dependent on few markets for the export of pepper oil and was successful in reducing the exposure and the consequent risk from volatility in prices of export to few markets. India exported more than 50 per cent of pepper oil to USA (23.6 per cent) and Germany (29 per cent) during TE 2007 and the share of these countries have decreased over the years (Figure 20). Of late, along with USA and Germany, France and Netherlands have also become the major importers of pepper oil from India.

Similar to the export of pepper oil from India, the geographic concentration indices for the export of pepper oleoresins have also decreased during the period from 2005 to 2019 (Figure 19). The values of the indices were below 40 per cent, which indicated that the export of pepper oleoresin from India was geographically diversified. Even though USA is the major importer of pepper oleoresin from India, its share has decreased from 41.7 per cent in TE 2007 to 26.8 per cent in TE 2019. In recent years, the Indian exports to markets such as China, Netherlands and Thailand have considerably increased (Figure 21).

4.1.6. Trade complementarity

The level of trade complementarity between two countries measures the export performance of a country in relation to the import requirements of its trading partner. To measure the level of trade complementarity that exists between two countries a trade complementarity index has been utilized. Trade complementarity indices of India with different countries for black pepper trade were estimated to understand whether an increased trade cooperation between the trading partners is possible or not. The estimations were done separately for pepper neither crushed nor ground and crushed or ground pepper and the results are shown in Table 4.12 and 4.13. If trade complementarity index is greater than one, it indicates that India and another country, say *X*, have complementarity in black pepper trade. The greater the value of the index, the higher will be the degree of complementarity between countries. If trade complementarity index is less than one, it means that the complementarity is low, and smaller the value of the index, the lower will be the degree of complementarity. Thus, the higher values of the index indicate more favorable prospects for a successful trade arrangement between countries.

From Table 4.12 and 4.13, while observing the trade complementary of India's black pepper trade with each country, it was found that India enjoys complementary advantage in trade of both pepper neither crushed nor ground and crushed or ground pepper with 14 countries. After 2000, the trade openness of Indian economy, in agricultural commodities considerably increased because of the reduction of tariffs as well as removal of Non-Tariff Barriers due to the enactment of liberalisation policies and FTAs. Even though India and most of the selected countries were having complementarity in the trade of black pepper (pepper neither crushed nor ground and crushed or ground pepper) for the entire period from 1988 to 2019, a discernible difference is noticed before and after 2000. It is evident from Table 4.12 that before 2000, values of the trade complementarity indices for India with countries like Australia, Germany, Japan, Netherlands, Russia, Sweden, Italy, Canada, UAE, UK and USA in the trade of pepper neither crushed nor ground were much higher than those

Table 4.12 Trade Complementarity Indices of India with selected partners in exports of black pepper neither crushed nor ground

Year	AUS	CAN	DEU	ITA	JPN	NLD	RUS	LKN	SWE	THA	UAE	UK	USA	VNM
1988	54.85		77.70		48.77					2.43				
1989	4.61	3.24	7.25		3.71					0.21				
1990	4.78	3.91	6.36		3.23			0.81		0.26				
1991	6.20	5.06	6.88		3.27			1.00		0.34	52.07		12.36	
1992	7.40	7.21	9.29		5.81	13.23		0.89	5.95	0.91	49.44		16.97	
1993	17.12	12.28	23.42		13.43	29.90		3.12	13.73	1.07	106.32	14.68	30.32	
1994	19.90	11.34	24.37	9.75	12.71	44.37		1.95	14.01	0.71		12.50	34.14	
1995	9.98	8.63	17.16	7.26	8.93	30.30			9.87	0.32		10.51	20.11	
1996	20.38	22.75	34.79	14.25	17.22	72.70	36.05		19.88	1.24		18.06	52.34	
1997	14.67	10.86	26.86	10.62	15.18	62.58	17.71		14.93	0.75		13.66	34.01	
1998	17.46	15.15	29.06	12.15	21.21	68.36	20.35		19.35	3.11		13.64	37.61	
1999	14.95	17.29	31.39	10.85	18.36	68.77	35.36	3.15	16.94	0.99	0.00	10.32	36.80	
2000	8.64	6.67	12.47	5.20	6.36	25.47	14.20	1.86	7.89	2.09	0.00	4.35	15.56	3.19
2001	8.69	7.62	13.28	4.60	6.75	26.82	8.42	0.24	8.02	2.73	0.00	4.31	15.93	6.62
2002	5.96	5.15	8.91	2.96	4.94	18.29	7.23	0.15	5.84	2.11	0.00	2.59	9.07	2.62
2003	4.95	3.20	8.19	2.28	4.43	14.59	4.46	3.52	4.00	1.84	0.00	2.22	8.10	12.29
2004	4.77	2.32	6.63	1.89	3.26	7.50	3.08	0.26	3.26	0.17	0.00	1.55	6.25	5.02
2005	4.73	2.93	6.29	2.04	3.93	8.15	4.50	0.12	2.88	0.19	10.20	1.96	7.43	1.75
2006	4.18	3.72	8.48	2.55	5.01	10.97	4.50	0.83	3.22	0.31	0.00	2.33	9.44	13.26
2007	5.49	5.16	14.81	3.30	6.75	14.98	3.44	1.01	5.50	1.80	25.13	2.94	14.54	29.96
2008	4.34	4.40	8.85	2.84	3.53	10.85	5.88	0.47	3.95	0.18	16.61	2.45	11.60	41.11
2009	2.68	2.37	4.96	1.50	2.14	5.81	5.66	0.17	2.19	0.14	0.00	1.21	6.27	19.86
2010	2.10	1.70	3.23	1.20	1.77	5.42	4.49	0.15	1.71	2.19	0.00	1.11	5.03	37.16
2011	2.91	2.49	6.08	2.12	2.53	9.42	4.05	0.31	3.31	1.98	0.00	1.97	8.50	30.46
2012	1.61	1.45	4.19	1.47	1.30	4.62	1.82	0.03	1.78	0.93	7.51	1.03	4.35	26.29
2013	1.58	1.76	5.67	1.47	1.50	4.50	2.14	0.18	1.96	1.64	9.16	1.42	5.43	22.37
2014	1.35	1.20	3.31	1.18	1.34	3.12	1.30	2.54	1.66	1.45	7.45	0.94	3.67	9.00
2015	1.73	1.87	5.57	2.08	2.27	3.60	2.08	0.54	2.02	2.69	8.93	1.56	5.69	27.47
2016	1.36	1.13	2.98	1.07	1.27	2.04	1.43	3.12	1.46	1.64	3.94	0.94	2.85	8.31
2017	1.05	0.00	2.74	0.99	0.99	1.67	2.12	5.09	1.34	1.39	4.21	0.85	2.70	5.29
2018	1.75	0.00	2.76	1.20	1.28	2.14	3.05		1.96	1.82	4.71	1.17	2.76	6.69
2019	1.52	1.23	2.47	0.94	1.05	1.62	2.68		1.63	1.84	3.48	0.96	2.20	7.81

Note: AUS – Australia, CAN – Canada, DEU – Germany, ITA – Italy, JPN – Japan, NLD – Netherlands, RUS – Russia, LKA – Sri Lanka, SWE – Sweden, THA – Thailand, UAE – United Arab Emirates, UK – United Kingdom, USA – United States of America, VNM – Vietnam.
Estimated using data from WITS

Table 4.13 Trade Complementarity Indices of India with selected partners in export of crushed or ground black pepper

Year	AUS	CAN	DEU	JPN	NPL	NLD	RUS	LKN	SWE	THA	UAE	UK	USA	VNM
1988	15.9				1.2		0.7					0.1		
1989	7.3		4.4		0.6		2.2					0.2		
1990	2.0		1.0		0.2		1.1					0.1		
1991	0.5		0.3		0.1		0.2			1.8		0.0		0.1
1992	1.5		2.0		0.3		1.2	2.3		4.3	1.1	0.1		0.3
1993	1.3		0.8		0.1		0.5	0.7		2.1	0.5	0.0	0.2	0.1
1994	4.2		5.7	3.8	0.8	1.5	5.5	7.8		22.3	4.7	0.2	2.4	0.7
1995	7.9		4.6	5.2	0.8	1.3	5.9	6.4		18.4	4.7	0.1	3.0	1.3
1996	4.2		3.3	5.8	0.7	0.7	4.4	4.5	7.4	13.9	3.2	0.1	1.8	0.9
1997	7.1		4.1	5.2	0.9	1.2	5.4	6.9	10.1		3.6	0.1	3.5	0.9
1998	3.3		1.8	1.8	0.4	0.4	2.8	2.3	4.7	5.4	1.6	0.0	1.2	0.5
1999	5.3	2.6	2.2	3.4	1.0	1.0	3.7	4.6	5.6	9.4	3.6	0.0	2.5	1.3
2000	6.3	7.2	7.5	7.2	1.0	3.2	9.9	4.9	16.7	10.3	7.3	0.3	5.5	4.1
2001	17.8	16.8	16.0	17.8	3.7	6.4	22.0	7.8	18.4	7.4	12.8	5.4	10.9	8.4
2002	13.4	24.5	11.2	21.7	4.4	4.6	15.3	10.4	10.4	16.6	11.5	2.7	8.8	6.9
2003	11.7	27.7	25.4	17.9	3.7	5.4	17.8	17.0	11.2	13.8	14.4	2.2	15.7	10.2
2004	13.1	26.4	21.7	17.5	6.1	5.1	14.9	16.5	12.8	13.2	15.5	1.6	14.9	11.2
2005	13.4	20.5	19.6	14.2	10.6	4.6	14.6	11.2	10.8	13.4	13.5	1.5	21.4	8.8
2006	23.1	26.8	28.0	13.2	9.9	4.9	17.3	14.8	12.8	16.2	17.5	3.9	37.5	11.3
2007	14.0	21.4	29.0	11.6	7.8	3.5	22.5	17.7	8.2	15.4	14.2	5.5	28.4	10.8
2008	15.4	13.1	24.6	14.1	3.4	3.0	18.3	11.1	8.4	13.0	13.0	5.7	27.0	10.8
2009	13.6	9.1	22.6	14.8	4.2	3.1	22.3	11.1	9.2	13.5	17.0	7.9	24.4	12.7
2010	8.1	6.2	12.4	8.5	2.8	2.2	12.6	9.1	6.5	13.3	10.5	3.9	19.8	9.4
2011	8.3	5.9	10.9	6.7	2.7	1.7	10.4	11.6	3.7	12.6	8.6	4.0	16.7	8.6
2012	12.4	7.4	15.7	9.0	4.2	1.8	13.8	16.7	8.4	17.6	11.7	6.3	27.9	11.7
2013	12.0	5.6	14.9	10.9	3.6	2.5	12.1	18.9	5.0	13.9	11.0	5.7	27.3	11.1
2014	17.6	5.9	14.1	10.0	4.0	3.5	12.9	18.5	4.4	11.6	11.1	7.8	25.4	10.9
2015	21.6	7.3	18.5	11.9	5.3	3.8	20.4	25.6	5.7	19.9	17.6	13.1	31.6	16.6
2016	17.1	5.7	14.3	9.6	6.0	4.1	15.2	15.1	3.8	20.7	9.2	11.9	21.2	13.0
2017	14.8	6.4	0.0	8.9	5.6	3.9	12.4	14.8	3.7	25.4	12.0	13.2	24.6	10.4
2018	10.5	6.0	0.0	7.7	3.4	2.8	9.6	8.8	4.5	15.8	8.9	14.3	18.9	8.9
2019	12.6	6.4	17.9	9.1	4.1	3.1	10.9	11.8	5.9	21.7	12.2	13.6	22.3	12.7

Note: AUS – Australia, CAN – Canada, DEU – Germany, JPN – Japan, NPL – Nepal, NLD – Netherlands, RUS – Russia, LKA – Sri Lanka, SWE – Sweden, THA – Thailand, UK – United Kingdom, USA – United States of America, VNM – Vietnam.
Estimated using data from WITS

after 2000. But, the trade of Indian crushed or ground pepper with some countries were found to be complementary after 2000. Also, some countries which were having advantage of complementarity with India even before 2000 exhibited very high indices after 2000 (Table 4.13). The trade complementarity indices of both pepper neither crushed nor ground and crushed or ground pepper, generally implied that the export pattern of black pepper from India strongly matched with the import patterns of black pepper in the partner countries in comparison with the world trade of black pepper. In addition, the decreasing trend of the trade complementarity indices of India with partner countries in the trade of pepper neither crushed nor ground after 2000 confirmed that India and its partner countries are becoming less complementary.

4.1.7 Decomposition analysis

The decomposition analyses were carried to find out the sources of growth and variance of average export value of Indian black pepper. The components of change in the export value of Indian black pepper (pepper neither crushed nor ground and crushed or ground pepper) in terms of change in mean export quantity, change in mean export unit value, change in mean export quantity and unit value covariance and the interaction between changes in mean export quantity and mean export unit value, are presented in Table 4.14. Decomposition analyses were separately attempted for exports of pepper neither crushed nor ground, crushed or ground pepper and total pepper. The results indicated that the contribution of change in the mean export unit value was the highest among all the decomposed components of changes in the average export value of black pepper.

It could be observed that the increase in the mean export value of black pepper (total) in the post-2000 period compared to the pre-2000 period was mainly due to the change in mean export unit value of 96.77 per cent, while the change in the mean export quantity contributed only 3.23 per cent to the growth in export value. These findings are as expected because the export unit value had recorded a significant higher growth rate during both the periods, whereas the export quantity recorded a decreased growth rate during the post-2000 period. The contributions of the interaction between changes in mean export quantity and unit value and, the change in export quantity-unit value covariance to the growth in export value were negligible. Similar results were

observed for pepper neither crushed nor ground and crushed or ground pepper for all the periods.

Table 4.14 Decomposition analysis of components of change in average export value of black pepper

Period/Commodity/ Components of change	Change in mean EUV	Change in mean EQ	Interaction between changes in mean EQ and mean EUV	Change in EQ-EUV covariance
Pepper neither crushed nor ground				
Pre-2000 & Post-2000	93.28	6.72	-0.0012	-0.0011
1990-1999 & 2000-2009	87.71	12.29	-0.0021	0.0018
2000-2009 & 2010-2019	96.17	3.82	0.0003	0.0040
Crushed or ground pepper				
Pre-2000 & Post-2000	511.22	-411.47	0.049	0.198
1990-1999 & 2000-2009	95.63	4.42	-0.0010	-0.0487
2000-2009 & 2010-2019	188.88	-88.89	-0.0137	0.0276
Total black pepper				
Pre-2000 & Post-2000	96.77	3.23	-0.001	-0.001
1990-1999 & 2000-2009	89.78	10.22	-0.0018	0.0004
2000-2009 & 2010-2019	103.76	-3.77	-0.00042	0.0059

Note: EQ – Export quantity and EUV – Export unit value

4.8 Dynamics in direction of black pepper exports

Markov chain analysis was used to study the dynamics in the direction of black pepper exports from India by estimating the transitional probability matrices from Markov chain analyses. The structural changes in the export of Indian black pepper were studied by estimating Markov transitional probability matrices. The probability of retaining the market share in the previous period (gain or loss) was interpreted by studying the diagonal elements of the transition probability matrix.

The analyses were carried out for black pepper neither crushed nor ground, crushed or ground black pepper, pepper oil and pepper oleoresin by considering thirty export markets and rest of the markets in the world was categorised under ‘Others’. The stable markets were identified using the diagonal elements of the transition probability matrix. The row elements in a transitional probability matrix provide the information on the probability of retention in the volume of trade and the extent of loss

in trade on account of competing regions/countries, whereas the column elements indicate the probability of gains in trade from other competing regions/countries.

4.8.1 Transition probabilities of black pepper neither crushed nor ground

The Markov chain analysis using data on country-wise exports from India of black pepper neither crushed nor ground was carried out for three periods *i.e.*, pre-2000 (1988 to 1999), post-2000 (2000 to 2019) and overall period (1988 to 2019). The estimated transition probability matrices of black pepper neither crushed nor ground for different periods are shown from Table 4.15 to Table 4.17 and as Figure 22 to 24. The diagonal elements in the transition probability matrix show the retention probabilities of various export markets or importing countries, which capture the net effects of the switching pattern in export markets over a period of time.

Figure 22 Retention probability chart for black pepper neither crushed nor ground exports from India in pre-2000 period

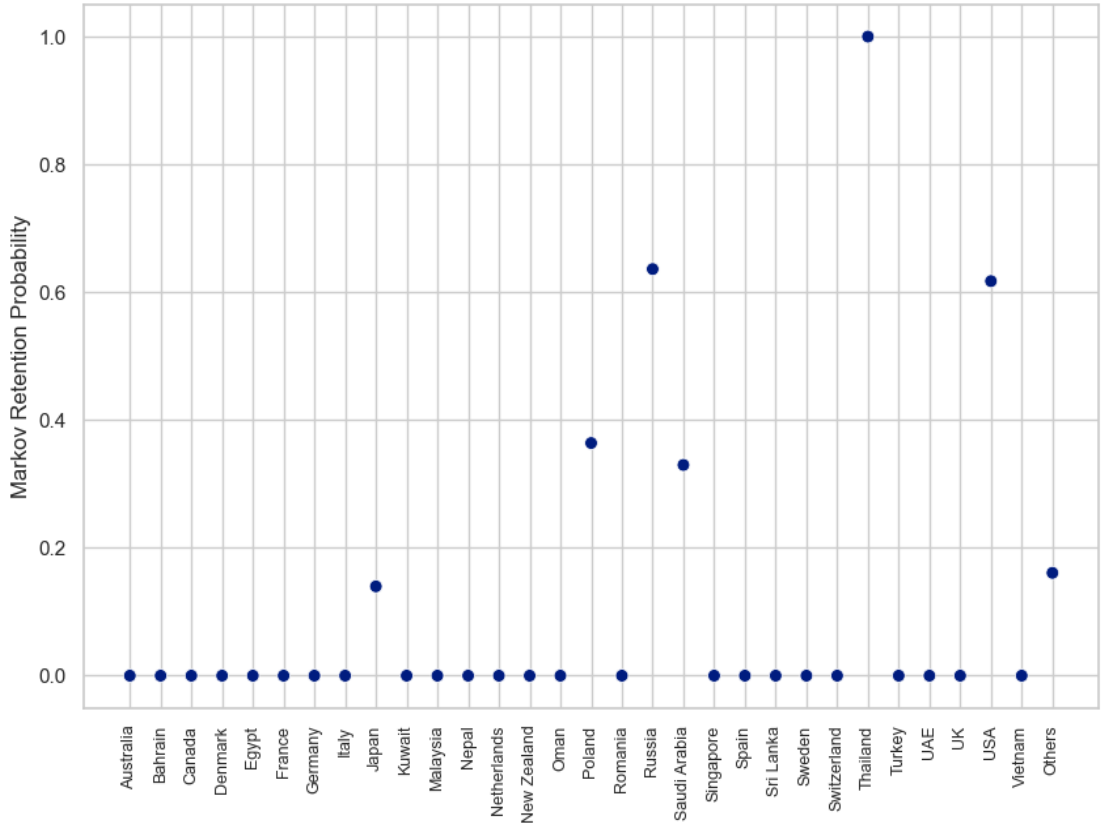


Table 4.15 Transition probability matrix for black pepper neither crushed nor ground exports from India in pre-2000 period

Country	AUS	BHN	CAN	DEN	EGY	FRA	DEU	ITA	JPN	KUW	MAL	NEP	NLD	NZL	OMN	POL	ROM	RUS	SAU	SIN	ESP	SLK	SWE	SWD	THL	TUR	UAE	UK	USA	VNM	OTH
AUS	0	0	0	0.1	0.749	0	0	0.086	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0.005	0.012	0	0	0.047	0	0	0	0
BHN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
CAN	0	0	0	0	0	0	0	0	0	0	0	0	0.046	0	0	0	0	0	0	0	0.052	0	0	0	0	0	0	0	0.902	0	0
DEN	0	0	0	0	0	0.66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.34	0	0	0
EGY	0	0	0	0.047	0	0	0	0.093	0	0	0	0.135	0.426	0	0	0	0	0	0	0	0.206	0	0	0.019	0	0	0	0.073	0	0	0
FRA	0	0	0	0	0	0	0	0	0	0.059	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.941
DEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
ITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
JPN	0	0	0.86	0	0	0	0	0	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KUW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.083	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.917
MAL	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
NLD	0	0	0	0	0	0	0	0	0.144	0	0.066	0.006	0	0	0	0	0	0	0	0	0.285	0.031	0	0.017	0	0.032	0	0.419	0	0	0
NZL	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMN	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POL	0	0.013	0	0	0.106	0	0.188	0	0	0	0	0	0	0	0	0.364	0	0	0	0.116	0	0	0.07	0	0	0	0.105	0	0.038	0	0
ROM	0	0	0	0	0	0	0	0	0.129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.871	0	0
RUS	0	0.004	0.043	0.004	0	0.003	0.016	0.071	0.015	0.006	0.007	0.004	0	0	0	0.047	0.045	0.636	0.006	0	0	0	0.002	0	0	0	0.002	0	0.048	0	0.043
SAU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	0.33	0	0	0	0	0	0	0	0	0	0	0	0
SIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
ESP	0	0	0.038	0	0	0	0	0.424	0	0	0	0	0.318	0.011	0	0	0	0	0	0	0	0	0	0	0	0.009	0	0.2	0	0	0
SLK	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SWE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
SWD	0	0	0	0	0	0.76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.24	0	0	0
THL	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TUR	0	0	0	0	0	0	0	0	0	0	0	0	0.894	0.106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UAE	0.016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.022	0.277	0	0	0	0	0	0	0	0	0.053	0.193	0	0.44
UK	0	0	0.356	0	0	0.104	0	0	0	0	0	0	0.428	0	0	0	0	0	0	0	0	0	0	0	0	0.003	0	0	0.109	0	0
USA	0.021	0	0.053	0.006	0.027	0.029	0.046	0.068	0.013	0	0	0.005	0.021	0.001	0	0.025	0	0	0	0	0	0	0.002	0	0	0	0.01	0.021	0.617	0	0.037
VNM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0	0	0.776	0	0	0	0	0	0	0	0	0.062	0	0	0	0.161

Note: AUS – Australia, BHA– Bahrain, BEL – Belgium, EGY – Egypt, CHN – China, CAN – Canada, FRA – France, DEU – Germany, ITA – Italy, JPN – Japan, KOR – Korea, KUW – Kuwait, MAL - Malaysia, MEX –Mexico, NLD – Netherlands, NZL – New Zealand, NOR – Norway, OTA – Other Asia, PHL – Philippines, POL – Poland, QTR – Qatar, RUS – Russia, SAU – Saudi Arabia, SIN – Singapore, SAF – South Africa, ESP – Spain, SWE – Sweden, THA – Thailand, UAE – United Arab Emirates, UK – United Kingdom, USA – United States of America, OTH – Others

Estimated using data from WITS

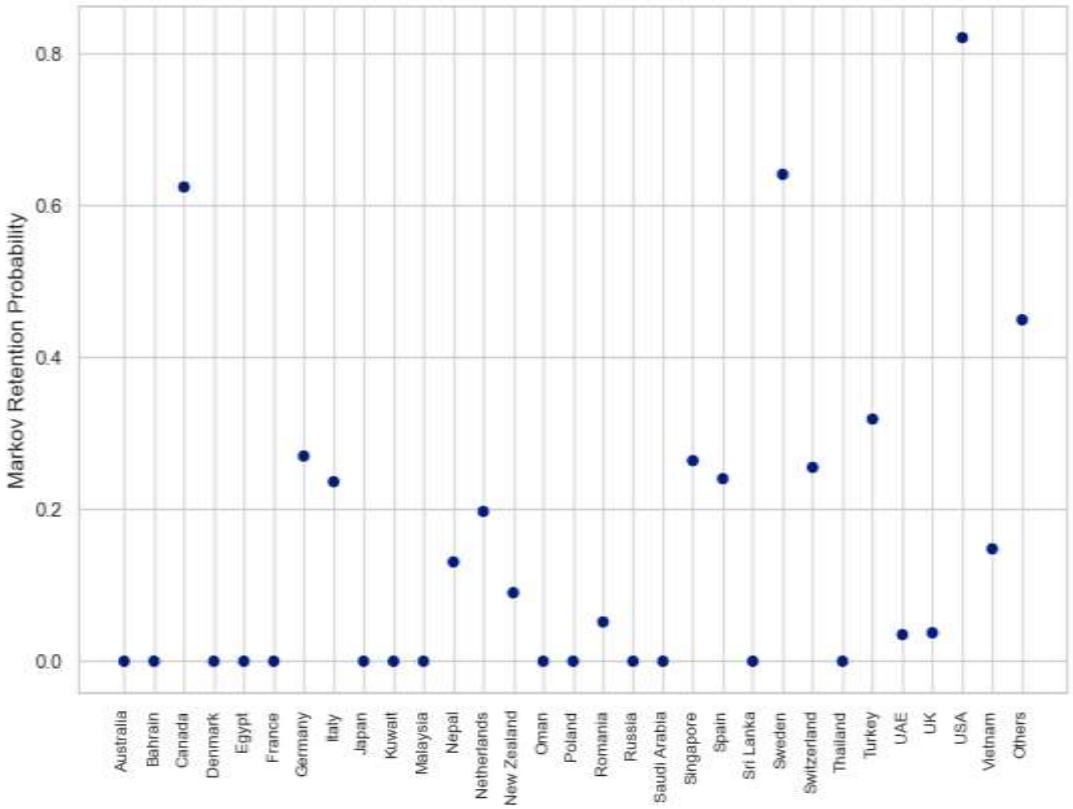
Table 4.16 Transition probability matrix for black pepper neither crushed nor ground exports in post-2000 period

Country	AUS	BHN	CAN	DEN	EGY	FRA	DEU	ITA	JPN	KUW	MAL	NEP	NLD	NZL	OMN	POL	ROM	RUS	SAU	SIN	ESP	SLK	SWE	SWD	THL	TUR	UAE	UK	USA	VNM	OTH
AUS	0	0	0.092	0	0	0	0.58	0	0	0	0	0	0	0	0	0	0	0	0.162	0	0	0	0	0	0	0	0	0	0	0	0.167
BHN	0	0	0	0	0	0	0	0	0	0	0.45	0	0	0	0	0	0	0	0	0	0.55	0	0	0	0	0	0	0	0	0	0
CAN	0.093	0	0.624	0.012	0	0	0	0.213	0	0	0	0	0	0	0	0	0	0	0.058	0	0	0	0	0	0	0	0	0	0	0	0
DEN	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EGY	0	0	0	0	0	0	0	0	0.111	0	0.088	0.143	0.532	0	0.003	0.123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRA	0	0	0	0	0	0	0	0.122	0	0	0	0.063	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.117	0	0	0	0.699
DEU	0	0	0	0	0	0.047	0.27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.091	0	0	0	0.161	0.432	0	0	0
ITA	0.152	0	0	0	0	0	0	0.236	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0.608	0	0
JPN	0	0	0.148	0	0	0	0	0.444	0	0.03	0.115	0	0	0.02	0	0	0	0	0.002	0	0	0	0	0.026	0	0	0	0.215	0	0	0
KUW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
MAL	0	0	0	0	0	0	0	0	0	0	0	0	0.188	0	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.561
NEP	0.145	0.008	0	0	0	0	0	0	0.503	0	0.076	0.131	0	0	0	0	0	0	0	0	0	0	0	0	0.137	0	0	0	0	0	0
NLD	0	0	0	0	0	0	0	0	0.239	0	0.019	0.013	0.197	0.009	0	0.046	0	0	0	0	0.213	0	0.115	0	0	0	0	0.15	0	0	0
NZL	0	0	0.26	0	0	0	0	0	0	0	0	0	0	0.09	0	0	0	0	0	0	0	0	0	0	0.336	0	0	0.313	0	0	0
OMN	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POL	0	0	0	0	0	0.004	0.963	0	0	0	0	0	0	0	0	0	0	0	0.034	0	0	0	0	0	0	0	0	0	0	0	0
ROM	0	0	0	0	0	0	0	0	0	0	0	0.025	0	0	0	0	0.052	0	0	0	0	0	0.794	0	0	0	0.13	0	0	0	0
RUS	0	0	0	0	0	0	0	0	0	0	0.028	0	0.063	0	0	0	0	0	0	0	0.006	0	0	0	0	0	0	0	0.903	0	0
SAU	0	0.043	0	0	0	0	0	0	0	0	0	0	0	0.112	0.018	0.019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.808
SIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.264	0	0	0	0	0	0	0	0	0	0.736	0
ESP	0	0	0	0	0	0.042	0.343	0	0	0	0	0	0.354	0	0	0	0.018	0	0	0	0.24	0.003	0	0	0	0	0	0	0	0	0
SLK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0	0.246	0	0.377	0	0	0	0.117	0.01	0	0	0.245
SWE	0.05	0	0	0	0	0.036	0	0	0	0.004	0	0.067	0	0	0	0	0.08	0	0	0	0	0	0.641	0	0	0.121	0	0	0	0	0
SWD	0	0	0	0	0	0	0.184	0	0	0	0	0	0	0	0	0	0	0	0.561	0	0	0	0	0.255	0	0	0	0	0	0	0
THL	0	0	0	0	0	0	0.136	0	0	0	0	0	0	0	0.003	0	0	0.494	0	0	0.204	0	0	0.019	0	0	0	0	0	0	0.143
TUR	0	0	0	0	0	0	0	0	0	0.146	0	0.339	0	0	0	0	0.017	0	0	0	0	0.18	0	0	0	0.319	0	0	0	0	0
UAE	0.105	0.001	0	0	0	0.117	0	0	0.166	0.028	0	0	0	0	0	0	0	0	0.002	0	0	0	0.186	0	0	0	0.035	0.312	0.048	0	0
UK	0.015	0	0	0	0	0.028	0	0	0.454	0	0.048	0.076	0	0	0.001	0	0	0.261	0	0	0	0.056	0	0	0.023	0	0	0.037	0	0	0
USA	0	0.002	0.021	0.004	0.009	0.023	0	0.002	0	0.007	0	0	0.002	0	0.001	0.012	0	0.009	0	0.014	0	0	0.001	0	0	0	0.022	0	0.821	0	0.051
VNM	0	0.008	0	0	0	0	0	0	0.005	0	0	0	0	0	0.001	0	0	0	0	0.08	0.11	0	0	0	0	0	0	0	0.209	0.148	0.439
OTH	0	0.003	0	0	0.009	0	0.052	0	0	0	0	0	0.105	0	0	0.058	0	0.084	0	0	0.058	0	0	0	0	0	0.038	0	0.052	0.092	0.449

Note: AUS – Australia, BHA– Bahrain, BEL – Belgium, EGY – Egypt, CHN – China, CAN – Canada, FRA – France, DEU – Germany, ITA – Italy, JPN – Japan, KOR – Korea, KUW – Kuwait, MAL - Malaysia, MEX –Mexico, NLD – Netherlands, NZL – New Zealand, NOR – Norway, OTA – Other Asia, PHL – Philippines, POL – Poland, QTR – Qatar, RUS – Russia, SAU – Saudi Arabia, SIN – Singapore, SAF – South Africa, ESP – Spain, SWE – Sweden, THA – Thailand, UAE – United Arab Emirates, UK – United Kingdom, USA – United States of America, OTH – Others

Estimated using data from WITS

Figure 23 Retention probability chart for black pepper neither crushed nor ground exports from India in post-2000 period



The transitional probability matrix for black pepper neither crushed nor ground exports from India to 31 major export destinations for pre-2000 period is presented in Table 4.15 and Figure 22, which gives a broad indication of the changes in the direction of trade. Russia was the most stable market for exports of black pepper neither crushed nor ground from India as its probability of retaining the previous period market share was 63.6 per cent, while USA was the second most stable market with 61.7 per cent probability of retention. In pre-2000 period, black pepper was mainly exported as black pepper neither crushed nor ground from India. These findings were in accordance with the findings of Jayesh (2001) and Sujatha and Prasad (2008) and they both reported that USA and USSR were the stable export markets for Indian black pepper in eighties and nineties. Even though they studied for total black pepper without considering its form, before 2000, black pepper was mainly exported as black pepper neither crushed nor ground from India. Poland and Saudi Arabia were also found to be stable markets with retention probabilities of 36.4 per cent and 32.9 per cent respectively.

In the post-2000 period, more number of stable markets were identified in the export of black pepper neither crushed nor ground from India when compared to the pre-2000 period, which is evident from Figure 23 and Table 4.16. The transition probability matrix (Table 4.16) and retention probability chart (Figure 23) for the post-2000 period reveal that USA had retained 82.1 per cent of the previous year's export share in the current period. Felix *et. al.,* (2016) reported a similar result for the Markov chain analysis carried out for the major Indian black pepper export markets for the period from 2002-03 to 2014-15. They found that USA retained 72.32 per cent of share of Indian black pepper export for the period from 2002-03 to 2014-15 and remained as most stable export market of Indian black pepper.

The probabilities that USA would gain from Russia and Italy were 90.3 per cent and 60.83 per cent respectively. Sweden was next in order, retaining 64.1 per cent of the previous year's share in the current year, gaining mainly from Romania and UAE with probabilities of 79.35 per cent and 18.59 per cent, respectively. However, Canada had retained 62.44 per cent of previous year's share in the current period, gaining mainly from New Zealand (26.04 per cent) and meagerly from USA. And also, Sweden and Canada were the emerging markets during the post-2000 period, while they had only zero retention probabilities during the pre-2000 period. Similar results were reported by Cariappa and Chandel (2020) that Sweden was a stable importer of Indian black pepper with a retention probability of 61 per cent for the period from 2000 to 2008. They also found that Sweden and Canada became a major export market of Indian black pepper after 2000, which was parallel to the present findings. Other stable markets were Turkey, Switzerland, Spain, Singapore, Germany, Italy, Netherlands, Vietnam, Nepal, New Zealand, Romania, UAE and UK. A number of new export markets have emerged after 2000 and this may be due to increased openness in the international market caused by removing quantitative restrictions and reduction of tariffs.

Table 4.17 Transition probability matrix for black pepper neither crushed nor ground exports from India in the overall period

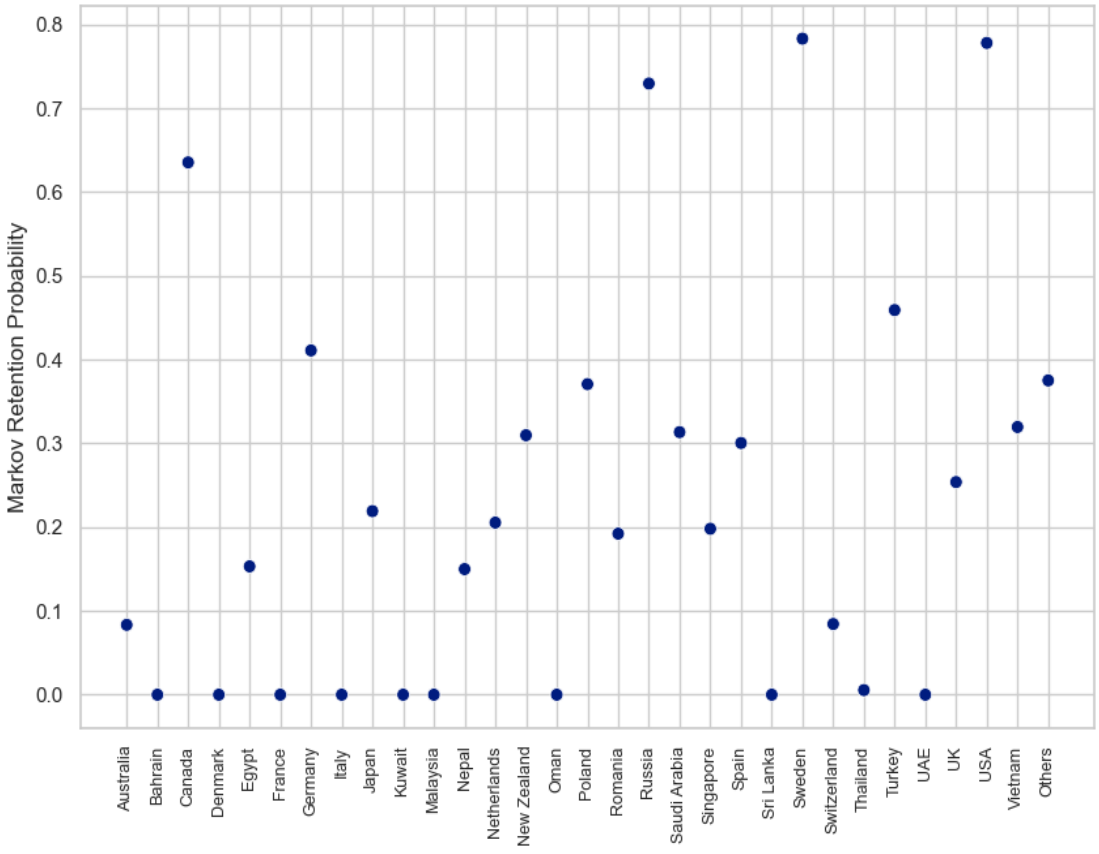
Country	AUS	BHN	CAN	DEN	EGY	FRA	DEU	ITA	JPN	KUW	MAL	NEP	NLD	NZL	OMN	POL	ROM	RUS	SAU	SIN	ESP	SLK	SWE	SWD	THL	TUR	UAE	UK	USA	VNM	OTH
AUS	0.083	0	0	0	0	0	0	0.354	0	0	0	0	0	0	0	0	0	0	0.077	0	0	0	0	0	0	0	0	0	0	0	0.486
BHN	0	0	0	0	0	0	0.732	0	0	0	0	0	0	0	0	0	0	0	0	0	0.268	0	0	0	0	0	0	0	0	0	0
CAN	0.096	0	0.635	0	0	0	0	0.265	0	0	0	0	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DEN	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EGY	0	0	0	0.063	0.153	0	0	0	0	0	0	0	0.513	0	0	0	0	0.153	0	0	0.111	0	0	0.007	0	0	0	0	0	0	0
FRA	0	0	0.169	0	0	0	0	0.085	0	0.053	0	0.017	0	0.014	0.003	0	0	0.186	0	0	0	0	0	0	0	0	0.024	0.054	0	0	0.395
DEU	0	0	0	0	0	0	0.411	0	0	0	0	0	0	0	0	0	0	0	0	0	0.012	0	0	0	0	0	0.14	0.254	0	0	0.183
ITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
JPN	0	0	0.083	0	0	0	0	0.251	0.219	0.007	0.063	0.055	0	0	0	0	0	0	0	0	0	0	0.169	0.006	0	0	0.146	0	0	0	0
KUW	0	0	0	0	0	0	0	0	0	0	0	0.152	0	0	0	0	0	0.848	0	0	0	0	0	0	0	0	0	0	0	0	0
MAL	0	0	0	0	0	0	0.148	0	0	0	0	0	0.182	0	0.003	0	0	0	0	0	0	0	0	0	0	0	0	0	0.064	0	0.603
NEP	0	0	0	0	0	0	0	0.4	0.25	0	0.046	0.15	0	0	0	0	0	0	0	0	0	0	0	0.007	0.148	0	0	0	0	0	0
NLD	0	0	0	0	0	0.005	0	0	0.149	0	0.014	0.017	0.205	0.021	0	0	0	0	0	0	0.224	0.034	0	0.003	0	0	0	0.326	0	0	0
NZL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.31	0	0	0	0	0	0	0	0	0	0.118	0.406	0	0	0.167	0	0	0
OMN	0	0	0	0	0	0	0	0.36	0	0.594	0.047	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POL	0	0	0	0	0.333	0.059	0.237	0	0	0	0	0	0	0	0	0.371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROM	0	0.009	0.032	0	0	0.002	0	0.015	0.21	0	0	0.027	0	0	0	0.321	0.192	0	0	0	0	0	0	0	0	0.033	0	0	0	0	0.158
RUS	0	0.002	0.03	0.004	0	0.006	0	0.05	0	0.001	0.001	0	0	0	0	0.025	0.031	0.73	0	0	0	0	0	0	0	0	0	0	0.119	0	0
SAU	0	0.013	0	0.007	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0.099	0.313	0	0	0	0	0	0	0	0	0	0	0	0.548
SIN	0	0	0	0	0	0	0	0	0	0	0	0	0.437	0	0	0	0	0	0	0.198	0	0	0	0	0	0	0	0	0.365	0	0
ESP	0	0	0	0	0	0	0.234	0	0	0	0	0	0.414	0	0	0	0	0	0	0	0.3	0.004	0	0	0	0.047	0	0	0	0	0
SLK	0	0	0	0	0	0	0	0	0.007	0	0	0	0	0	0.004	0	0	0	0	0	0.355	0	0.527	0	0	0	0.107	0	0	0	0
SWE	0.056	0	0	0	0	0	0	0	0	0	0	0.046	0	0	0	0	0.046	0	0	0	0	0	0.783	0	0	0.068	0	0	0	0	0
SWD	0	0	0	0	0	0	0	0.381	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.084	0	0	0	0.534	0	0	0
THL	0.022	0	0	0	0	0	0.035	0	0	0	0.025	0	0	0	0	0	0	0	0	0	0.173	0	0	0.018	0.005	0	0	0	0.328	0	0.394
TUR	0	0	0	0	0	0	0	0	0	0	0	0.035	0	0	0	0	0	0	0	0	0	0.32	0.185	0	0	0.459	0	0	0	0	0
UAE	0.104	0.006	0	0	0	0.005	0.187	0	0.187	0.112	0.062	0.025	0.003	0	0	0	0	0	0	0	0.052	0	0.012	0	0	0	0	0.197	0	0.049	0
UK	0.004	0	0	0	0	0.208	0	0	0.34	0	0.079	0.039	0.052	0	0	0	0	0	0	0	0	0	0.001	0.012	0.01	0	0	0.254	0	0	0
USA	0.013	0.002	0.022	0.006	0.006	0.026	0.005	0.025	0	0	0	0.002	0.02	0	0	0.021	0	0	0	0.019	0	0	0	0.001	0	0	0.008	0.01	0.778	0	0.034
VNM	0	0.011	0	0	0	0	0	0	0.036	0	0.004	0	0	0	0	0	0	0	0	0.046	0.124	0	0	0	0	0	0.016	0	0	0.32	0.443
OTH	0	0.001	0	0	0	0	0.096	0	0	0.001	0	0	0	0	0.001	0	0	0.093	0.042	0	0.017	0	0	0	0	0	0.057	0	0.289	0.028	0.375

Note: AUS – Australia, BHA– Bahrain, BEL – Belgium, EGY – Egypt, CHN – China, CAN – Canada, FRA – France, DEU – Germany, ITA – Italy, JPN – Japan, KOR – Korea, KUW – Kuwait, MAL - Malaysia, MEX –Mexico, NLD – Netherlands, NZL – New Zealand, NOR – Norway, OTA – Other Asia, PHL – Philippines, POL – Poland, QTR – Qatar, RUS – Russia, SAU – Saudi Arabia, SIN – Singapore, SAF – South Africa, ESP – Spain, SWE – Sweden, THA – Thailand, UAE – United Arab Emirates, UK – United Kingdom, USA – United States of America, OTH – Others

Estimated using data from WITS

While considering the overall study period from 1988 to 2019, it could be observed that Sweden, USA and Russia were the most stable markets for the exports of pepper neither crushed nor ground from India, with 78.32 per cent, 77.8 per cent and 72.96 per cent probabilities of retention respectively (Table 4.17 and Figure 24). In the overall period, the most stable market Sweden gained from Turkey (18.5 per cent) and Japan (16. 93 per cent), whereas USA gained from Singapore (36.4 per cent) and Russia (11.8 per cent). The other stables markets identified in the overall period were Canada (63.54 per cent), Turkey (45.92 per cent), Germany (41.09 per cent), Vietnam (31.96 per cent), and New Zealand (30.97 per cent).

Figure 24 Retention probability chart for black pepper neither crushed nor ground exports from India in the overall period



4.8.2 Transition probabilities of crushed or ground pepper

Transition probability matrices for crushed or ground pepper exports from India for three different periods *i.e.*, 2000 to 2009, 2010 to 2019 and 2000 to 2019 (overall period) are presented from Table 4.18 to Table 4.20 and from Figure 25 to Figure 27.

As evident from Table 4.18 and Figure 25, the probability matrix indicated that Every year in the period crushed or ground black pepper exports from India to USA could retain 68.6 per cent of its previous year share and was one of the major stable importer of crushed or ground black pepper. USA gained from the share of Germany, Malaysia, Canada, UAE, UK and other countries. The other stable markets were Australia, Sweden and Saudi Arabia with retention probabilities of 34.74 per cent, 28.38 per cent, and 27.04 per cent, respectively.

Figure 25 Retention probability chart for crushed or ground black pepper exports from India during the period from 2000 to 2009

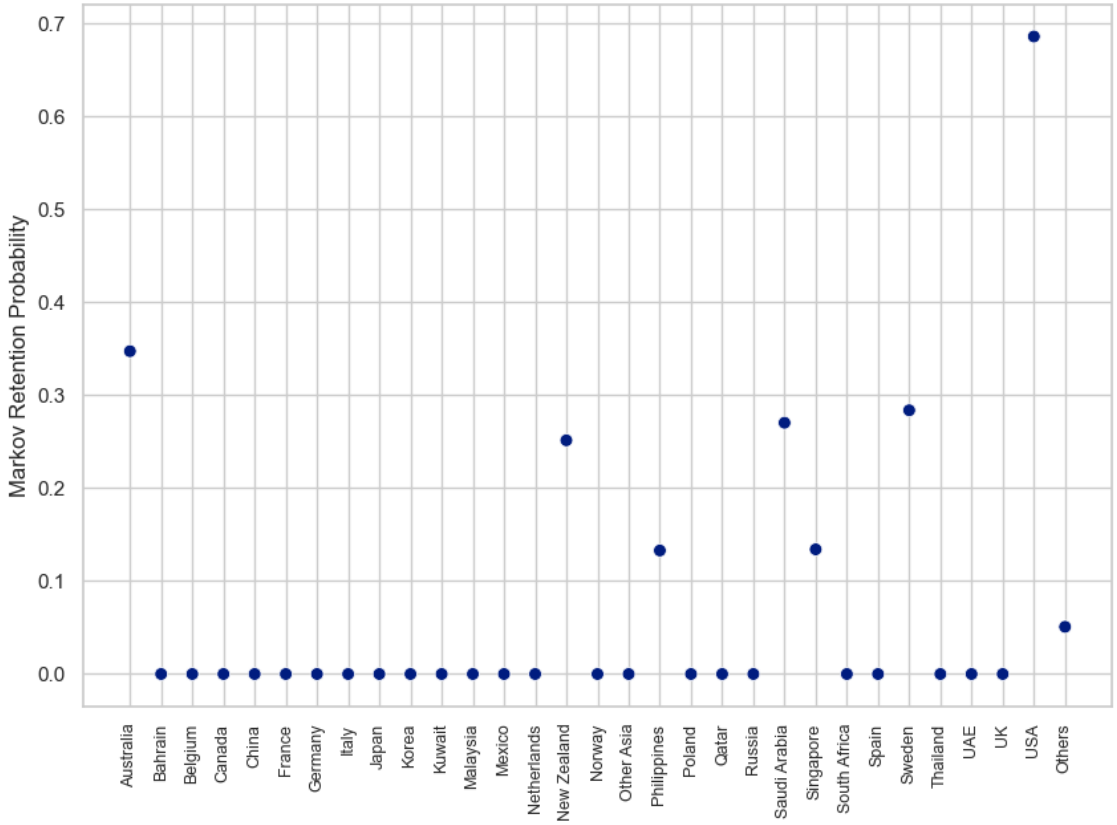


Table 4.18 Transition probability matrix for crushed or ground black pepper export from India during 2000 to 2009 period

Country	AUS	BHN	BEL	CAN	CHN	FRA	DEU	ITA	JPN	KOR	KUW	MAL	MEX	NLD	NZL	NOR	OTA	PHL	POL	QTR	RUS	SAU	SIN	SAF	ESP	SWE	THA	UAE	UK	USA	OTH
AUS	0.347	0	0	0	0	0	0.039	0	0	0.024	0	0	0	0.001	0	0	0	0.009	0	0	0	0	0	0.012	0	0	0	0.005	0.5	0	0.064
BHN	0	0	0	0	0	0	0	0	0	0	0.014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.986	0
BEL	0	0	0	0	0.018	0	0	0	0.067	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.043	0	0.063	0	0	0.808
CAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
CHN	0	0	0	0.147	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.853	0	0
FRA	0	0.023	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.071	0	0	0	0	0	0.474	0	0	0	0.432	0
DEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0.077	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.923	0
ITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
JPN	0	0.033	0	0.77	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.117	0	0
KOR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.389	0	0	0	0	0	0	0.611
KUW	0	0	0	0	0	0	0.363	0	0	0	0	0	0.145	0	0	0	0	0	0	0	0.188	0.303	0	0	0	0	0	0	0	0	0
MAL	0	0	0	0	0.021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.979	0
MEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0	0	0	0	0	0	0	0	0	0.993	0
NLD	0	0	0	0	0	0	0	0	0	0.229	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.771
NZL	0	0	0.445	0	0	0	0	0	0	0	0	0	0	0	0.251	0	0	0	0	0	0	0	0	0.105	0	0.199	0	0	0	0	0
NOR	0	0	0.623	0	0	0.377	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.193	0	0	0.089	0	0	0	0	0.094	0	0	0	0	0	0.624	0
PHL	0.677	0	0.19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.133	0	0	0	0	0	0	0	0	0	0	0	0	0
POL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
QTR	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
SAU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.27	0	0	0	0	0	0	0	0.73	0
SIN	0	0	0	0	0	0	0	0.118	0.094	0	0	0	0	0	0	0	0	0	0.076	0	0	0	0.134	0	0	0	0.105	0	0	0.473	0
SAF	0	0	0	0	0	0	0	0	0	0	0	0.65	0	0	0	0	0	0	0	0	0.167	0	0	0	0	0	0	0.184	0	0	0
ESP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
SWE	0.12	0	0	0	0	0	0.072	0	0	0	0	0.128	0	0	0	0.064	0	0.328	0	0.005	0	0	0	0	0	0.284	0	0	0	0	0
THA	0	0	0	0.045	0	0	0.384	0	0	0	0	0	0	0	0	0.067	0.122	0	0	0.015	0	0	0.143	0	0	0	0	0	0.225	0	0
UAE	0	0	0	0	0.113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.887	0
UK	0	0	0.122	0	0	0	0	0	0	0.015	0.015	0	0	0.017	0.02	0.001	0.006	0	0	0.001	0	0	0	0.004	0	0	0	0	0	0.798	0
USA	0.04	0.002	0.005	0.044	0	0.002	0.008	0.016	0.008	0	0.001	0	0.003	0	0.005	0.005	0	0.002	0.003	0	0.001	0.003	0.001	0	0.004	0.002	0.012	0	0.147	0.686	0
OTH	0	0	0	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0	0	0	0.02	0	0.92	0.051

Note: AUS – Australia, BHA– Bahrain, BEL – Belgium, CHN – China, CAN – Canada, FRA – France, DEU – Germany, ITA – Italy, JPN – Japan, KOR – Korea, KUW – Kuwait, MAL - Malaysia, MEX –Mexico, NLD – Netherlands, NZL – New Zealand, NOR – Norway, OTA – Other Asia, PHL – Philippines, POL – Poland, QTR – Qatar, RUS – Russia, SAU – Saudi Arabia, SIN – Singapore, SAF – South Africa, ESP – Spain, SWE – Sweden, THA – Thailand, UAE – United Arab Emirates, UK – United Kingdom, USA – United States of America, OTH – Others

Estimated using data from WITS

Table 4.19 Transition probability matrix for crushed or ground pepper export from India during 2010 to 2019 period

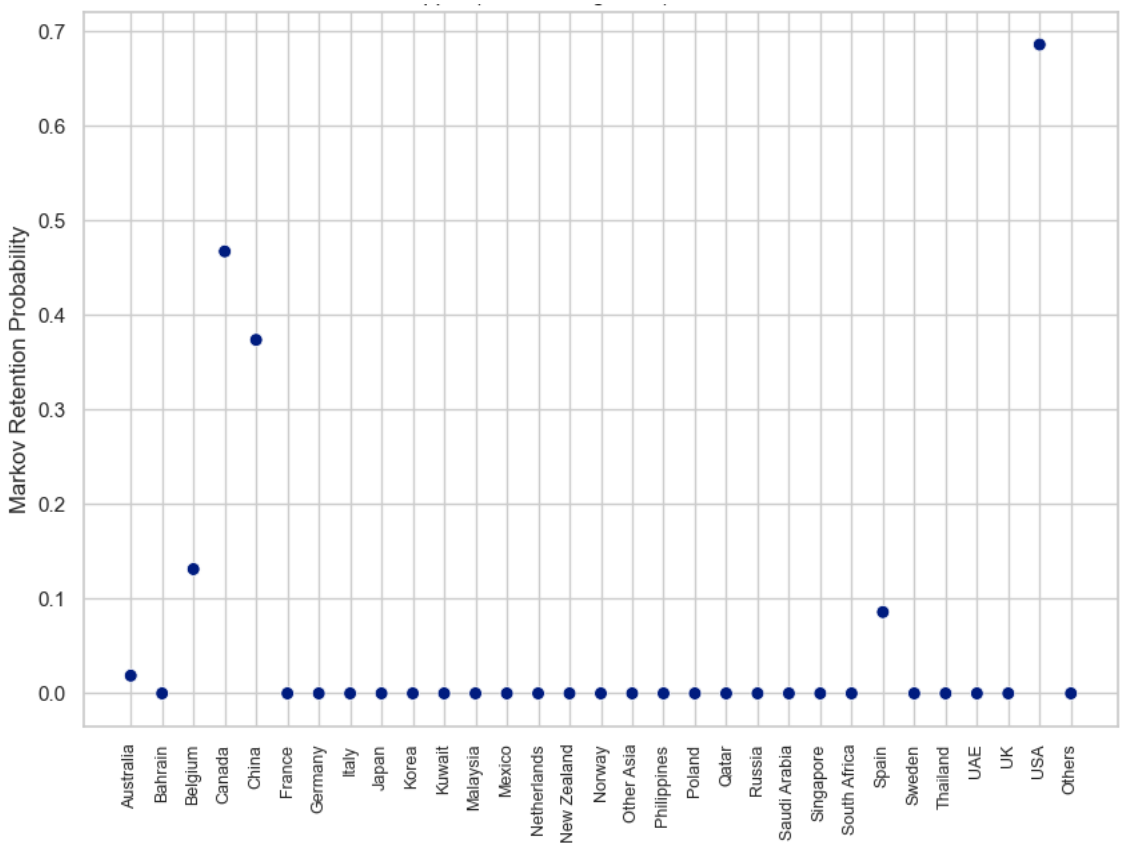
Country	AUS	BHN	BEL	CAN	CHN	FRA	DEU	ITA	JPN	KOR	KUW	MAL	MEX	NLD	NZL	NOR	OTA	PHL	POL	QTR	RUS	SAU	SIN	SAF	ESP	SWE	THA	UAE	UK	USA	OTH
AUS	0.019	0.002	0	0	0	0	0	0	0.088	0	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0.852	0
BHN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
BEL	0.265	0.022	0.131	0	0	0	0	0	0.256	0.081	0	0	0	0	0.192	0	0	0	0	0	0.018	0	0	0	0	0.036	0	0	0	0	0
CAN	0.14	0	0	0.467	0	0.094	0	0	0.031	0	0.006	0.017	0	0	0	0	0.012	0	0	0	0	0	0	0	0.233	0	0	0	0	0	0
CHN	0	0	0	0	0.374	0	0	0	0	0	0	0.09	0	0	0	0	0	0.536	0	0	0	0	0	0	0	0	0	0	0	0	0
FRA	0	0	0	0	0	0	0	0	0	0	0	0	0	0.504	0	0	0	0	0.388	0.108	0	0	0	0	0	0	0	0	0	0	0
DEU	0	0	0	0	0	0	0	0.494	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.316	0.189	0	0
ITA	0.967	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0.013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JPN	0	0	0.112	0	0	0	0	0.025	0	0	0	0	0	0	0	0	0.012	0	0	0	0	0	0	0	0	0.145	0	0	0	0.034	0.671
KOR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
KUW	0	0	0	0	0	0	0	0	0.129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.871	0	0	0	0	0	0
MAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0	0	0	0	0	0	0.993	0	0	0	0	0	0
MEX	0	0	0	0.394	0	0	0	0.12	0	0	0	0	0	0	0	0	0.179	0	0	0	0	0	0	0	0	0	0	0	0	0	0.307
NLD	0	0	0	0	0	0	0.093	0	0	0	0	0	0.014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.893	0
NZL	0	0	0	0	0	0	0	0	0	0	0.143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.857	0	0	0	0
NOR	0	0	0	0	0	0.837	0	0	0	0	0	0	0	0	0	0	0	0	0	0.024	0	0.065	0	0	0	0	0.074	0	0	0	0
OTA	0	0	0	0	0	0	0	0	0	0	0.022	0	0.248	0	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.62	0
PHL	0	0	0	0.92	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.267	0	0	0	0	0.002	0	0	0.144	0.587	0
QTR	0	0	0	0	0.064	0	0.393	0	0	0	0	0	0	0.543	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RUS	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.87	0	0	0
SAU	0	0	0	0	0	0	0	0	0	0	0	0	0	0.415	0	0	0	0	0.112	0	0	0	0	0.291	0	0	0	0	0.182	0	0
SIN	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAF	0	0	0	0	0.303	0	0	0	0	0	0	0	0	0.08	0	0	0	0.168	0	0.058	0	0.121	0.035	0	0.235	0	0	0	0	0	0
ESP	0	0	0.054	0	0	0	0.05	0.005	0.074	0	0	0	0	0	0	0	0.015	0.117	0	0	0	0	0	0	0.086	0.075	0	0	0	0.485	0.04
SWE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
THA	0	0	0	0	0	0.181	0	0	0	0	0	0	0	0	0	0	0.212	0	0	0	0	0	0	0	0	0	0	0	0	0	0.607
UAE	0.13	0	0	0	0	0.042	0	0	0	0	0.142	0.09	0	0	0	0	0.094	0	0	0.124	0	0	0.003	0.102	0	0	0	0	0.274	0	0
UK	0.018	0.002	0	0.097	0.029	0	0	0.024	0.004	0	0	0	0	0.024	0.018	0	0.016	0	0	0.013	0	0	0	0	0	0.033	0	0	0	0.722	0
USA	0.026	0.001	0	0	0	0	0.001	0	0	0	0	0	0	0	0	0.003	0.001	0	0	0	0	0.01	0.002	0.011	0	0	0	0.01	0.188	0.686	0.062
OTH	0	0	0	0	0	0	0	0	0	0.006	0.023	0	0	0	0.004	0	0	0	0	0	0.041	0	0	0	0	0.021	0	0	0	0.905	0

Note: AUS – Australia, BHA– Bahrain, BEL – Belgium, CHN – China, CAN – Canada, FRA – France, DEU – Germany, ITA – Italy, JPN – Japan, KOR – Korea, KUW – Kuwait, MAL - Malaysia, MEX –Mexico, NLD – Netherlands, NZL – New Zealand, NOR – Norway, OTA – Other Asia, PHL – Philippines, POL – Poland, QTR – Qatar, RUS – Russia, SAU – Saudi Arabia, SIN – Singapore, SAF – South Africa, ESP – Spain, SWE – Sweden, THA – Thailand, UAE – United Arab Emirates, UK – United Kingdom, USA – United States of America, OTH – Others

Estimated using data from WITS

The transitional probabilities presented in Table 4.19 and Figure 26 depict the changes in the direction of exports of crushed or ground pepper from India during the period from 2010 to 2019. The major stable markets identified were USA and Canada with retention probabilities of 68.6 per cent and 46.73 per cent, respectively. USA gained from Netherland, Australia and Spain whereas Canada gained from Philippines and UK. Compared to the previous period (2000 to 2009), India could maintain USA as the most stable market, but India lost the export markets *viz*., Sweden, Saudi Arabia, Singapore, Philippines and New Zealand

Figure 26 Retention probability chart for crushed or ground black pepper exports from India (2010 to 2019)



The other stable markets during 2010-2019 period were China and Belgium. China as an export market exhibited only lesser stability during the previous period and it gained from Singapore and UK in the current period. In the latest decade, Indian black pepper was having higher demand in China because of its distinctive flavour and spicy taste (The Economic times, 2014)

In the overall period (2000 to 2019), USA was the most stable market for crushed or ground black pepper exports from India as its probability of retaining the previous period market share was 71.1 per cent, while China was the second most stable market with 55.53 per cent probability of retention, followed by Spain (51.13 per cent), Australia (46.61 per cent), Canada (41.56 per cent), Saudi Arabia (40.99 per cent), Belgium (34.7 per cent), and Philippines (31.36 per cent). The most stable market USA, gained from Malaysia, Russia, UK, Saudi Arabia and Singapore in the overall period (Table 4.20 and Figure 27). It is visible from the transition probability matrices for crushed or ground black pepper export from India in all the three periods considered in the study that USA was the most stable market and India could retain this market.

Figure 27 Retention probability chart for crushed or ground black pepper export from India (2000 to 2019)

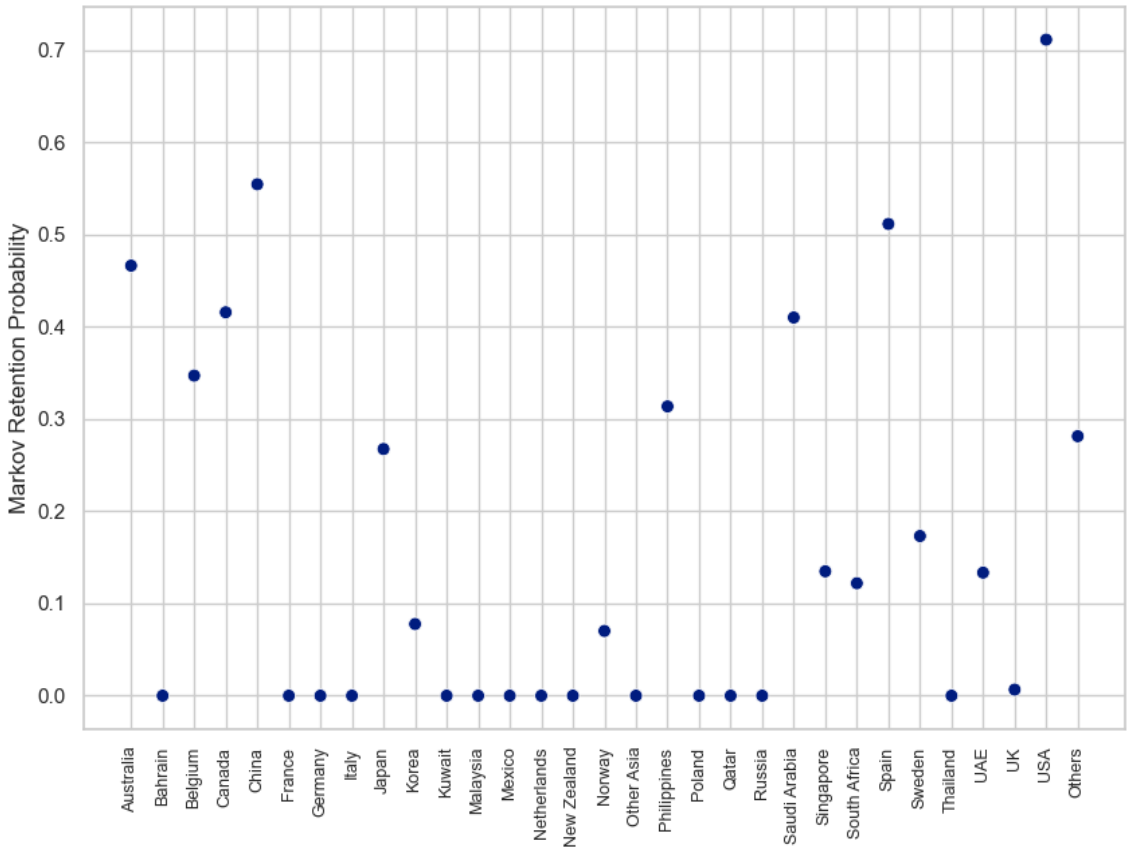


Table 4.20 Transition probability matrix for crushed or ground black pepper export from India during 2000 to 2019 period

Country	AUS	BHN	BEL	CAN	CHN	FRA	DEU	ITA	JPN	KOR	KUW	MAL	MEX	NLD	NZL	NOR	OTA	PHL	POL	QTR	RUS	SAU	SIN	SAF	ESP	SWE	THA	UAE	UK	USA	OTH
AUS	0.466	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.164	0.342
BHN	0	0	0.798	0	0	0	0	0.202	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BEL	0.16	0.031	0.347	0	0	0	0.009	0.021	0.102	0.089	0	0	0.043	0	0.063	0	0	0	0	0	0	0	0	0	0	0.135	0	0	0	0	0
CAN	0	0	0	0.416	0	0.106	0	0	0.036	0	0.002	0	0	0	0	0.007	0	0	0	0	0	0	0	0	0.003	0	0	0	0	0.431	0
CHN	0	0	0	0.205	0.554	0	0	0	0	0	0	0	0	0	0	0	0.108	0.133	0	0	0	0	0	0	0	0	0	0	0	0	0
FRA	0	0	0	0	0.013	0	0.088	0	0	0	0	0.023	0	0	0.015	0	0	0.149	0	0.073	0	0	0	0	0	0.275	0	0	0	0.364	0
DEU	0	0	0.057	0	0	0	0	0.142	0	0	0	0	0	0	0.028	0	0	0	0	0	0	0	0	0	0	0	0	0	0.774	0	0
ITA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
JPN	0	0	0	0	0	0	0	0	0.267	0	0.127	0	0	0	0	0	0.183	0	0	0	0	0.167	0	0	0	0	0	0	0	0	0.255
KOR	0	0	0.019	0	0	0	0	0	0	0.078	0	0	0	0	0.229	0	0	0	0.057	0	0	0	0	0.193	0	0	0	0.225	0	0	0.201
KUW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MAL	0	0	0	0	0	0	0	0	0.054	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.946	0
MEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.333	0	0.454	0	0	0.213
NLD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.017	0	0	0	0	0	0.983	0
NZL	0	0	0.91	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NOR	0	0	0.624	0	0	0	0	0	0	0	0	0	0	0	0.191	0.07	0	0.114	0	0	0	0	0	0	0	0	0	0	0	0	0
OTA	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0.045	0	0	0	0	0	0	0	0	0	0	0	0	0	0.875	0
PHL	0	0	0	0.686	0	0	0	0	0	0	0	0	0	0	0	0	0	0.314	0	0	0	0	0	0	0	0	0	0	0	0	0
POL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.204	0	0	0	0	0.796	0
QTR	0	0	0	0	0.386	0	0	0	0	0	0	0	0	0.614	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RUS	0	0	0	0	0	0	0	0	0.085	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.915	0
SAU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.016	0	0	0	0.019	0.002	0.047	0.41	0.01	0	0	0	0	0	0	0.495	0
SIN	0	0	0	0	0	0	0	0.113	0	0	0	0	0	0	0	0	0	0	0.079	0	0	0	0.135	0	0	0	0.112	0	0	0.561	0
SAF	0	0	0	0	0.133	0	0	0	0	0	0.038	0	0	0.157	0	0	0.037	0.092	0	0.207	0	0.109	0	0.122	0.022	0	0	0	0.083	0	0
ESP	0	0	0	0	0.002	0.016	0.011	0	0	0	0	0.057	0	0.074	0	0	0	0.137	0.043	0.007	0	0	0	0	0.511	0.066	0	0	0	0	0.075
SWE	0.485	0.025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.173	0	0	0	0.317	0
THA	0	0	0	0	0	0	0.13	0	0	0.089	0	0	0	0	0.275	0.165	0.215	0	0	0	0	0	0.125	0	0	0	0	0	0	0	0
UAE	0	0	0	0	0.15	0.149	0	0	0	0	0.037	0.007	0	0.033	0	0	0.087	0	0	0.064	0	0	0	0.148	0	0	0	0.133	0	0	0.191
UK	0	0	0	0.003	0	0.004	0	0	0	0	0	0	0	0.011	0	0	0	0	0	0	0	0	0	0.029	0	0	0	0.011	0.007	0.861	0.075
USA	0.029	0.001	0	0.028	0	0	0.012	0.01	0.003	0	0.002	0.003	0.004	0	0.002	0.003	0	0.002	0.003	0	0.001	0.005	0.001	0	0	0.004	0.011	0	0.165	0.711	0
OTH	0	0	0	0	0	0	0	0	0.021	0.002	0	0	0	0.06	0	0	0	0	0	0	0.022	0	0	0	0	0	0	0.036	0.281	0.296	0.281

Note: AUS – Australia, BHA– Bahrain, BEL – Belgium, CHN – China, CAN – Canada, FRA – France, DEU – Germany, ITA – Italy, JPN – Japan, KOR – Korea, KUW – Kuwait, MAL - Malaysia, MEX –Mexico, NLD – Netherlands, NZL – New Zealand, NOR – Norway, OTA – Other Asia, PHL – Philippines, POL – Poland, QTR – Qatar, RUS – Russia, SAU – Saudi Arabia, SIN – Singapore, SAF – South Africa, ESP – Spain, SWE – Sweden, THA – Thailand, UAE – United Arab Emirates, UK – United Kingdom, USA – United States of America, OTH – Others

Estimated using data from WITS

Table 4.21 summarizes the details of the stable markets, markets gained and market lost for Indian black pepper exports during different periods. From the results, it was found that USA was the most stable market for exports of both black pepper neither crushed nor ground and crushed or ground black pepper from India in all the periods. After 2000, more number of stable markets were identified in the export of black pepper. Sweden and Canada became major markets for Indian black pepper neither crushed nor ground exports in the post-2000 period. China was an unstable export market for the export of Indian crushed or ground black pepper during pre-2000 and it became a stable market after 2010 because of increased demand of ground black pepper in China.

Table 4.21 Dynamics in export markets for Indian black pepper

Period	Stable markets	Markets gained	Market lost
Black pepper neither crushed nor ground			
Pre-2000 (1988 to 1999)	Russia and USA		
Post-2000 (2000 to 2019)	USA, Sweden, Canada, Turkey, Switzerland and Spain	Sweden, Canada, Switzerland, Spain, Singapore and Germany	Russia, Poland, Saudi Arabia, and Japan
Overall (1988 to 2019)	Sweden, USA and Russia		
Crushed or ground black pepper			
2000 to 2009	USA		
2010 to 2019	USA, Canada and China	China, Canada and Belgium	Singapore and UK
2000 to 2019	USA, China, Spain		

4.8.3 Transition probabilities of pepper oil and pepper oleoresin

Pepper oil and oleoresin are value added products of black pepper. India became one of the major producer and exporter of pepper oil and oleoresin after 2000. The stable markets for exports of pepper oil and pepper oleoresin from India during

the period from 2005 to 2019 period were identified and are presented in Table 4.22 and 4.23, and also demonstrated in Figure 28 and 29.

The results obtained from the Markov chain analysis of the country-wise export of pepper oil from India during the period from 2005 to 2019 period is presented in Table 4.22 and Figure 28. Germany was the most stable market for pepper oil export from India as its probability of retaining the market share was 62.82 per cent, while USA was the second most stable market with 53.25 per cent probability of retention followed by Singapore (47.72 per cent), Thailand (37.64 per cent), and Netherlands (29.3 per cent).

Figure 28 Retention probability chart for pepper oil export from India (2005 to 2019)

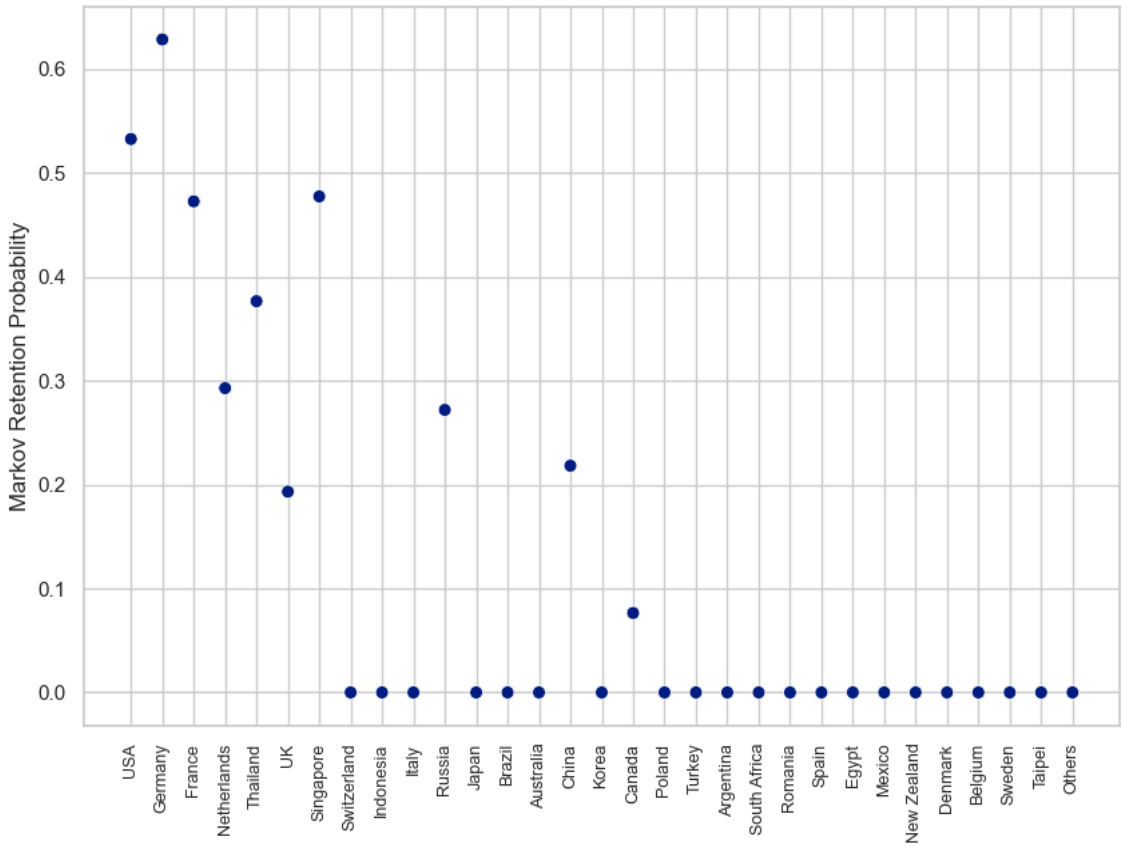


Table 4.22 Transition probability matrix for pepper oil export from India (2005 to 2019)

Country	USA	DEU	FRA	NLD	THA	UK	SIN	CHE	IND	ITA	RUS	JPN	BRA	AUS	CHN	KOR	CAN	POL	TUR	ARG	SAF	ROM	ESP	EGT	MEX	NZL	DEN	BEL	SWE	TAI	OTH
USA	0.532	0.126	0	0.004	0.009	0.11	0	0.008	0	0.036	0	0.03	0.019	0.009	0	0.006	0	0.023	0	0.011	0.004	0.004	0.057	0	0	0	0.002	0.002	0.006	0.001	0
DEU	0.224	0.628	0	0	0.005	0	0	0.041	0.027	0	0	0	0	0	0	0	0.049	0	0	0	0	0	0.019	0	0	0	0.006	0	0	0	0
FRA	0	0	0.472	0	0	0	0	0.214	0	0.04	0.129	0.032	0	0.076	0	0.024	0	0	0	0	0	0	0	0	0	0.012	0	0	0	0	0
NLD	0	0	0.063	0.293	0	0	0.131	0	0	0.012	0.004	0.011	0.142	0	0	0.041	0	0	0.065	0.047	0.058	0.049	0	0.012	0	0	0	0	0	0	0.072
THA	0	0	0.491	0	0.376	0.034	0	0	0	0	0	0.099	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UK	0	0	0	0.244	0	0.193	0	0	0.016	0	0	0	0.039	0	0.235	0	0.066	0.152	0	0.042	0.013	0	0	0	0	0	0	0	0	0	0
SIN	0	0	0	0	0.173	0	0.477	0	0	0	0	0	0	0	0	0.113	0	0	0.06	0	0	0	0	0.064	0.022	0	0	0	0	0	0.092
CHE	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IND	0.005	0.338	0	0.182	0	0	0	0.086	0	0.008	0.098	0.08	0.085	0.022	0	0	0	0	0	0	0	0.03	0	0	0	0.015	0	0.051	0	0	0
ITA	0.85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.081	0	0	0	0	0	0	0.07	0	0	0	0	0	0	0	0
RUS	0.348	0	0	0	0	0	0	0	0	0	0.272	0.022	0	0	0	0.006	0	0	0	0	0	0	0.078	0	0	0	0	0	0	0	0.273
JPN	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BRA	0.563	0	0	0.316	0	0	0	0	0	0	0	0.121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AUS	0	0	0	0	0	0.565	0	0	0	0	0	0.058	0	0	0	0	0	0	0	0	0	0	0.183	0	0.193	0	0	0	0	0	0
CHN	0	0	0.229	0.497	0	0	0	0	0	0	0	0	0	0	0.218	0	0	0	0	0	0	0	0	0	0.056	0	0	0	0	0	0
KOR	0	0	0.802	0	0.139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.059
CAN	0	0	0	0	0	0	0	0	0.251	0	0.324	0	0.281	0	0	0	0.076	0	0	0	0	0	0	0	0	0	0	0.027	0	0	0.041
POL	0	0	0.045	0	0	0.647	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.269	0	0	0.008	0.031	0	0	0	0
TUR	0.994	0	0	0	0	0	0	0	0	0.006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ARG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.073	0	0	0	0	0.194	0	0	0	0	0	0.005	0	0	0	0.727
SAF	0	0	0	0	0.91	0	0.09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROM	0	0	0	0	0	0	0.031	0	0	0.868	0	0.048	0	0	0	0.004	0	0	0	0	0	0	0	0	0	0.047	0	0	0	0	0
ESP	0	0	0.067	0	0.186	0.064	0.047	0	0	0.009	0.089	0.111	0.089	0.283	0	0	0	0	0	0	0	0	0	0	0	0	0.015	0	0	0	0.041
EGT	0	0	0	0	0	0	0.823	0	0	0	0	0	0	0	0	0	0	0	0.177	0	0	0	0	0	0	0	0	0	0	0	0
MEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NZL	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DEN	0	0	0	0	0	0	0	0	0.154	0	0	0.486	0	0	0	0	0	0	0.36	0	0	0	0	0	0	0	0	0	0	0	0
BEL	0	0.18	0	0	0	0	0	0	0.513	0	0	0	0	0	0	0.071	0	0	0	0	0	0	0	0	0	0	0	0	0	0.237	0
SWE	0	0	0	0	0	0.73	0	0.016	0	0	0	0.034	0	0	0	0	0	0	0	0	0	0.22	0	0	0	0	0	0	0	0	0
TAI	0.951	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.007	0.042	0	0
OTH	0	0.475	0	0	0	0	0	0.106	0	0.149	0	0.043	0	0.015	0	0	0.154	0	0	0	0	0	0	0	0	0	0	0.032	0	0.027	0

Note: USA – United States of America, DEU – Germany, FRA – France, NLD – Netherlands, UK – United Kingdom, SIN – Singapore, CHE – Switzerland, IND – Indonesia, ITA – Italy, RUS – Russia, JPN – Japan, BRA – Brazil, AUS – Australia, CHN – China, KOR – Korea, CAN – Canada, POL – Poland, TUR – Turkey, ARG – Argentina, SAF – South Africa, ROM – Romania, ESP – Spain, EGT – Egypt, MEX – Mexico, NZL – New Zealand, DEN – Denmark, BEL – Belgium, SWE – Sweden, TAI – Taipei Chinese, OTH – Others

Estimated using data from WITS

Table 4.23 Transition probability matrix for pepper oleoresin export from India (2005 to 2019)

Country	USA	DEU	FRA	CHN	NLD	UK	THA	PHL	CAN	RUS	BRA	MEX	POL	KOR	SAF	TUR	ESP	IND	AUS	JPN	MAL	ITA	EGT	SIN	ISR	DEN	UKR	NZL	PRU	UAE	ROM	SWE	BEL	HON	CZE	CHE	SAA	OTH
USA	0.66	0.22	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0.01	0	0.01	0	0	0	0.01	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0
DEU	0	0.37	0	0	0	0.17	0	0	0.03	0.09	0	0.01	0	0	0.06	0	0	0	0.05	0	0.02	0	0	0.02	0.02	0.02	0.01	0	0.02	0.01	0	0	0	0	0	0.01	0	0
FRA	0.76	0	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0	0
CHN	0	0	0	0.02	0	0.22	0.26	0.09	0	0	0	0	0	0	0.14	0.11	0.05	0	0	0.01	0.03	0.01	0	0.01	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0
NLD	0	0	0	0	0.03	0.23	0.06	0.13	0	0.15	0	0.15	0.04	0.02	0.02	0	0	0	0	0.05	0	0	0.04	0.03	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0.01
UK	0.81	0	0	0	0.01	0.05	0	0	0.07	0	0	0.05	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THA	0	0	0	0.21	0	0	0.23	0.46	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0
PHL	0	0	0	0.41	0.29	0	0	0	0	0	0	0	0	0.14	0	0	0	0.06	0	0.05	0	0.02	0	0	0	0	0	0.03	0	0	0	0	0	0	0	0	0	0	0
CAN	0.29	0	0	0	0	0	0	0	0.52	0	0	0	0	0	0	0	0.04	0	0	0	0.02	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RUS	0	0	0	0.02	0	0	0	0	0	0.09	0	0	0.59	0	0.02	0.18	0	0	0	0.01	0	0	0	0	0	0.03	0	0	0	0.01	0	0	0	0	0	0	0	0	0.05
BRA	0	0.2	0.01	0	0.01	0.32	0	0	0.01	0	0.05	0.04	0.01	0	0.02	0	0.04	0	0.02	0	0	0	0	0.01	0.02	0.04	0	0	0	0	0	0	0	0	0.03	0	0	0.02	0
MEX	0.02	0	0	0	0	0.07	0	0.17	0	0	0	0	0.1	0	0.02	0	0	0	0.21	0.1	0.16	0	0	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
POL	0	0	0	0	0.72	0	0.2	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05
KOR	0.96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAF	0	0	0	0	0	0	0.09	0	0	0	0.88	0	0.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TUR	0	0	0.39	0.13	0	0	0	0	0	0.06	0	0	0	0.1	0	0	0.1	0	0	0	0	0.01	0	0	0	0	0	0.05	0	0.01	0	0.02	0.01	0	0	0	0	0	0
ESP	0	0	0	0	0.05	0	0.07	0.09	0	0	0.56	0.12	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0.03	0	0.03	0	0	0	0	0
IND	0	0	0	0	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AUS	0	0	0.71	0	0	0	0	0	0.19	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0
JPN	0	0	0	0.33	0.29	0	0	0.03	0	0	0	0	0	0.15	0	0	0.11	0	0	0	0	0	0	0	0	0	0	0.04	0	0.06	0	0	0	0	0	0	0	0	0
MAL	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0.26	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0
ITA	0	0	0	0.41	0	0	0	0	0	0	0	0	0	0	0	0	0.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EGT	0	0	0	0	0	0.14	0.02	0	0	0	0	0	0.4	0	0.44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SIN	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ISR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.45	0	0	0	0.06	0	0.39	0	0	0.09	0	0	0	0	0	0
DEN	0.46	0	0.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0	0	0	0	0	0
UKR	0	0.39	0	0	0	0.07	0	0	0	0.16	0	0	0	0	0	0	0	0	0	0.13	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0.05	0	0	0
NZL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0	0.05	0	0.8	0	0	0	0	0	0	0	0	0	0
PRU	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UAE	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.21	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0
ROM	0	0	0	0.36	0	0	0.6	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SWE	0	0.27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0
BEL	0	0	0	0	0	0	0	0	0	0	0	0	0	0.13	0	0.76	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0.03	0.06	0	0	0	0
HON	0.83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CZE	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHE	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.44	0	0	0	0.29	0	0	0	0	0
OTH	0	0	0	0	0.02	0.49	0	0	0	0.26	0	0	0	0.12	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0

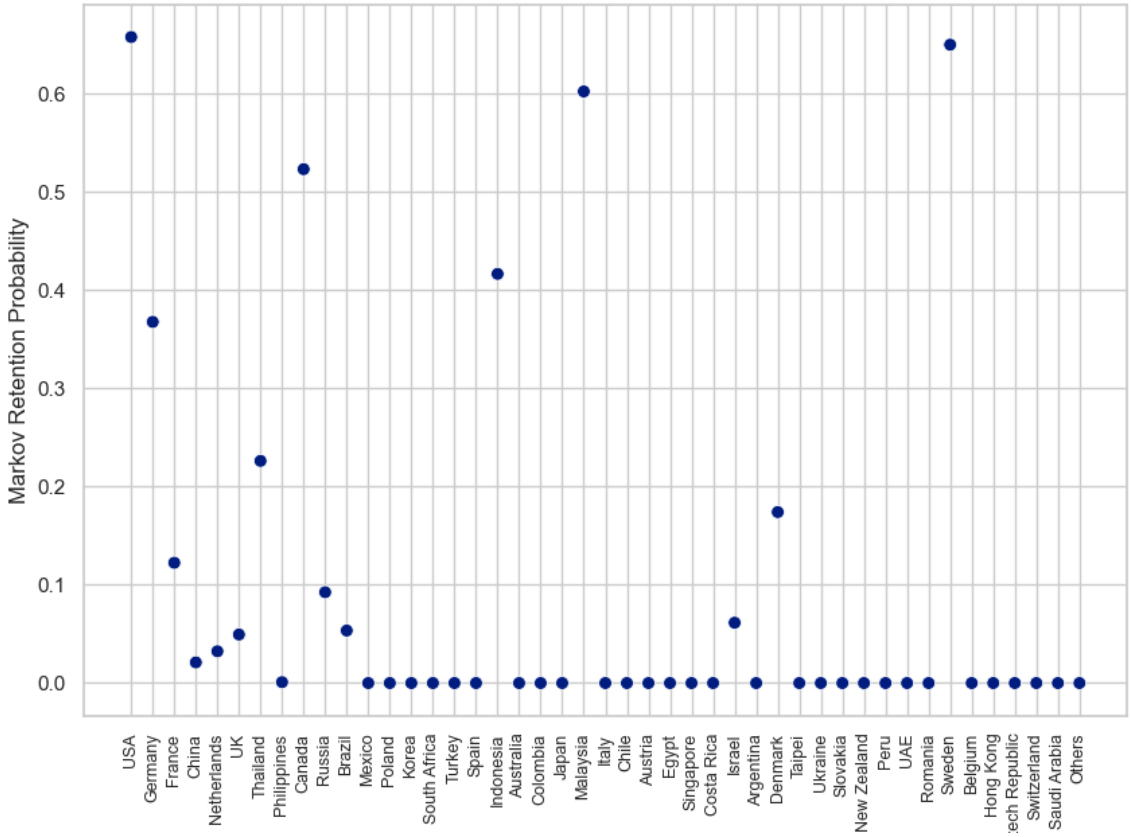
Note: USA – United States of America, DEU – Germany, FRA – France, NLD – Netherlands, UK – United Kingdom, CHN – China, CAN – Canada, BRA- Brazil, PHL - Philippines, IDN – Indonesia, MAL - Malaysia, ISR - Israel, RUS – Russia, THA – Thailand, ARG - Argentina, DEN - Denmark, SWE - Sweden, , KOR – Korea, CAN – Canada, POL – Poland, TUR – Turkey, ARG – Argentina, SAF – South Africa, ROM – Romania, ESP – Spain, EGT – Egypt, MEX – Mexico, NZL – New Zealand, BEL – Belgium, TAI – Taipei Chinese, OTH – Others

Estimated using data from WITS

The estimated results of the Markov chain analysis presented in Table 4.23 and Figure 29 show the retention probabilities of export markets of pepper oleoresin exported from India during the period from 2005 to 2019 period. USA, Sweden and Malaysia were the most stable markets for pepper oleoresin exports from India, with retention probabilities of 65.81 per cent, 65.03 per cent and 60.26 per cent respectively. The other stable markets were Canada (52.35 per cent), Indonesia (41.68 per cent), and Germany (36.79 per cent).

The results of the Markov chain analysis for various periods indicate the changing pattern in the stability of export markets for black pepper from India and the declining probabilities of retention of major countries over the period of time. USA remined as the major stable market of black pepper exports from India in all most all the periods. In the latest period, the retention probability for US has reduced as India has diversified the exports of black pepper and its products to more number of countries

Figure 29 Retention probability chart for pepper oleoresin export from India (2005 to 2019)



4.9 Estimation of import demand and export supply elasticities of Indian black pepper – Simultaneous equation model

The import demand and export supply elasticities of Indian black pepper were estimated using Two Stage Least Square (2SLS) Model. The analysis was carried out to assess the extent of influence of import prices and domestic income on import demand of black pepper, and to find out the effect of export price and production on export supply. The import demand and export supply equations were considered simultaneously to avoid biasedness in the results. To capture the effect of two periods (pre-2000 and post-2000), which differed because of the RTAs entered into agreement after 2000, a dummy variable which takes value of "zero" for the years before 2000 and "one" for the years after 2000 was introduced. The import demand and export supply elasticities of India's black pepper trade were estimated and the results are presented in Table 4.24 and Table 4.25.

Table 4.24 Import demand elasticities of Indian black pepper trade

Variable	Coefficient	Std. Error	t-ratio	p-value	
Intercept	10.440	0.869	12.01	<0.0001	*
Import price	1.493	0.362	4.12	0.0425	**
Domestic price	-0.350	0.141	-2.48	0.541	
GDP	0.850	0.105	8.10	<0.0001	*
Dummy	-1.306	0.219	-5.96	<0.0001	*
R^2	0.920		$\bar{R}^2$	0.912	

Note: *Significant at one per cent level, **Significant at five per cent level and ***Significant at 10 per cent level

The results of the estimated import demand equation showed that the Gross Domestic Product (GDP) of the country, import price and dummy variable were having significant influence on import demand of Indian black pepper. This means that import of Indian black pepper by other countries will increase with the increase in the GDP of importing countries *i.e.,* one per cent increase in GDP will increase the black pepper import from India by 0.85 per cent. And also, an increase in the import prices results into a proportionate increase in the import demand, the results showed that the increase in import price will increase the black pepper imports from India by 1.49 per

cent. The domestic price of black pepper was having a negative effect, but it was not significant. Mukundan and Indira devi (2000) reported that along with demand-supply factors, fluctuations in domestic and foreign prices also influence the black pepper exports from India. Post-2000 period was having a negative and highly significant effect in the import demand of Indian black pepper. In the post-liberalisation era, the import demand for Indian black pepper has considerably reduced, the quantity of Indian black pepper imported to other countries has decreased from 32,980 tonnes in TE 1990 to 29,240 tonnes in TE 2000 and further it showed a decline of 37.7 per cent from 2000 to 2019 (WITS, 2019). Hence, it can be inferred that the RTAs entered into agreement by India after 2000 have not increased the import demand for Indian black pepper. High R-square and adjusted R-square values for import demand function indicated the fitness of the model in providing estimates of elasticity of import demand for Indian black pepper.

Table 4.25 Export supply elasticities of Indian black pepper trade

Variable	Coefficient	Std. Error	t-ratio	p-value	
Intercept	26.006	3.499	7.43	<0.0001	*
International price	0.630	0.388	1.62	0.1160	
Lagged production	0.797	0.321	2.48	0.0194	**
Dummy	-0.345	0.114	-3.03	0.0054	*
$\mathbf{R^2}$	0. 487		$\bar{\mathbf{R}}^{\mathbf{2}}$	0.396	

Note: *Significant at one per cent level, **Significant at five per cent level and ***Significant at 10 per cent level

The lagged black pepper production was found to be significant and was having positive effect on export supply. As the black pepper production in India increases, exports supply will also increase. Gayathri and Saravanan (2014) reported that Indian black pepper export share has decreased due to decreased production, high domestic demand and low productivity. Besides uneven production pattern and low levels of productivity observed for black pepper in India, the marketing and exports of the commodity were also controlled by few traders and exporters. There was also lack in attention towards quality of the black pepper exports, which ultimately resulted in reduced exports of black pepper from India (Flowarin 2014; Vigneshwara, 1995). The impact of post-2000 was significant and was having negative effect on export supply

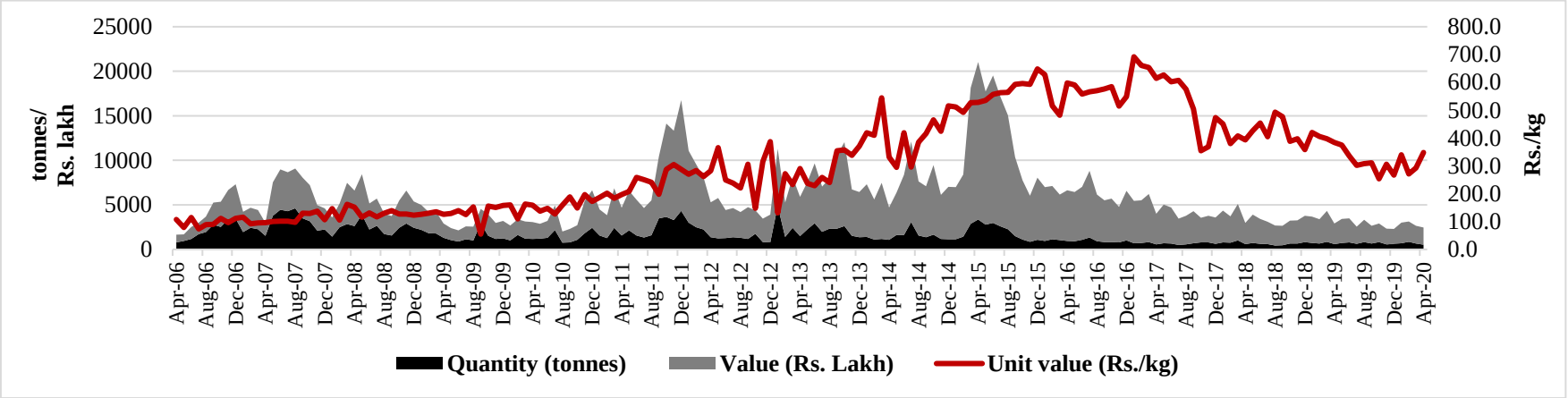
of Indian black pepper. Similar results were found by Pushia (2020) that Indian black pepper sector experienced a negative growth rate in terms of production and exports during the post-globalization period (2000 to 2015). The insignificant elasticity coefficient of international price revealed the influence of price of black pepper in Indian market and non-price factors like increase in domestic demand (Hussain *et. al.*, 2020; Sengupta and Roy, 2011) in the export supply for Indian black pepper.

4.10 Seasonal and cyclical variations in Indian black pepper trade

Even though the demand for black pepper in the domestic as well as international markets were evenly distributed throughout the year, the supply of the commodity has shown much variations. As any other agricultural commodity, black pepper is also seasonal in production. In Kerala, the harvest season extends from November to January in the plains and January to March in the hilly areas including Idukki and Wayanad.. The difference between international and domestic black pepper prices is the key factor that is impacting domestic production, exports and imports. Black pepper is a perennial crop, which requires about three to four years from planting to harvest. To understand the effect of seasonality and cyclical variations of Indian black pepper trade, monthly trade data on quantity and value of pepper neither crushed nor ground and crushed or ground pepper from January 2006 to December 2019 were decomposed into different time series components.

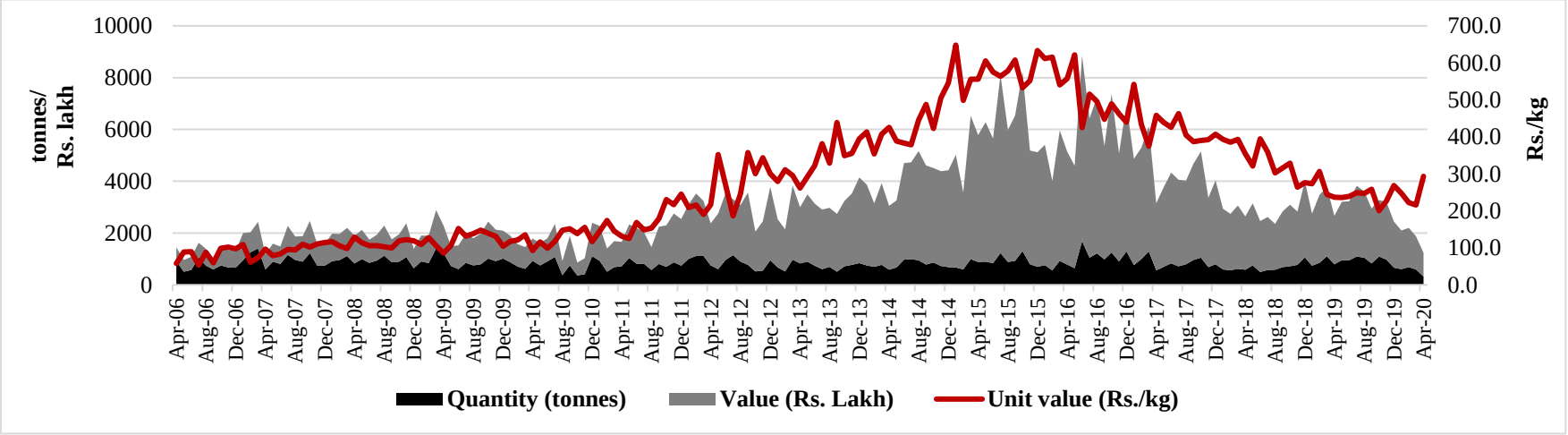
Figure 30 and Figure 31 show the monthly export of pepper neither crushed nor ground, and crushed or ground pepper from India for the period from April 2006 to April 2020. The monthly data on quantity, value and unit value of both pepper neither crushed nor ground and crushed or ground pepper have shown wide fluctuations. In the export of pepper neither crushed nor ground, the lowest unit value of Rs. 55 per kg was observed during September 2009, whereas the highest unit value of Rs. 692 per kg was reported in January 2017 (Figure 30). The export unit value of pepper neither crushed nor ground has shown an increasing trend till January 2017 and there were noticeable declines in the export quantity and value of pepper neither crushed nor ground after 2016. In the case of crushed or ground pepper, the lowest unit value of Rs. 53 per kg was reported in July 2006 and the maximum unit value of Rs. 648 per kg was observed in January 2015 (Figure 31).

Figure 30 Monthly export of pepper neither crushed nor ground from India (April 2006 to April 2020)



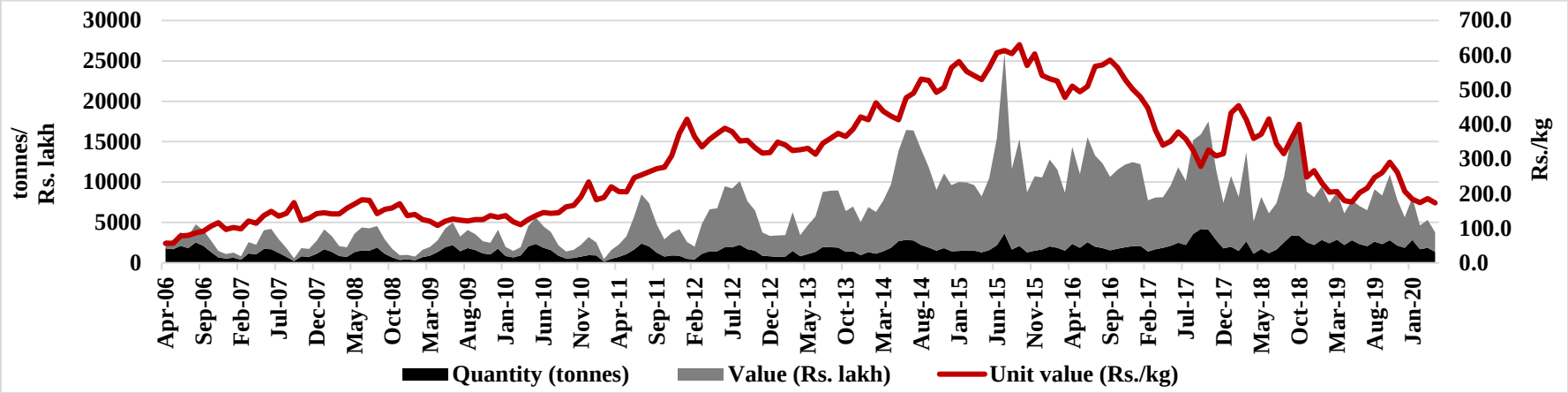
Note: Estimated using data from Export-Import data bank, GoI

Figure 31 Monthly export of crushed or ground pepper from India (April 2006 to April 2020)



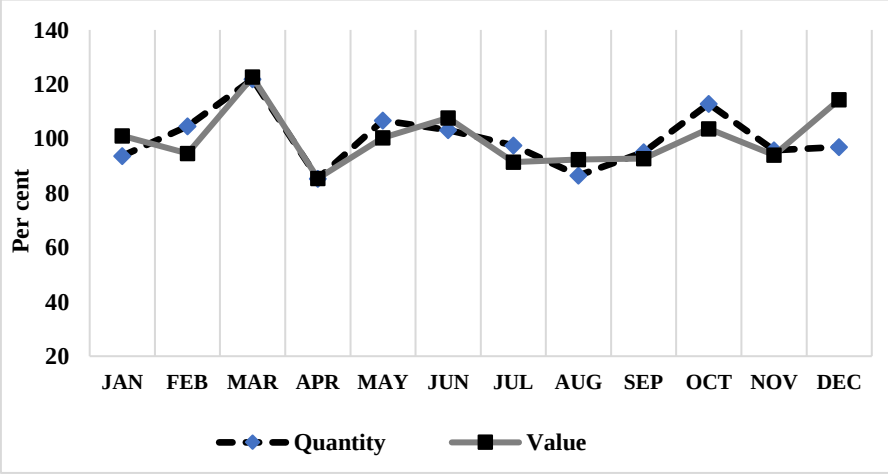
Note: Estimated using data from Export-Import data bank, GoI

Figure 32 Monthly import of pepper neither crushed nor ground into India (April 2006 to April 2020)



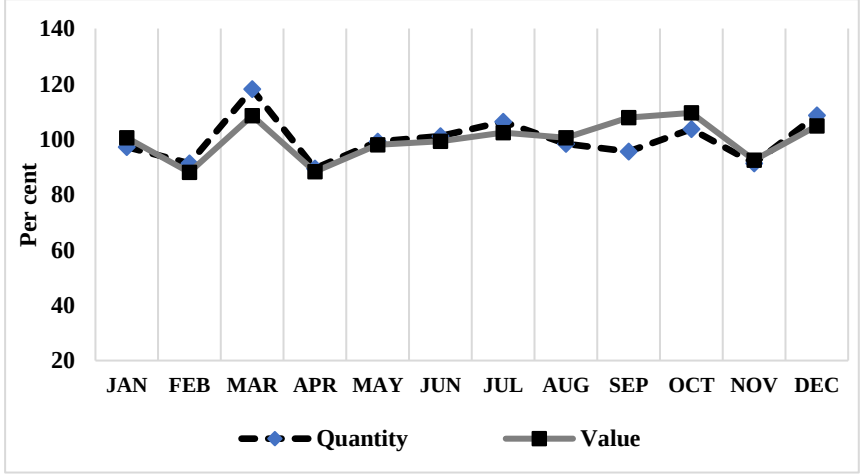
Note: Estimated using data from Export-Import data bank, GoI

Figure 33 Seasonal Indices for export of pepper neither crushed



Note: Estimated using data from Export-Import data bank, GoI

Figure 34 Seasonal Indices for export of crushed or ground pepper



Note: Estimated using data from Export-Import data bank, GoI

After January 2012, there was a discernible increase in the value of exports of crushed or ground pepper, whereas as the quantity of exports did not exhibit much variations. The increase in value of black pepper exports even when there was a decline in quantity of exports could be attributed to the increase in unit value of exports. Then from June 2016, the unit value of exports started declining , in turn adversely affecting the value of exports.

India is mainly importing black pepper as pepper neither crushed nor ground and in the recent decade imports have considerably increased. The monthly imports of pepper neither crushed nor ground is presented in Figure 32. After January 2010, a significant increase in the value of imports is visible and it reached the maximum value in August 2015, which could be attributed to the highest unit value of Rs. 630 per kg in the same period.

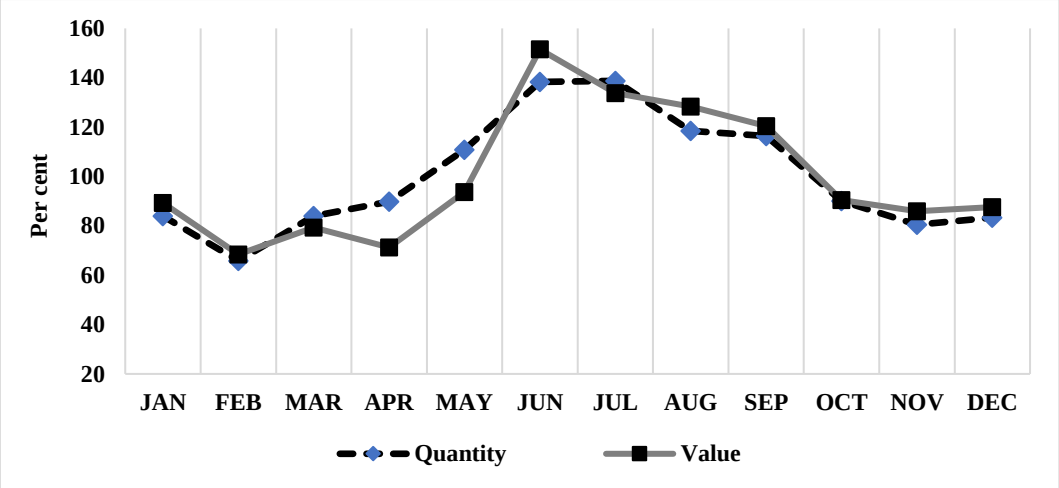
4.10.1 Seasonal Variations in export and import of black pepper

The presence of seasonal pattern is an important aspect in the price as well as trade of an agricultural commodity. It is important to understand the seasonality in supply and demand of a commodity because it will cause regular price variations in a typical crop year. The seasonality is the phenomenon that causes quantity and value of a commodity to behave in a relatively predictable manner, year in and year out. The dominant (but not the only) factor driving seasonality is the on-off nature of crop harvest.

The seasonal indices for monthly export and import of black pepper were estimated and wide variations were observed in the values of indices, which confirmed the fact that exports and imports were exhibiting considerable seasonal variations. Figure 33 and Figure 34 show the seasonal indices for quantity and value of monthly export of pepper neither crushed nor ground and crushed or ground pepper. Both the indices have shown similar pattern and the highest seasonal indices were estimated for the month of March and December, and the lowest values for the indices were found for the months of April, July and August. The production and harvest of black pepper normally starts during November and ends in March. The export of black pepper coincides with the harvest period because to the end of February and during March, the supply of black pepper will be higher in the market. Another important factor that

impacts domestic production, exports and imports is the variation between international and domestic black pepper prices. The plots of the seasonal indices for monthly imports of pepper neither crushed nor ground is presented in Figure 35. The highest seasonal indices were estimated for the months of June, July and August and the lowest values were found in November, December and January which coincided with the harvest season. Hence, the imports of black pepper to India were found to be higher during the off-season.

Figure 35 Seasonal indices for import of pepper neither crushed nor ground to India



Note: Estimated using data from Export-Import data bank, GoI

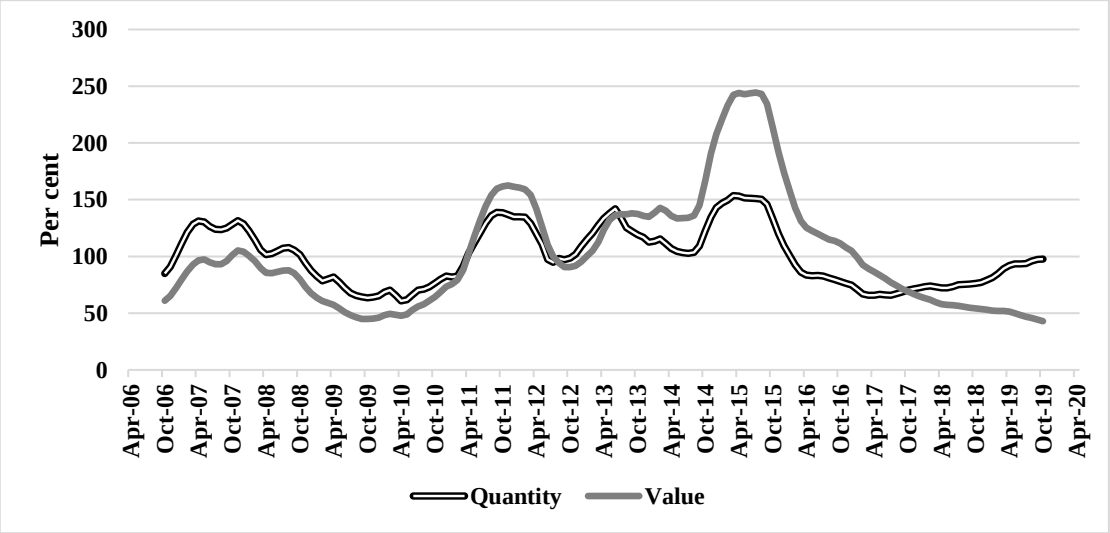
4.10.2 Variations in export and import of black pepper

The cyclical variations in the trade of a commodity represents the deviations in the trade quantity or value from the average trend due to business cycles of booms and recessions that appear in an economy. Cyclical movements are of longer duration, usually extending to a few years and are of different periodicities. The cyclical pattern of black pepper exports and imports could be observed from Figures 36 to 38. The cyclical pattern of quantity and value of black pepper exports moved together and have shown similar cycles, which are clearly demonstrated in Figures 36 and 37.

The exports of pepper neither crushed nor ground exhibited three visible cycles, the first was a six-year cycle was from 2006 to 2011 and the second cycle was from 2012, which was a smaller cycle of length of three years. The third cycle started from 2015 and reached the peak within a short period and then touched the lowest value in 2017. After that the rising phase of the cycle was in its beginning for quantity

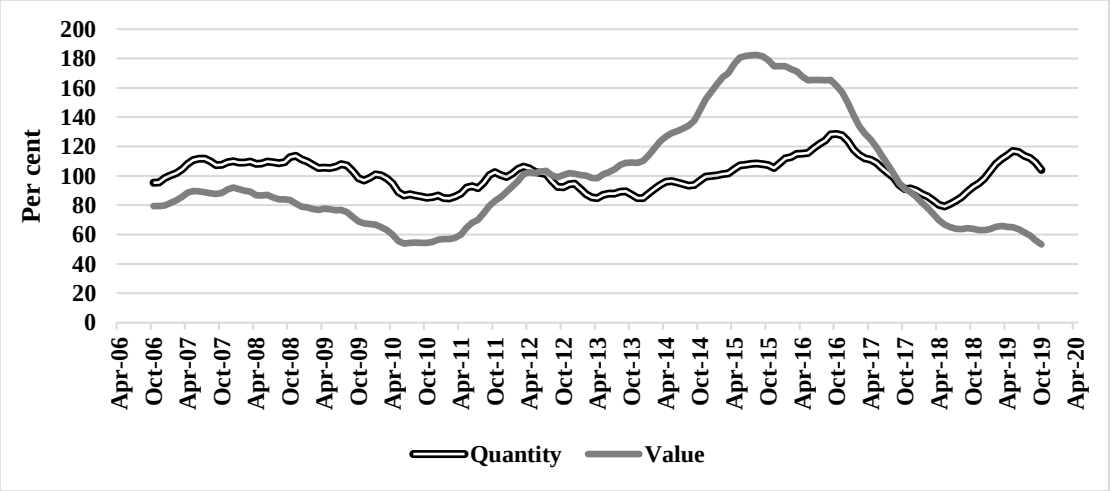
but the value of exports was found to be declining. In the case of exports of crushed or ground black pepper from India, a single long cycle was observed from June 2010 to April 2018 for quantity, while it was found to be still declining for export value.

Figure 36 Cyclical variations in export of black pepper neither crushed nor ground from India



Note: Estimated using data from Export-Import data bank, GoI

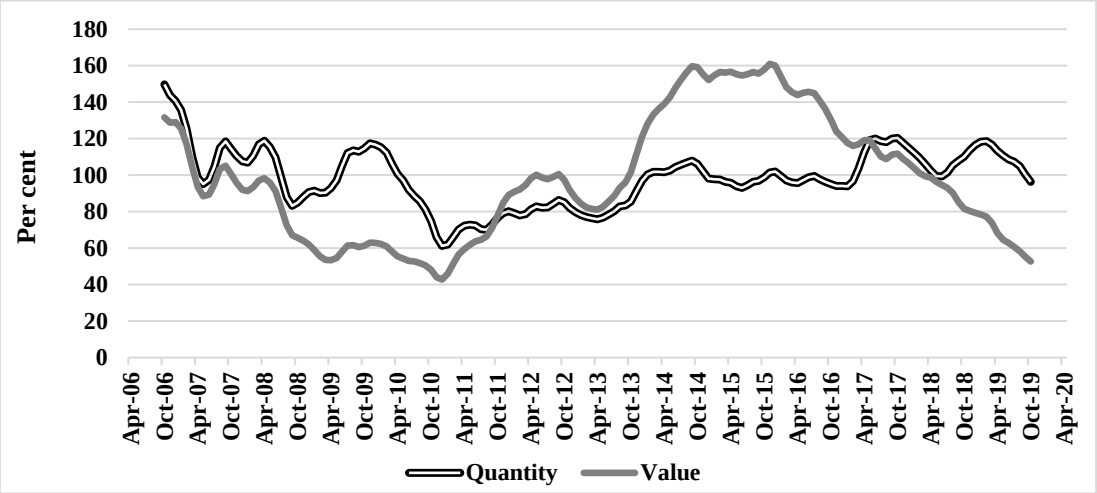
Figure 37 Cyclical variations in export of crushed or ground pepper from India



Note: Estimated using data from Export-Import data bank, GoI

Figure 38 shows the cyclical variations in import of pepper neither crushed nor ground to India and it was difficult to identify cycles from the figure because it showed more fluctuations within a year, and also quantity and value of imports were also not following the similar patterns.

Figure 38 Cyclical variations in import of pepper neither crushed nor ground to India



Note: Estimated using data from Export-Import data bank, GoI

4.2 DYNAMICS IN TRADE POLICIES AND TARIFF STRUCTURE OF BLACK PEPPER

Trade policy in India has advanced through different phases from a closed economy to a liberalised one, with lot of long-term and short-term measures combating transitional crisis. The period of fifties witnessed quantitative restrictions on imports and exports of large number of commodities. The average import-weighed tariffs exceeded 80 per cent more than 90 per cent of tradable goods were protected by quantitative restrictions on imports, and foreign investment was subject to strict limitations (Chadha *et al.*, 2003). In the sixties, export subsidisation was introduced for export promotion continuing the quantitative restrictions on imports. Since late eighties, the country witnessed both import liberalisation and export promotion measures with greater intensity. In 1991, the country embarked on a series of major trade reforms, progressively cutting tariff-and non-tariff barriers, phasing out quantitative restrictions, and easing limitations on the entry of foreign investment.

4.2.1 India's trade policy scenario in black pepper

The major changes in the trade policy of black pepper after the liberalisation of trade in India are presented in Table 4.26. The policy changes introduced in 1991 was mainly focused on the industrial sector. The uniqueness and multifunctionality of the agricultural sector kept the policy makers away from liberalising the agricultural sector. Specifically in agriculture, notable liberalisation attempts were made from mid-

nineties. The policies were more targeted towards the agricultural sector only since the export-import policy of 1999. The impact of trade liberalisation is not uniform across commodities, regions and different sections of population and has been found to vary from crop to crop, region to region and over producers and consumers (Chand, 1999).

The removal of Quantitative Restrictions in agricultural trade after 2001 was the beginning of a new era in the agricultural trade in general and spices trade in particular. The imports of spices to India were banned earlier as part of the general ban on the import of consumer goods (Golder, 2005). This restriction was removed on almost all spices including black pepper in 2001. During this period, India had bound 81 per cent of the agricultural tariff lines at three levels; 100 per cent for primary products, I50 per cent for processed products and 300 per cent for edible oils (UNCTAD, 2012; Deepika, 2004). The bound rate of duty on pepper neither crushed nor ground was 100 per cent, while it was 150 per cent for crushed or ground pepper. For most of the agricultural commodities, the existing tariff rates have been reported to be lower than the bound rates (EXIM Bank, 2020). The difference between the bound rate and MFN rate for black pepper in India was found to be 30 percent and above.

India and Sri Lanka entered into a free trade agreement in 2000 and agreed for duty free concessions for a wide range of products traded between the two countries. This Indo-Sri Lanka Free Trade Agreement (ISLFTA) had influenced the black pepper trade and production in India. In this agreement, black pepper was categorised by Sri Lanka in the negative list, giving no concession to imports from India whereas, India allowed 50 per cent tariff concession to imports of black pepper from Sri Lanka. India had agreed for tariff reduction within a period of three years from 2000 and since 2003, imports of black pepper from Srilanka became duty free. This resulted in increased pepper imports from Sri Lanka and subsequently, the imports at zero duty were capped at 2,500 tonnes per year in 2007. India and Sri Lanka are the major producers of black pepper among the countries in the South Asian Association of Regional Cooperation (SAARC) and the two countries had agreed for tariff reductions under South Asian Free Trade Agreement (SAFTA), which came into force in 2006. The products included under sensitive list were not to have any tariff reductions and India included

black pepper under sensitive list. For exporting black pepper to India all the other SAARC countries had to pay a tariff duty of 8 per cent.

India enforced the Advance Authorisation scheme in 2006, which is a duty-free import authorisation scheme issued to allow duty free import of inputs, which are physically incorporated in the export product (DGFT, 2020). Out of the total import of black pepper to India, about 70 per cent is being imported under the advance authorisation scheme without payment of duty for processing, value addition and re-export. The duty-free imports of black pepper are permitted only for activities like crushing, grinding and manufacture of oleoresins. The authorisation is not permitted and given for cleaning, grading and re-packing of black pepper. The minimum value addition required to be achieved under this scheme is 15 per cent.

The ASEAN-India FTA, which is in operation since January 2010 has been considered as a landmark agreement for India and an important milestone in the international trade of Indian black pepper. Black pepper was categorised in special product group and hence the MFN rates for black pepper were to be reduced in a phased manner and the preferential tariff, which was 68 per cent in 2010 was to be reduced to 50 per cent by the end of 2019. One of the major problems in Indian black pepper trade was the import of low-quality pepper into India from Vietnam through Sri Lanka. Black pepper imports from Vientnam were routed through Sri Lanka, by utilizing the provisions of India Sri Lanka Free Trade Agreement (ISLFTA) and Agreement on South Asian Free Trade Area (SAFTA). The increased imports of black pepper has caused considerable fall in prices in the domestic market. An important decision was taken by the government to reduce the import of black pepper and to stabilize the domestic price of black pepper by fixing a Minimum Import Price(MIP) of Rs.500 on CIF basis per kg for black pepper (GoI, 2018). The government also started monitoring the Certificates of Origin issued for black pepper exports under ISFLTA and SAFTA. Another illegal way of entry of black pepper into the country was through the international borders of Nepal, Bhutan, Bangladesh and Myanmar (GoI, 2019). Import duty of black pepper was fixed to protect the interest of the Indian pepper growers. But this created problems among the exporters of black pepper, who were importing black pepper for value-addition and further re-exports from India (GoI,

2020). The levy of MIP of Rs 500 per kg on black pepper made a loss of Rs 75 crore to spice exporters in a three months' period after implementation of the MIP (Krishnakumar, 2018). Following the representation by the All-India Exporters Forum (AISEF), the Central Government later excluded the Export Oriented Units (EOUs) and Special Economic Zone (SEZs) from the MIP (GoI, 2018). These modifications were made on the import policy of black pepper under Advance Authorisation Scheme in which the imports by 100 per cent EOUs and units in the SEZ were made free and were exempted from the condition of MIP in February 2018.

The imports of black pepper under Advance Authorisation scheme were made free and exempted from the requirement of MIP when the imports were for the extraction of oleoresin and for re-exports by the manufacturer exporters only, subject to the following conditions,

a) Light black pepper berries were to have a minimum piperine content of six per cent for import into India for oleoresin extraction.

b) The sample were to be drawn by the customs and tested at Spices Boards Quality Evaluation Laboratories for piperine content as per the ISO 5564 Spectrophotometric method.

c) The yield assessment for oleoresin was to be done as per the ISO 1108 method at the quality evaluation laboratory of Spices Board.

d) The manufacturer exporters, who import black pepper for oleoresin purpose were to submit the details of import of pepper *viz*., quantity of black pepper imported, quantity of oleoresin produced, quantity of oleoresin re-exported, balance stock available as well as the details of usage/disposal of spent material on a monthly basis to the Spices Board.

Some of the recent trade policy changes have affected the direction of pepper exports from India. The restructuring of foreign trade policy by scrapping incentives for value-added black pepper exports to developed countries and retaining it for exports to emerging markets have placed the Indian exporters into a disadvantageous situation. This has resulted in increased exports to emerging markets like Vietnam,

which is the largest producer of black pepper, at the expense of consignments to major buyers like

Table 4.26 Dynamics in trade policies of Indian black pepper since liberalisation

Year	Highlights
1991	Liberalisation policies were initiated in India Agricultural sector was not liberalised during this phase
1995	WTO regime started, but agricultural sector largely remained outside the purview of trade liberalization
2001	Removal of Quantitative Restrictions in April 2001 and a new regime in the agricultural trade in general and spices trade in particular was commenced Bound tariff for pepper neither crushed nor ground was fixed as100 per cent and that of crushed or ground pepper was bounded at 150 per cent. The applied tariff for pepper neither crushed nor ground and crushed or ground pepper was 70 per cent
2001 - 2002	India allowed 50 per cent tariff concession for imports of black pepper from Sri Lanka.
2003	Black pepper imports from Sri Lanka became duty free
May 2006	Advance Authorisation Scheme was started
2006	The import duty for black pepper from SAARC countries was made 8 per cent
2007	Imports from Sri Lanka at zero duty was capped at 2,500 tonnes per year
2010 to 2019	Implementation period of ASEAN-India FTA - Black pepper was categorised into special product group. The MFN rates for black pepper was to be reduced in a phased manner and the preferential tariff in 2010 was 68 per cent which was to be reduced to 50 by the end of 2019
December 2017	Import of black pepper was subjected to the Minimum Import Price (MIP) of Rs 500 on CIF basis per kg
February 2018	Modifications were made in the import policy of light black pepper under Advance Authorisation Scheme
March 2018	Import of black pepper over and above the CIF of Rs. 500 per kilogram was made free and import below CIF Rs. 500 was prohibited.
July 2018	Import of black pepper under Advance Authorisation Scheme, imports by 100% Export Oriented Units (EOUs) and units in the SEZ were made 'Free' and exempted from the MIP condition.
September 2018	Import policy of black pepper was revised from prohibited to free and MIP was not applicable on long pepper

the US and European countries. Under the new Merchandise Export from India Scheme (MEIS), the five per cent export incentive earlier provided for value-added pepper had been withdrawn and was replaced with three per cent incentive for raw pepper and two per cent benefit for value-added pepper exports to emerging markets (The Economic Times, April 2015).

4.2.2 Tariff structure of Indian black pepper

A tariff is the tax that is to be paid at the border or customs when a commodity is imported to a country. It adds to the cost of the imported goods and is one of several trade policies that a country can enact (EXIM Bank, 2019). Tariffs are paid to the customs authority of the country imposing the tariff. Most of the countries apply tariffs primarily to protect domestic industries.

Tariffs are usually collected by customs authorities and can be either *ad valorem* or specific. An *ad valorem* tariff is expressed as a percentage of the value of the imported (exported) good (usually as a percentage of the Cost Insurance and Freight import value), while a specific tariff is stated as a fixed currency amount per unit of the good. The *Ad valorem* tariffs are much more widely used than specific tariffs as they are easier to aggregate and to compare and are thus more transparent, which is important in particular when countries negotiate tariff commitments (WTO, 2015).

Two further distinctions that relate more specifically to the GATT/WTO need to be taken into account when establishing a country's tariff profile. The first distinction is between Most-Favoured Nation (MFN) tariff rates and preferential tariff rates. MFN tariffs are the ones that WTO members commit to accord to imports from all other WTO members with which they have not signed a preferential agreement. Preferential tariffs are the ones accorded to imports from preferential partners in free trade agreements (FTAs), customs unions or other preferential trade agreements and are more likely than others to be at zero, which means this will be the lowest among different types of tariffs. The second distinction is between bound and applied tariffs. When governments negotiate tariff reductions in the GATT/WTO, their commitments take the form of MFN tariff bindings. Bound MFN tariff levels, which are listed in a country's tariff schedule, indicate the upper limit at which the government is

committed to set its applied MFN tariff. For a given tariff line, the bound tariff must thus be higher than or equal to the applied MFN tariff, which should be higher than or equal to the preferential tariff, if any. For developed countries, bound tariffs are typically identical or very close to applied tariffs. For developing countries, bound rates are mostly above the applied tariffs.

The tariff profile of Indian black pepper was studied by comparing different tariffs imposed on black pepper and dynamics in the tariff structure was studied using averages and dispersion of tariffs

4.2.2.1 Bound vs applied tariffs

The bound and applied tariffs of black pepper in major black pepper producing countries are shown in Table 4.27. In India, the bound rates of duty on pepper neither crushed nor ground is 100 per cent and 150 per cent for crushed or ground pepper, whereas the applied tariff is 65.6 per cent and 70 per cent, respectively. The bound rate and applied rates of black pepper in India were higher when compared to other black pepper producing countries. India and Indonesia were having wide difference in the bound and applied tariff, with a difference of 30 to 35 per cent in both pepper neither crushed nor ground and crushed or ground pepper. The reason for the differences between the bound and applied tariff rates is the existence of preferential agreement, in which India applies a lower tariff on imports of black pepper from partners in a free trade agreement (UNCTAD, 2020). The applied and bound rates of black pepper in Vietnam were the same (20 per cent).

Table 4.27 Bound tariff and applied tariff of black pepper in major black pepper producing countries

Countries	Bound tariff		Applied tariff		
	Neither crushed nor ground	Crushed or ground	Year *	Neither crushed nor ground	Crushed or ground
Brazil	35	35	2020	10	10
India	100	150	2020	65.6	70
Indonesia	40	40	2018	5	5
Malaysia	5	5	2020	0	0
Sri Lanka	50	50	2017	30	30
Viet Nam	20	20	2020	20	20

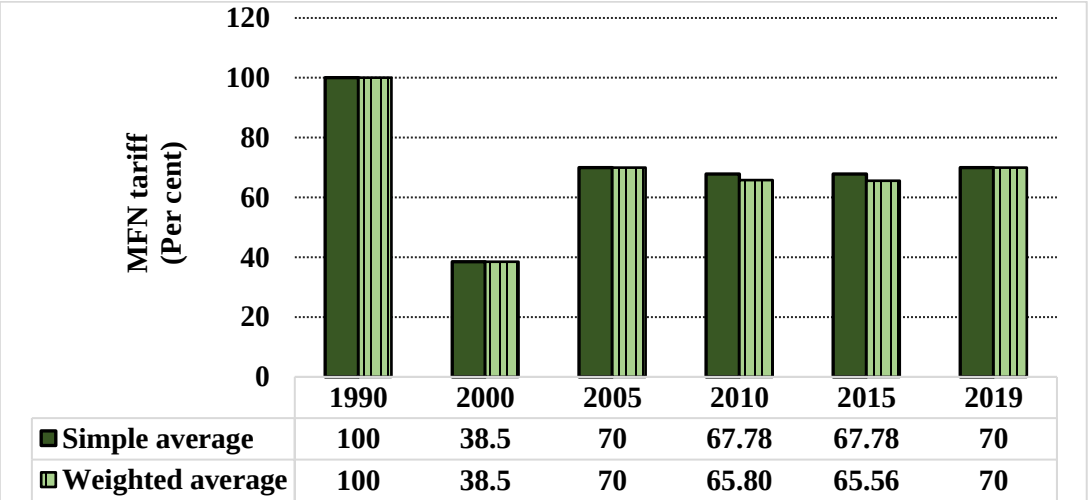
Note: *Reference year of tariff prevailing in individual countries
Source: WTO Tariff download facility (http://tariffdata.wto.org/ReportersAndProducts.aspx)

4.2.2.2 Analysis of black pepper tariffs using averages

The tariff schedules are typically defined at the HS six-digit level of disaggregation or higher levels (up to HS 12). Tariffs can be aggregated in different ways: by simple averaging or by using some weighting scheme. The simple average tariff of a commodity is the average of all tariff lines coming under that commodity group. The problem with this measure is that a very high tariff on a tariff line that weighs little in imports, pushes the average up to the same extent as a high tariff on a major import. As a result, the average tariff tends to overstate protection. The weighted average of tariff is an alternative that corrects the bias of giving same weight to all the tariff lines (WTO, 2017). Here, black pepper is having two sub-headings (at HS six-digit) *i.e.*, pepper neither crushed nor ground and crushed or ground pepper with nine tariff lines under pepper neither crushed nor ground and one tariff line under crushed or ground pepper. The MFN, preferential and effectively applied tariffs of black pepper neither crushed nor ground and crushed or ground black pepper were aggregated using simple average and weighted average methods. The results are presented in Figure 39, 40 and 41.

Figure 39 illustrates the simple and weighted averages of MFN tariff of black pepper for different periods. The MFN tariff of black pepper was reduced below 40 per cent during 2000, as this period coincided with the commencement of the liberalisation of agricultural trade. This resulted in increased imports of black pepper to India. Subsequently, India increased the MFN tariff of black pepper to 70 per cent after 2005. The simple and weighed averages of MFN tariff was similar for all the periods, except for 2010 and 2015. The average MFN tariff rate for both black pepper neither crushed nor ground and crushed or ground black pepper were 100, 38.5, 70, and 70 per cent for 1990, 2000, 2005 and 2019, respectively. There was a reduction in weighted average of MFN tariff in 2010 and 2015 because there were differences in MFN tariffs among tariff lines of black pepper. The average MFN rate was 65.56 per cent for black pepper neither crushed nor ground and 70 per cent for crushed or ground black pepper in 2010 and 2015, this difference resulted in the reduction of weighted average compared to simple average in both the periods. In fact, the simple average tariff overstated the MFN tariff of black pepper because of the influence of highest value rather than the actual effects in 2010 and 2015.

Figure 39 Liberalisation of Most Favoured Nation tariffs for black pepper in India

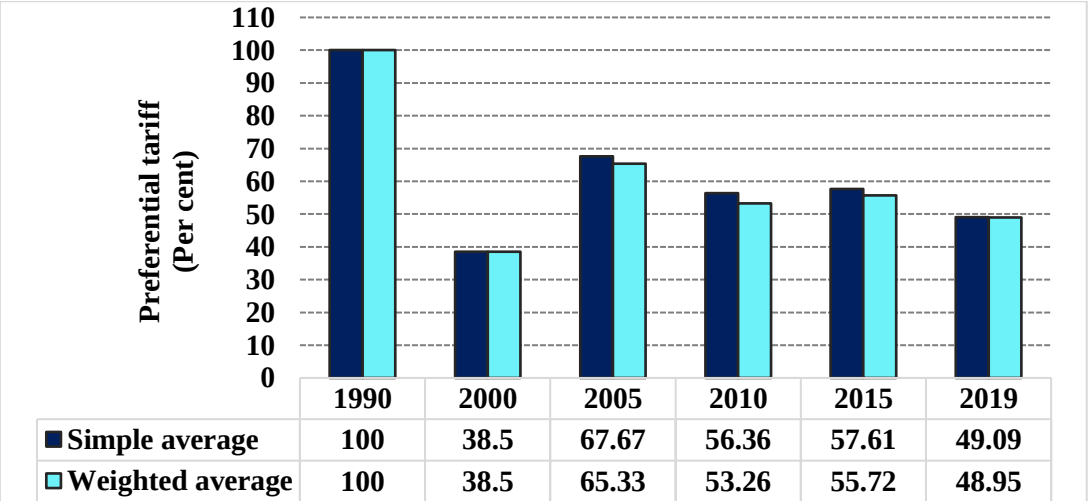


	1990	2000	2005	2010	2015	2019
Simple average	100	38.5	70	67.78	67.78	70
Weighted average	100	38.5	70	65.80	65.56	70

Note: Estimated using data from WITS

The decline in tariffs of black pepper that has occurred since 2010 is largely the result of preferential liberalization. Figure 40 shows the preferential tariff of black pepper in India and it could be observed that the tariff has decreased from 56 per cent (simple average) and 53 per cent (weighted average) in 2010 to 49 per cent (both simple and weighted average) in 2019.

Figure 40 Liberalisation of preferential tariffs of black pepper in India



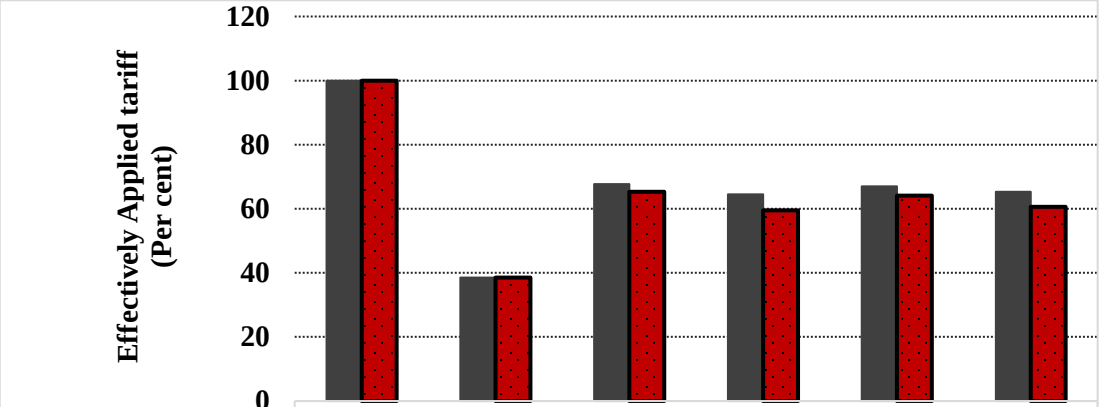
	1990	2000	2005	2010	2015	2019
Simple average	100	38.5	67.67	56.36	57.61	49.09
Weighted average	100	38.5	65.33	53.26	55.72	48.95

Note: Estimated using data from WITS

Tariffs are more uniform and less distortionary when simple average and weighted average tariffs are identical. When the weighted average tariff is below simple average tariff, it shows that tariffs are non-uniform and tend to be more distortionary and it also means that high tariffs are applied on goods. Applied tariffs

for imports of black pepper to India are shown in Figure 41. The applied tariffs are obtained by weighting the MFN and preferential tariffs by the relative importance of MFN and preferential imports better represent the actual degree of protection enjoyed by domestic farmers (UNCTAD, 2020). Applied tariff for black pepper was below 40 per cent in 2000 and in later periods, applied tariff was above 60 per cent. After 2005, weighted average tariff was below the simple average tariff which indicated that tariffs of black pepper were non-uniform and more distortionary.

Figure 41 Liberalisation of effectively applied tariffs of black pepper in India



	1990	2000	2005	2010	2015	2019
Simple average	100	38.5	67.7	64.5	67.0	65.3
Weighted average	100	38.5	65.33	59.52	64.08	60.55

Note: Estimated using data from WITS

4.2.2.3 Dispersion of tariffs

The tariff averages provide only a partial picture of a given tariff structure. The dispersion of tariffs around the mean also matters from an economic point of view: in general, the higher the dispersion, the more will be the distortion (UNCTAD, 2017). The dispersion of tariffs can be captured using standard deviation and Coefficient of Variation of tariffs. The standard deviation is a measure of the amount of variation of a set of values. A low standard deviation indicates that the values tend to be close to the mean of the set, while a high standard deviation indicates that the values are spread out over a wider range. The coefficient of variation is a measure of relative variability and is defined as the standard deviation divided by the average tariff.

The dispersions of MFN tariff, preferential tariff and effectively applied tariff imposed on black pepper imports by India are presented in Table 4.28. MFN tariffs of black pepper lines didn't show any deviation in 2005 and 2019, but a slight variation

was observed in 2015. The deviation in the preferential tariff of black pepper has decreased from 2005 to 2019, whereas for applied tariff the deviation has increased. This shows that the applied tariff of black pepper was much distortionary when compared to other tariffs. The highest deviation between black pepper neither crushed nor ground and crushed or ground black pepper among the different periods was found during 2010. This deviation could be attributed to the implementation of ASEAN-India FTA, in which India agreed for phased reduction of tariffs for black pepper neither crushed nor ground, and crushed or ground black pepper was put under protection list.

Table 4.28 Dispersion of tariffs imposed by India on black pepper

Year	HS Code	Description	#lines	MFN	PRF	AHS
2005	90411	Neither crushed nor ground	9	70	65.33	65.33
	90412	Crushed or ground	1	70	70	70
		Average		70	67.67	67.67
		Standard deviation		0	2.335	2.335
		Coefficient of Variation		0.00	3.45	3.45
		Minimum		70	70	70
		Maximum		70	65.33	65.33
2010	90411	Neither crushed nor ground	9	65.56	56.36	58.91
	90412	Crushed or ground	1	70	70	70
		Average		67.78	63.18	64.455
		Standard deviation		2.22	6.82	5.545
		Coefficient of Variation		3.28	10.79	8.60
		Minimum		70	70	70
		Maximum		65.56	56.36	58.91
2015	90411	Neither crushed nor ground	9	65.56	55.72	64.08
	90412	Crushed or ground	1	70	59.5	70
		Average		67.78	57.61	67.04
		Standard deviation		2.22	1.89	2.96
		Coefficient of Variation		3.28	3.28	4.42
		Minimum		70	59.5	70
		Maximum		65.56	55.72	64.08
2019	90411	Neither crushed nor ground	9	70	48.95	60.5
	90412	Crushed or ground	1	70	49.23	70
		Average		70	49.09	65.25
		Standard deviation		0	0.14	4.75
		Coefficient of Variation		0.00	0.29	7.28
		Minimum		70	49.23	70
		Maximum		70	48.95	60.5

Note: MFN – Most Favoured Nation Tariff, PRF – Preferential Tariff, and
AHF – Effectively Applied Tariff

4.2.2.3 Tariff rates imposed on black pepper by major importers

USA, Germany, Canada, Japan, Italy and UAE are the major export markets for Indian black pepper. Table 4.29 shows the tariff rates imposed by major importers of Indian black pepper. Tariffs do not seem to be a major barrier for exports of black pepper from India. The tariff rate imposed by different countries ranged from zero to five per cent. USA, European Union (Germany, Netherlands, France and Italy) and Canada imposed zero duty towards the import of pepper neither crushed nor ground from India. While comparing with other major importers, UAE was imposing the highest duty of five per cent.

Table 4.29 Tariff rates imposed on black pepper by major importers

Importers	Neither crushed nor ground		Crushed or ground	
	Average of AV Duties	No. of Non-AV Duty	Average of AV Duties	No. of Non-AV Duty
USA	0.0	0	0.0	0
European Union	0.0	0	4.0	0
Canada	0.0	0	1.5	0
Japan	1.5	0	1.5	0
UAE	5.0	0	5.0	0

Note: European Union includes the markets like Germany, Netherlands, France and Italy
AV – Ad valorem
Source: WTO Tariff download facility (http://tariffdata.wto.org/ReportersAndProducts.aspx)

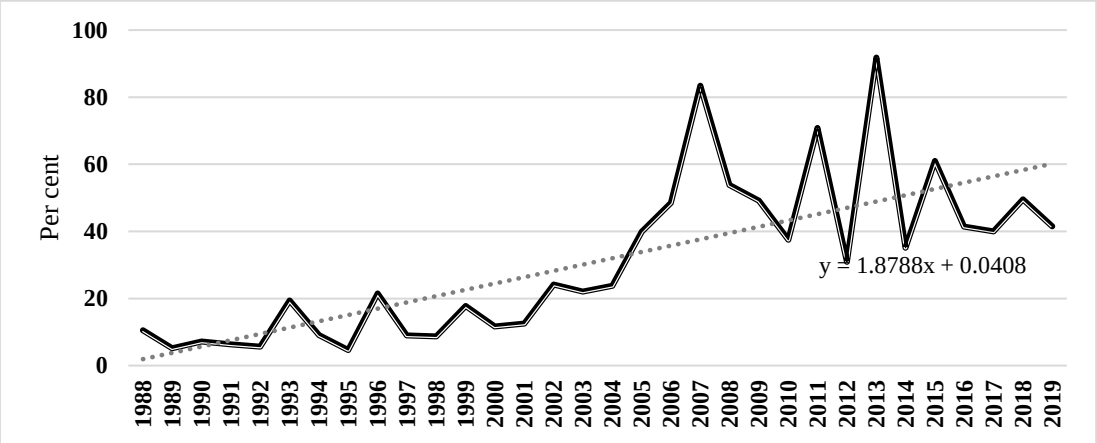
4.2.3 Import penetration

Import penetration is the ratio of imports to domestic demand, *i.e*. how much of domestic demand is being met by imports (OECD, 2005). A rise in import penetration may result from an increase in demand which cannot be met from domestic sources, from worsening of the competitiveness of domestic suppliers, or from relaxation or removal of restrictions on imports (Fronczek, 2017). A low import penetration reflects reduction in imports not only due to import barriers like tariffs and non-tariff measures but also due to a good matching of output produced by highly competitive domestic firms to domestic demand. Conversely, a high import penetration rate may reflect weak competitiveness on the part of domestic firms, especially when the export ratio is low. The size of the countries involved is also very important. The level of import penetration is usually greater in small countries because they are more open to the world economy and also due to the pattern of specialization

in these countries. As they are unable to specialise in many sectors, they become more dependent on imports. In the long term, however, if the import penetration rate rises faster than domestic demand and is not accompanied by equivalent gains in export markets, this could indicate some deterioration of competitiveness (OECD, 2009).

Import penetration ratio of black pepper in India from 1988 to 2019 is presented in Figure 42. The import penetration ratio was comparatively low till 2000 and it was below 20 per cent. This may be due to the Quantitative Restrictions (QRs) on agricultural imports that existed in India during that period. After 2000, the QRs on agricultural trade were removed and the proliferation of free trade agreements in India had also reduced the tariffs rates of black pepper. A higher penetration ratio is visible after 2000 not only due to trade liberalisation but also the reduced production and increased domestic consumption of black pepper. The fitted trend line for import penetration ratio also exhibited a positive trend indicating growing trend in import penetration.

Figure 42 Import penetration ratio of black pepper in India



Note: Estimated using data from WITS

4.3 IMPACT OF MULTILATERAL AND REGIONAL TRADE AGREEMENTS ON BLACK PEPPER TRADE

With the economic reforms in 1991 and the subsequent WTO agreement in 1995, India embraced the policies of Liberalisation, Privatization and Globalization (LPG). The Agreement on Agriculture as part of the WTO agreement was a multilateral agreement involving many countries. Even after the formation of WTO, member countries did not come to agreement in many of the trade related aspects.

Hence, the countries individually or in group entered into agreements with other country or group of countries and these agreements are called as Regional Trade Agreements (RTAs). The trade agreements of a country are known as any contractual measures with other country or countries regarding their trade relationship (Francis, 2009).

RTAs are trade agreements between two or more countries to eliminate the tariffs on commodities traded between them. RTAs regulate trade matters in relation to trade in goods, trade in services and other trade-related aspects. One of the basic principle of WTO agreement is the Most Favored Nation (MFN) treatment. MFN means equal treatment to all member countries of WTO. RTAs exclude MFN clause of the WTO agreement because it gives preferential treatment to the members of the agreement, but it does not give equal treatment to the non-members of the agreement. Hence, any such agreement violates the non-discrimination principal of WTO. Even then, there is provision in WTO agreement for entering into RTAs under specific conditions. Regional agreements are deliberated as the right step towards free trade and are considered good for developing countries as these agreements provide an instinct to the growth and development processes (Frankle and Fellow, 1996).

India views RTAs as constructive blocks towards the overall purpose of trade liberalization. The most prominent regional groupings in Asia are the Association of South East Asian Nations (ASEAN) and the South Asian Free Trade Agreement (SAFTA). The RTAs having implications on Indian black pepper trade are Association of South East Asian Nations (ASEAN)-India Free Trade Agreement (AIFTA), Indo-Sri Lanka Free Trade Agreement (ISLFTA), and South Asian Free Trade Agreement (SAFTA).

4.3.1 ASEAN-India Free Trade Agreement (AIFTA)

The ASEAN- India FTA, which is in operation since January 2010, has been considered as a landmark agreement for India and was an important milestone in the pursuance of its objective to expand its economic and political relations with neighbouring nations. The ASEAN consists of ten countries namely Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. The ASEAN-India FTA (AIFTA) is considered as

a major step of India into the formidable regional trade block of south Asia. The agreement was expected to be beneficial to both India and the block as it was supposed that the increased market access would result in doubling of the bilateral trade. The agreement opens up the $ 1.1 trillion ASEAN market to Indian exporters and it has been expected that this agreement will cut back the dependence of Indian exporters on the western countries.

4.3.1.1 Framework of tariff reductions in AIFTA

The AIFTA provides for a phased reduction of import duties on agricultural and non-agricultural goods of Indian and ASEAN member countries between January 2010 and January 2016. The products were categorised into five and the tariff reductions or eliminations were done based on these categories. The duties were to be reduced from the Most Favoured Nation (MFN) tariff rates applied in 2007. India, Indonesia, Malaysia, Singapore, Thailand and Brunei Darussalam had to eliminate tariffs by 2013 for the products listed under Normal Track-1 (NT-1), and by 2016, for Normal Track-2 (NT-2) products. The deadlines for bilateral duty elimination for India and the Philippines were 2018 and 2019 respectively. Apart from the Sensitive Track, there is a list of Special Products, for which tariffs were to be reduced at a much slower pace than the Normal Track and Sensitive Track. There is also an Exclusion List of products for which no tariff reduction commitments have been made (Table 4.30).

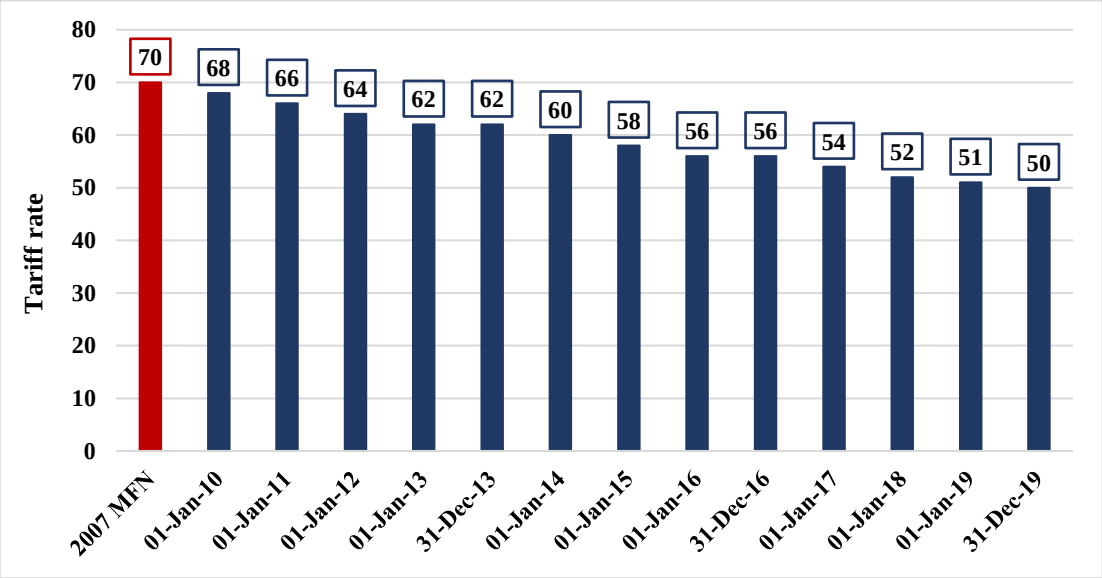
Table 4.30 Framework of tariff reductions in AIFTA

Category	Tariff reductions
1. Normal track i) Normal track 1 ii) Normal track 2	Tariff eliminated in phased manner
2. Sensitive track	Tariff to be brought down to 5 per cent
3. Special products	MFN rates to be reduced in phased manner
4. Highly Sensitive products	Category 1 reduced to 50 %, Category 2 reduced by 50 % Category 3 reduced by 25 %
5. Exclusion list	No reduction of tariff

With the signing of the AIFTA, India was committed to reduce or eliminate tariffs on more than 89 per cent of all of its agricultural, marine and manufactured goods. Nearly 70 per cent of India's tariff lines were under the Normal Track-1, for which tariffs were reduced to zero by 2013. Nearly nine per cent of India's tariff lines came under the Normal Track-2, for which tariffs were dropped to zero by 2016. The 496 products excluded from tariff reduction commitments and included in the 'Exclusion List' constituted 9.8 per cent of India's total tariff lines, while 11.1 per cent of its total tariff lines came under the 'Sensitive Track'. The 'Special Products' constituted just 0.1 per cent of its total tariff lines. Evidently, the vast majority of products came under the lists for tariff rate eliminations by 2013 or 2016 (Francis, 2011).

Black pepper was categorised under the special product group. The MFN rate for black pepper was to be reduced in a phased manner and the preferential tariff in 2010 was 68 per cent, which was reduced to 50 per cent by the end of 2019 (Figure 43).

Figure 43 AIFTA preferential tariff rates for black pepper



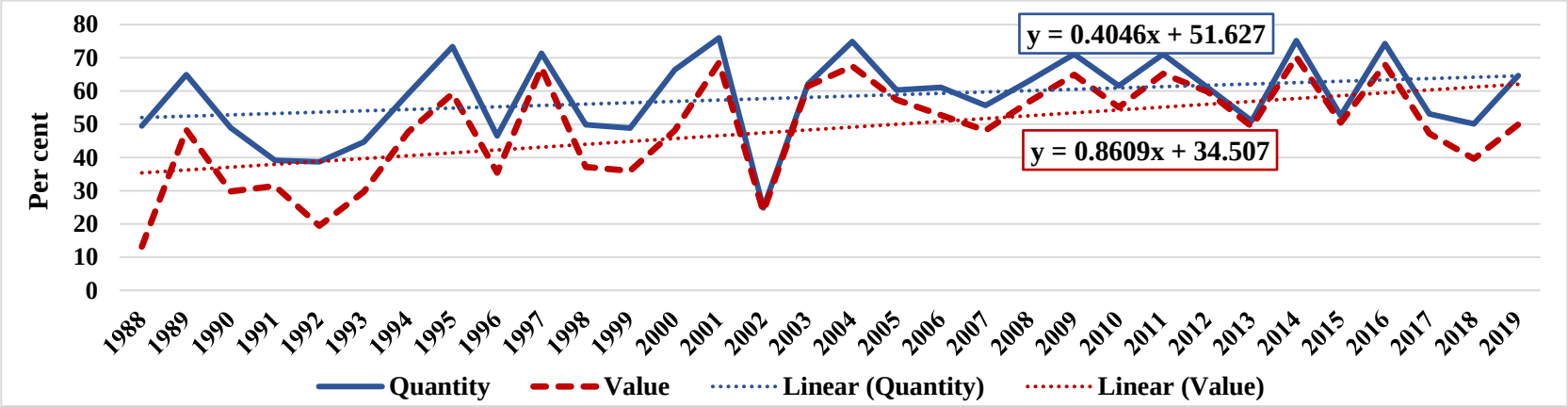
Source: Ministry of Commerce and Industry, GoI

4.3.1.2. Black pepper trade between India and ASEAN

It is evident from Figure 44 that Indian imported black pepper mainly from ASEAN countries. The share of ASEAN in imports of black pepper to India has increased from 49 per cent in 1988 to 65 per cent in 2019 in terms of quantity and 13 per cent to 50 per cent in terms of value during the same period. As an exporter, India's share in exports of black pepper to ASEAN was below six per cent till 2010 in terms of both quantity and value. After the signing of AIFTA, the exports from India to ASEAN showed a slightly increasing pattern for few years and then declined to six per cent in 2019. Also, as evident from Figure 45, India was not a major exporter of black pepper to ASEAN countries.

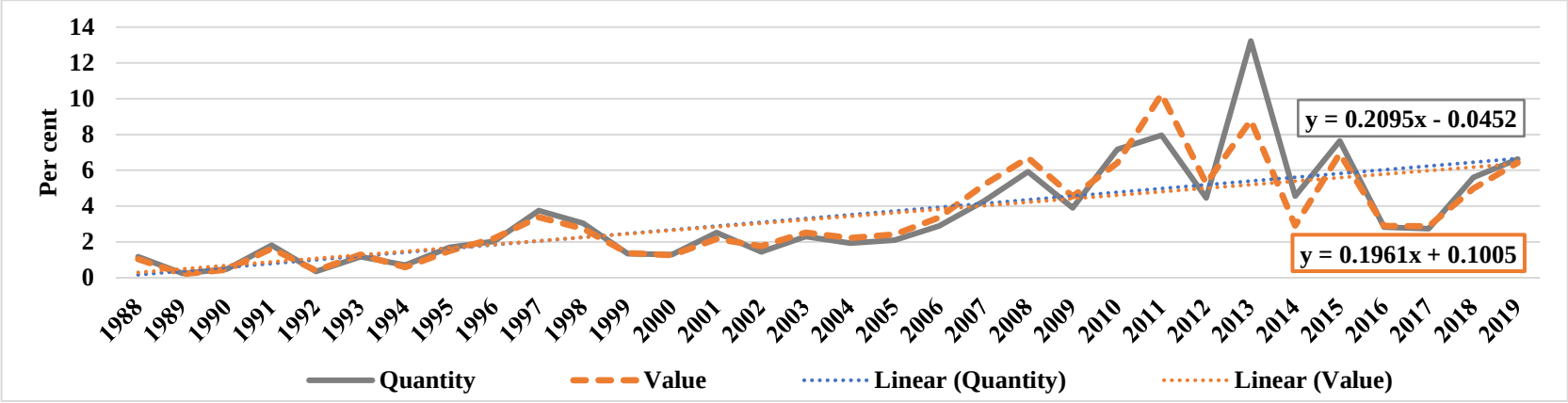
Vietnam and Indonesia are the major import markets of black pepper for India and they contributed 55 per cent in quantity and 45 per cent in value of black pepper imported to India (Figure 46 and 47). As could be observed from Table 4.31, after 2010, there was a sudden increase in the share of imports from Vietnam in the total imports to India, both in terms of quantity and value. The exports as well as imports between India and ASEAN countries have increased after 2010, but the imports were very much higher when compared to exports, which was evident from the increasing negative balance of trade. Even from 1990s, India was having a negative balance of trade with ASEAN countries in the trade of black pepper. After 2010, a noticeable growth in negative balance of trade has occurred which could be due to the free trade agreement between India and ASEAN countries (Figure 48). The balance of trade between India and ASEAN countries were -30,705 US$ in terms of value and -430 tonnes in terms of quantity in TE 1990, which increased to -29.44 lakh US$ and -1821 tonnes in TE 2000 and then immensely increased to -589.97 lakh US$ and 15,932.6 tonnes in TE 2019. Balance of Trade in terms of value was found to be higher than Balance of Trade in terms quantity, which means that the import price was lower than the export price. (Table 4.31).

Figure 44 Share of ASEAN countries in black pepper imports to India (Per cent)



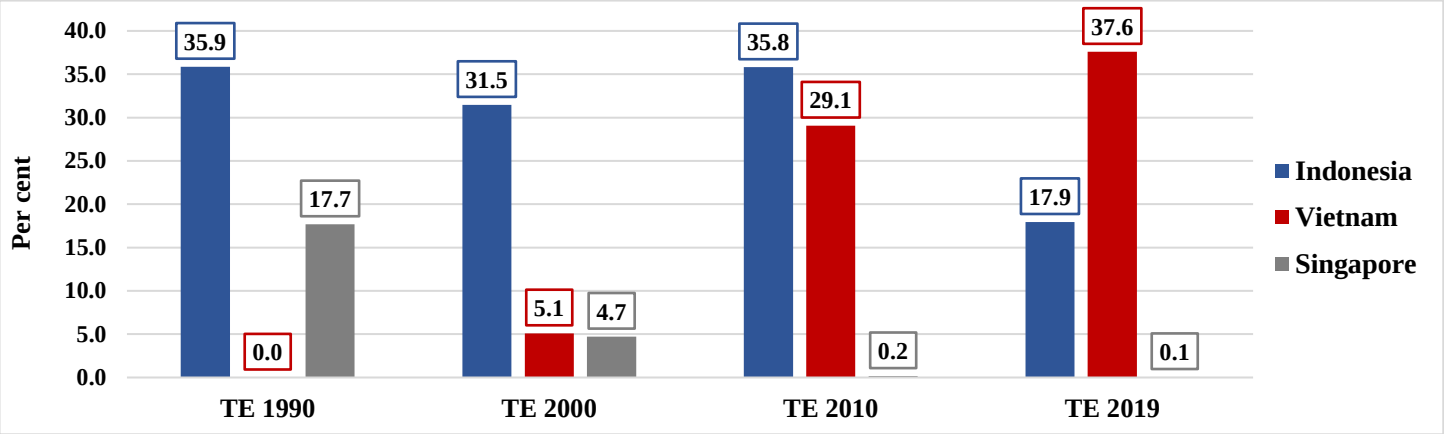
Note: Estimated using WITS data

Figure 45 Share of ASEAN countries in black pepper exports from India (Per cent)



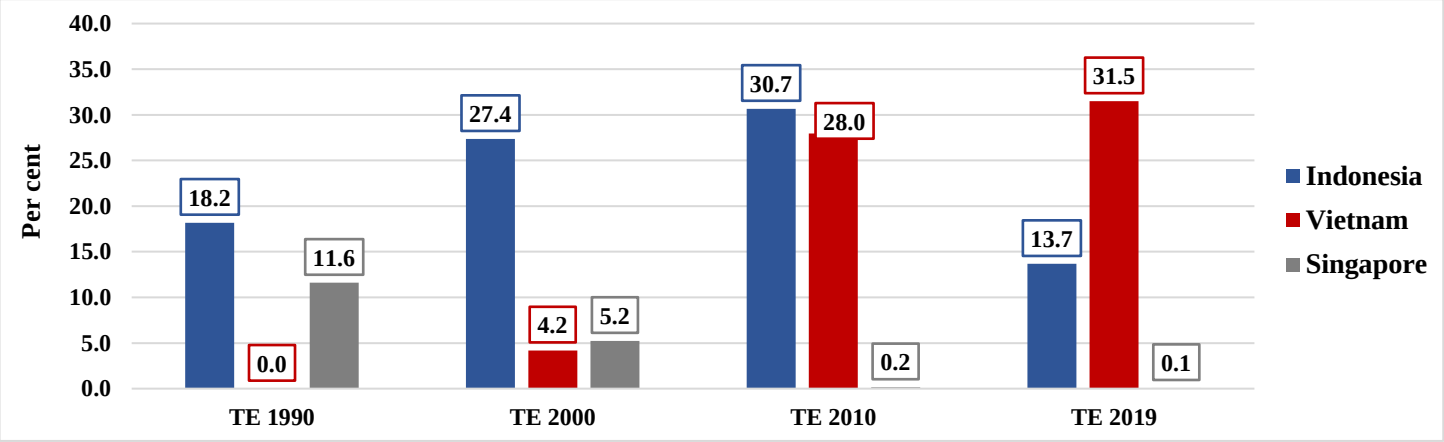
Note: Estimated using WITS data

Figure 46 Share of major ASEAN countries in quantity of black pepper imports to India



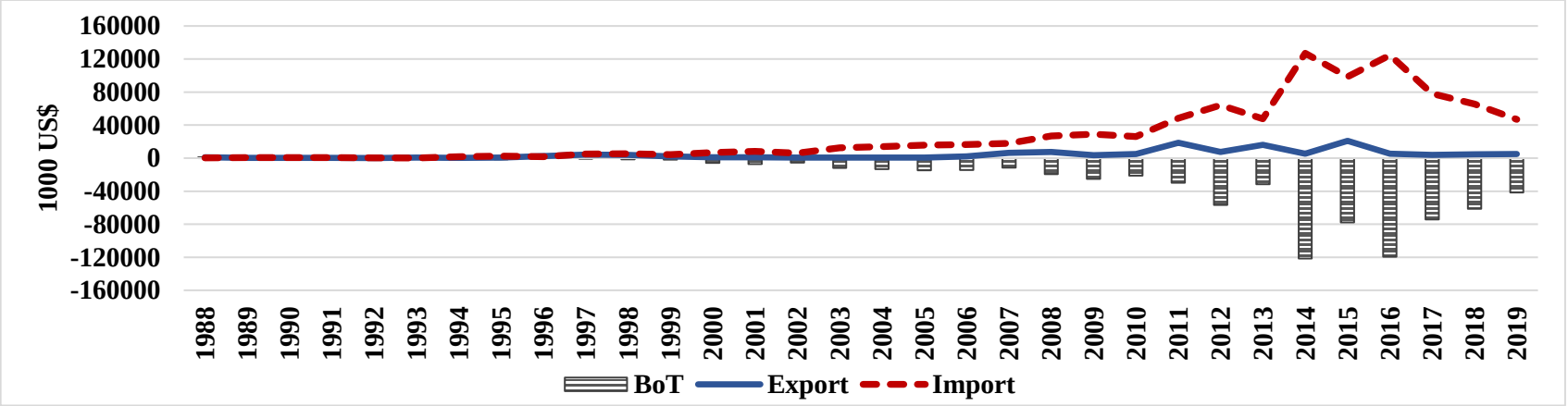
Note: Estimated using WITS data

Figure 47 Share of major ASEAN countries in value of black pepper imports to India



Note: Estimated using WITS data

Figure 48 India's Balance of Trade (BoT) of black pepper with ASEAN countries



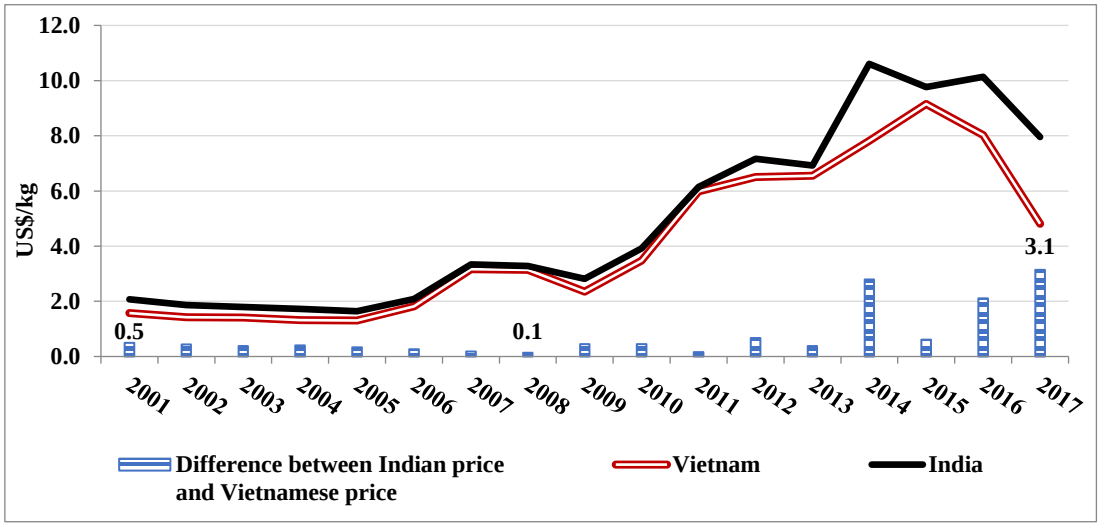
Note: Estimated using data from WITS

Table 4.31 India's Balance of Trade (BoT) of black pepper with ASEAN countries

	Quantity		Value		BoT	
Year	Export (kg)	Import (kg)	Export (US$)	Import (US$)	Quantity (kg)	Value (US$)
TE 1990	214522.7	644634.3	534538	565243	-430111.7	-30705
TE 1995	416295.0	1141058.7	687376	1421712	-724763.7	-734336
TE 2000	575960.3	2397148.0	2425493	5369024	-1821187.7	-2943531
TE 2005	364843.0	10479945.3	712298	14089343	-10115102.3	-13377046
TE 2010	1745331.0	9816304.3	5383227	27350304	-8070973.3	-21967077
TE 2015	3003915.7	12252961.0	14175402	91126137	-9249045.3	-76950735
TE 2019	913921.0	16846502.0	4497592	63494461	-15932581.0	-58996870

Note: Estimated using data from WITS

Figure 49 Black pepper prices in India and Vietnam (2001 - 2017)



Source: Pepper statistical yearbook, IPC

The prices of black pepper in India and Vietnam are plotted in Figure 49. The Vietnamese black pepper price was always below the Indian price, but the difference between the Indian and Vietnamese prices has increased after 2013. Even if India is imposing a 100 per cent tariff on imported black pepper from Vietnam, the tariff added price will be still lower than the Indian prices. Consequently, the black pepper processing industries in India have been importing cheaper black pepper from Vietnam for re-exports, especially after processing.

The black pepper productivity ratios were calculated to understand how much times the productivities in ASEAN countries were higher than the productivity in India. The Productivity ratios are defined as the yield in individual ASEAN country divided by the yield in India. As evident from Table 4.32, the productivity of Vietnam, Indonesia, Malaysia and Thailand were higher than Indian productivity during the period from 1990 to 2017, except for Indonesia in 2017 which was below the average productivity of black pepper in India. The productivity of black pepper in Vietnam was found to be five times that of India. Hence, it can be concluded that India has a major productivity disadvantage *vis-à-vis* the ASEAN countries in the case of black pepper (Veeramani and Saini, 2011).

Table 4.32 Productivity ratios of Black pepper

Country	1990	2000	2010	2019
Indonesia	2.9	2.3	1.7	0.9
Malaysia	8.4	6.0	8.4	3.2
Thailand	6.3	11.3	12.3	5.5
Vietnam	3.8	11.4	9.1	5.0
World	2.5	3.0	3.3	2.2

Source: Various issues of Pepper Statistical Yearbook, International Pepper Community

4.3.1.3 Impact of AIFTA on black pepper

The impact of AIFTA on black pepper was analysed using SMART and gravity models. The results obtained were organised and are discussed in sections 4.3.1.3.1 and 4.3.1.3.2.

4.3.1.3.1 SMART simulation for impact of AIFTA on black pepper

The SMART model is a partial equilibrium simulation model used to quantify the impact of tariff reduction of black pepper under AIFTA. This model is accessible in the World Integrated Trade Solutions (WITS) software for simulation purpose. The model focuses on one importing country (India) and its exporting partners (ASEAN countries) and assesses the impact of a tariff change scenario under two assumptions. It is evident from Figure 43 that the tariff rate of black pepper was reduced from the base rate of 70 per cent in 2007 to 50 per cent in December 2019. This was the tariff reduction scenario considered for the analysis under two assumptions i.e., infinite export supply elasticity and finite export supply elasticity.

The SMART model, by default, assumes infinite export supply elasticity, which implies that the export supply curves are flat and that the world prices are exogenous. In other words, the infinite export supply elasticity implies that the prices in exporting countries (for e.g., ASEAN) are not affected as a result of the higher demand by the importing country (for e.g., India). Therefore, the exporting country would supply higher quantity of the commodity at the same price as earlier. That is,

under the assumption of infinite export supply elasticity, tariff reduction generally results in a positive 'quantity effect' while the 'price effect' is always zero.

Given that India is a much bigger country compared to the individual ASEAN countries, the assumption that the higher import demand by the former will have no effect on prices in the latter may appear unrealistic. The SMART model, however, allows using finite export supply elasticity values instead of the default assumption of infinite export supply elasticity. The World Bank Research Department provides estimates of export supply elasticity values at the 6-digit level of HS classification. These estimates were used and the results of the simulations are reported based on the assumption of infinite as well as finite values of export supply elasticities. The use of finite export supply elasticity values implies that higher demand from importing countries would cause price increases in the exporting countries. In other words, the exporting country would supply higher quantity only at a higher price, implying that tariff reduction generally results in a positive 'price effect' as well as a positive 'quantity effect'.

The simulation results at the aggregate level, under the above tariff reduction scenario, based on the assumption of infinite export supply elasticity and finite export supply elasticity, are shown in Table 4.33. The increase in the imports of black pepper from ASEAN countries and its decomposition into trade creation and trade diversion effects are reported in the table. Also reported are the estimated loss of tariff revenue and the overall welfare effects as a result of imports.

According to Balassa (1961), formation of a free trade agreement creates dynamic and static benefits. The static benefits accrue to member countries as trade creation and negatively impact on non-member countries as trade diversion. Trade creation is defined as the direct increase in imports following a reduction of the tariff imposed on goods from exporting country by home country (WITS, 2011). Trade diversion is the quantity of exports from non-member countries that is being replaced by exporting partner country as a result of free trade agreement. Trade diversion is traditionally viewed as negative for global welfare as more efficient producers are being displaced by less efficient ones due to the new trade preferences (Chandran and Sudershan, 2012).

Table 4.33 Aggregate impact on black pepper trade under tariff reduction in ASEAN-India FTA (Values in '000 US$)

Aggregate simulation results		Infinite export supply elasticity	Finite export supply elasticity
Base Year Import (2007)	Value	28226.02	28226.02
Total increase in imports	Value	3845.43	133.86
	Per cent	13.62	0.47
Trade creation	Per cent	6.04	0.23
Trade diversion	Per cent	5.95	0.21
Price effect	Value	0.00	4.96
Tariff Revenue Loss	Value	-5078.17	-149.45
Total welfare	Value	1201.12	46.92

Source: Simulations using the SMART model (WITS)

In addition to trade diversion and creation effects, there can also be a price effect. This is not always the case, but tends to occur when the elasticity of the export supply of a specific item is finite. Accordingly, a decline in price leads to an increase in demand, which pushes up the world price of the item in question. Altogether, the trade impact would consist of both trade diversion and trade creation effects, which are associated with quantities, whereas price effect adds to the import value (villa *et. al.,* 2012).

In the case of imports of black pepper to India, tariff reduction under AIFTA resulted in trade creation for both infinite and finite export supply elasticity assumptions. As discussed earlier, trade creation improves welfare as the new imports replace high-cost domestic production. The extent of trade creation in this case had only slight domination over trade diversion.

The results showed that the tariff reduction has led to significant tariff revenue loss to the government. The gain in consumer surplus (due to the fall in domestic price) outweighs the loss in tariff revenue leading to net welfare gain. Although the consumers in FTA members may gain from an increase in welfare as FTA enables them to buy imports at lower prices, a FTA member country as a whole may suffer from loss in government's tariff revenue.

The assumption of infinite export supply elasticity implies that tariff reduction by India will not affect the prices in the ASEAN countries – that is, the 'price effects' are zero (hence not shown in Table 4.33). Finite values of export supply elasticity, however, would mean that the tariff change will generate price adjustments in addition to quantity adjustments. Therefore, the price effect captures that part of the increase in India's import value (in US$) attributable to higher prices in the ASEAN. It is evident that the quantity effect (i.e., trade creation) dominates over the price effect, which means that the major part of India's import growth is due to higher quantity rather than higher price. Table 4.34 shows the distribution of total trade creation in black pepper across the ASEAN trading partners. It is clear from the table that Indonesia and Vietnam together accounted for nearly 100 per cent of the trade creation.

Table 4.34 India's trade creation and trade diversion with ASEAN countries

ASEAN partners	**Trade Creation**	**Trade diversion**
	('000US$)	('000US$)
Infinite export supply elasticity		
Indonesia	1058.133	1050.195
Singapore	1.189	1.111
Thailand	1.672	1.563
Vietnam	875.701	855.87
Aggregate	1936.695	1908.739
Finite export supply elasticity		
Indonesia	35.575	32.612
Singapore	0.038	0.035
Thailand	0.053	0.049
Vietnam	28.992	26.591
Aggregate	64.658	59.287

Source: Simulations using the SMART model (WITS)

While trade creation generally dominates over trade diversion, it is of interest to identify the non-ASEAN countries whose trade is being diverted to the ASEAN as a result of India's preferential tariff liberalization. Table 4.35 provides a list of top eight non-ASEAN countries that account for the largest extent of trade diversion. This list shows the major non-ASEAN countries whose exports to India are affected as a

result of the latter's higher imports from the ASEAN countries. Sri Lanka was the most affected country among non-ASEAN countries.

Table 4.35 Top non-ASEAN countries that account for the largest extent of trade diversion (Values in '000 US$)

Countries	Infinite export supply elasticity	Finite export supply elasticity
Sri Lanka	-1888.65	-57.651
United States	-25.991	-0.884
China	-10.923	-0.372
Madagascar	-5.311	-0.181
Brazil	-3.579	-0.122
Canada	-1.352	-0.046
Germany	-0.494	-0.017
Korea, Rep.	-0.384	-0.013

Source: Simulations using the SMART model (WITS)
Note: Negative sign represents the decline in value of imports

4.3.1.3.2 Gravity model for assessing the impact of AIFTA on black pepper

The SMART model is sensitive to import demand and export supply elasticities, which are pre-determined. The gravity model is an alternative approach, without the requirement of any elasticity parameters, to estimate the impact of AIFTA on black pepper. The main idea of the gravity model is borrowed from the Newtonian model of gravitational forces – that is, the force of attraction between two bodies is proportional to the product of their masses and inversely proportional to the square of the distance between them (Harrigon, 2001). The simplest gravity model predicts that the trade between two countries will be proportional to the product of their gross domestic products and inversely proportional to the physical distance between them (Anderson and van Wincoop, 2004). This basic model can be augmented using other variables that can facilitate or hinder bilateral trade flows.

The panel data on imports of black pepper to India from ASEAN countries during the period from 2000 to 2019 were used for gravity analysis. This data showed zero trade flow between India and ASEAN countries in some of the years. Ignoring the zeros induces a selection bias if the zero trade flows are not random, as is usually

the case (Veeramani and Saini, 2011). Helpman *et. al.*, (2008) have proposed a theoretical model rationalizing the zero trade flows and have suggested estimating the gravity equation with a correction for the probability of countries to trade. Heckman sample selection model can be used to assess whether selection bias is present, identify factors contributing to the selection bias, and to control this bias.

The estimation of Heckman sample selection model has two stages. In the first stage, the equation for the selection of the trade partners is estimated and then an outcome equation for trade flow is estimated for adjusting the selection bias (Greene 2008). The selection equation estimates the probability of India and individual ASEAN countries engaging in trade (as the dependent variable) on a set of independent variables (GDP, distance, language, colony and AIFTA dummy). The Inverse Mills ratio (IMS) is estimated using a probit model (selection equation) and it explains that part of the error term which captures the difference in the outcome variables due to the selection and not the programme itself (Sachu *et. al*, 2020). In the second stage, the model determines the intensity of bilateral trade *i.e.*, the outcome variable is regressed with treatment dummy variable and a set of control variables, including IMS as an explanatory variable to minimise the effect of endogeneity.

The estimated results of the gravity model by using Heckman sample selection model is presented in Table 4.36. The Wald test shows the statistical significance of Heckman sample selection model at one per cent level of significance. A likelihood Ratio test is used to test for the independence of the selection and outcome equations. Specifically, it tests the null hypothesis that rho equals zero. It indicates the correlation between the error terms of the outcome and selection equations. The failure to reject the null hypothesis indicates insignificant sample selection bias, while rejection of the null hypothesis means that the Ordinary Least Square (OLS) model produces biased estimates. Here, the null hypothesis was rejected and hence it is concluded that the use of Heckman model was appropriate.

The first part of the output is the selection equation, *i.e.* the probit model. From the results, it could be observed that the distance had a negative impact on the probability that India and ASEAN countries would engage in trade and it was significant at one per cent level. The volume of bilateral trade between geographically

nearer countries tends to be higher due to the lower transportation costs and other advantages arising from greater geographical proximity (Leamer and Levinsohn, 1995; Veeramani and Saini, 2011). Common cultural and political background can stimulate bilateral trade (Eichengreen and Irwin 1996; Fidrmuc and Fidrmuc 2003). From the cultural variables like common colony and language, only the dummy for common colony was significant and had a negative effect on trade. Singapore, Malaysia and Brunei were having common colonial link (British colonies) among the ASEAN countries and these countries were importing less quantities of black pepper to India. So, the dummy for common colony showed a negative effect on trade. The GDP was having a positive influence on the probability that India and ASEAN countries would engage in trade, but it was not statistically significant. Similar results were reported by Veeramani and Saini (2011) while studying the impact of AIFTA on plantation crops using gravity model.

Table 4.36 Estimates of the Gravity model: Heckman sample selection model

Variables	Selection Model	Outcome Model
	Probit	Regression
GDP	0.0932	0.112
	(0.5212)	(0.596)
Common language	0.049	4.256
	(0.421)	(1.616)
Common colony	-5.474**	-11.099***
	(2.324)	(3.632)
Distance	-0.0037***	-0.0056***
	(0.0009)	(0.0020)
AIFTA dummy	0.165**	0.196**
	(0.0704)	(0.077)
Inverse Mills Ratio		-0.431
		(0.824)
Constant	22.914	33.641**
	(14.12)	(15.04)
Observations	180	159
Pseudo-R^2	0.364	0.387

Notes: Robust Standard error in parenthesis, *** p<0.01, ** p<0.05, * p<0.1, Log likelihood = -55.327, Wald chi^2 = 173.13***, LR test of rho=0 is 43.86***

The second part of the result is the outcome equation, *i.e.* the typical gravity model. The variables that were significant in the selection equation turned out to be

significant in the outcome equation as well, with the signs of the coefficients being the same in the two equations. The Inverse Mill's ratio, which takes into account the selection bias, was insignificant, which in turn means that the null hypothesis of uncorrelated errors could be accepted. The main variable of interest was the AIFTA dummy that captures the effects of trade creation and trade diversion. The estimated coefficient of AIFTA dummy was positive and significant which indicated a positive trade creation effect among AIFTA member countries. Trade creation improves welfare as the increased black pepper imports to India from FTA member countries as a result of AIFTA replaces the high-cost domestic production (Sikdar and Nag, 2011). It can be inferred from the coefficient of AIFTA dummy (0.196) that black pepper imports to India from ASEAN countries would be higher by 19.6 per cent of the black pepper imports with the rest of the world after the formation of AIFTA. Jagdambe and Kannan (2020) reported similar findings that trade creation effect was greater than that of trade diversion implying that the former helps to improve the welfare among the AIFTA members. The results from the study clearly indicate that AIFTA favours trade creation rather than trade diversion effect for Indian black pepper trade.

4.3.2 Indo-Sri Lanka Free Trade Agreement (ISLFTA)

The Indo-Sri Lanka Free Trade Agreement (ISFTA), which was signed on 28th December 1998 and entered into effect from 1st March 2000, provides duty free concessions to a wide range of products traded between the two countries. Sri Lanka's final tariff liberalization commitment under ISFTA came into effect in November 2008 and with this completion of the commitment, the ISFTA which came into effect from March 2000 was fully implemented. However, Sri Lanka had already obtained a completely duty-free access to the vast Indian market under the ISFTA since the end of March 2003. Thus, the entrepreneurs based in Sri Lanka could export more than 4000 product lines to the Indian market on duty free basis. Both the countries are members of WTO, SAFTA and Bangkok Agreement, within the framework of which mutual preferential trade concessions are extended to each other.

The ISLFTA consists of the Agreement and the following six Annexures.

- Annexure A - List of items entitled to 25 per cent duty concessions by India.

- Annexure D (I) - Negative list of items of India.
- Annexure D (II) - Negative list of items of Sri Lanka.
- Annexure E - Items entitled for 100 per cent duty concession by India.
- Annexure F-1 - Items entitled for 100 per cent duty concession by Sri Lanka
- Annexure F (II) - Items entitled for 50 per cent duty concessions by Sri Lanka.

The items which were not included in Annexure A, Annexure D (I) or Annexure E of India were entitled to 50 per cent duty concession.

4.3.2.1 Duty concessions for black pepper in ISLFTA

In the ISLFTA, black pepper was categorised by Sri Lanka in the negative list, giving no concession to imports from India, whereas India allowed 50 per cent tariff concession to imports of black pepper from Sri Lanka. India had agreed for tariff reduction within a period of three years and since 2003, imports of black pepper from Sri Lanka became duty free. This resulted in increased black pepper imports from Sri Lanka and subsequently, the imports at zero duty were capped at 2,500 tonnes per year.

4.3.3. South Asian Free Trade Agreement (SAFTA)

The South Asian Association for Regional Cooperation (SAARC) was formed in 1985. The member states of SAARC are Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The SAARC Preferential Trading Arrangement (SAPTA) was signed in April 1993 and came in to force in December 1995. The SAPTA aimed at promoting mutual trade and economic cooperation among the member countries through exchange of concessions. Four rounds of negotiations were held under SAPTA, which was envisaged primarily as the first step towards the transition to a South Asian Free Trade Area (SAFTA), and subsequently towards a Customs Union. Accordingly, SAPTA was superseded with the implementation of SAFTA. Product coverage was limited under SAPTA and usage of tariff preferences under the SAPTA has been gradually decreasing (GoI, 2014). However, the member countries recognized the need to progress beyond a preferential trading arrangement and move towards a higher level of trade and economic cooperation in the region. As a result, the SAARC Council of Ministers signed a framework Agreement on South Asian Free Trade Area (SAFTA) in January 2004 in Islamabad and was entered into

force on 1st January, 2006. The Phase-I of the Trade Liberalization Programme (TLP) under SAFTA was implemented from 1st July 2006 and was scheduled to be completed by 31st December 2015.

India and Sri Lanka are the major producers of black pepper among SAARC countries and the other member countires are producing only negligible quantities of black pepper. India included black pepper under the sensitive list and the products, including black pepper were not subjected to any tariff reduction. The import of pepper to India from other SAARC countries invited eight per cent tariff duty. It may be noted that SAARC member countries were producing only a negligible quantity of black pepper. Hence, exportable surplus as well as the export potentials of these countries were minimal.

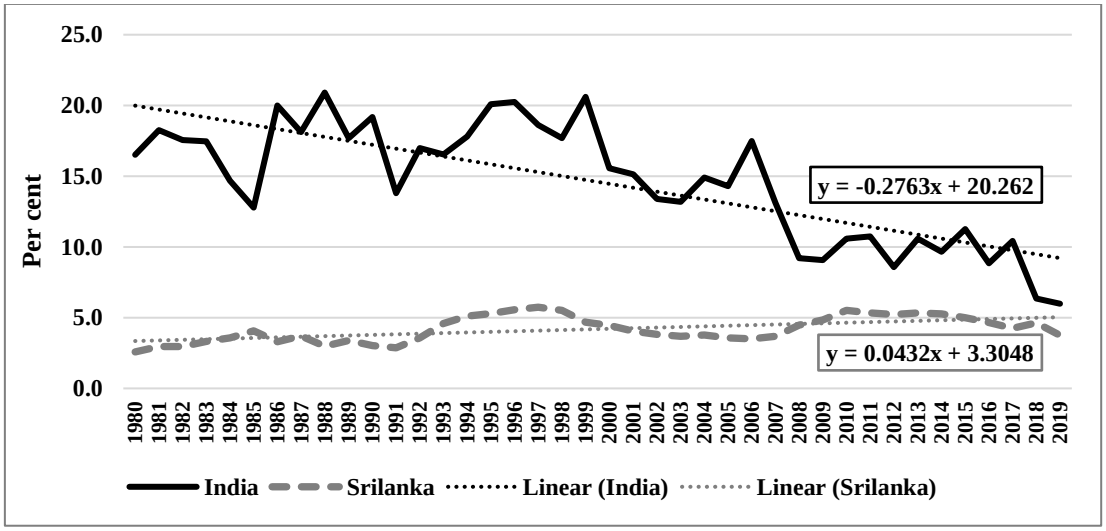
4.3.4 Impacts of ISLFTA and SAFTA on black pepper

The impacts of ISLFTA and SAFTA on Indian black pepper were analysed using SMART model and Interrupted Time Series Analysis (ITSA).

4.3.4.1 Production and trade of black pepper in India and Sri Lanka

It could be observed from Figure 50 that the share of India in world black pepper production has shown a decreasing trend from 1980 to 2019, which has declined from 16.5 per cent in 1980 to 6 per cent in 2019, whereas in the case of Sri Lanka, it has slightly increased from 2.6 per cent to 3.8 per cent during the same period.

Figure 50 Share of India and Sri Lanka in world black pepper production



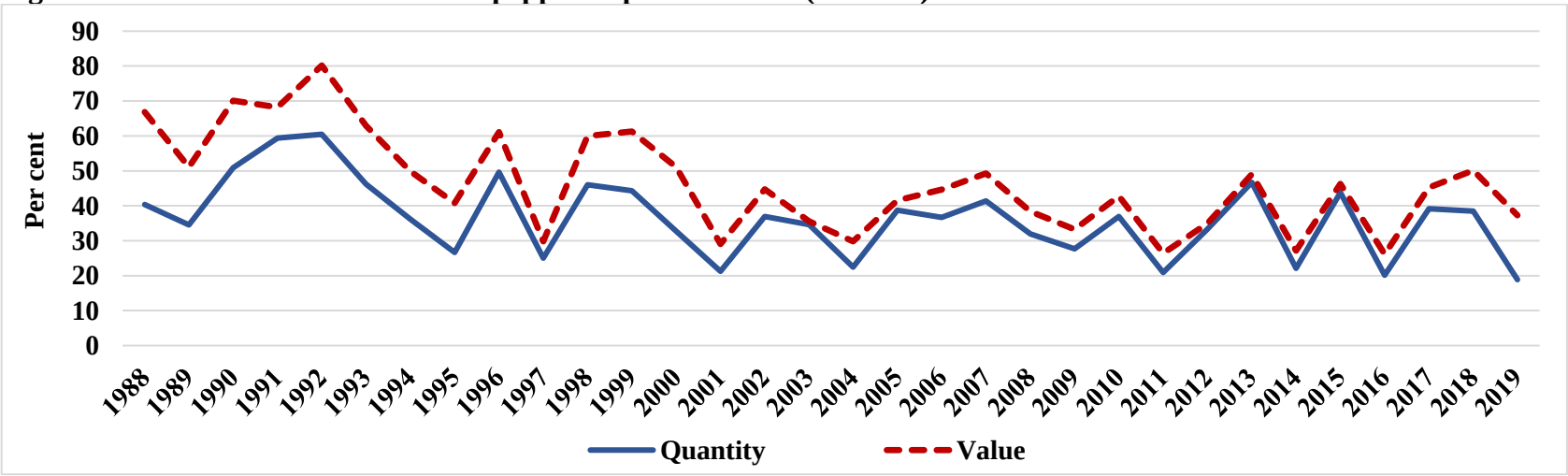
Note: Estimated using FAOSTAT data

Table 4.37 India's trade and Balance of Trade (BoT) in black pepper with Sri Lanka

Year	Export		Import		BoT	
	Export Quantity (tonnes)	Export Value (1000 US$)	Import Quantity (tonnes)	Import Value (1000 US$)	BoT (tonnes)	BoT (1000 US$)
TE1990	0.00	0.00	508.69	1164.99	-508.69	-1164.99
TE1995	2.48	2.94	619.38	1278.54	-616.90	-1275.61
TE2000	51.18	91.88	1647.29	7572.36	-1596.10	-7480.48
TE2005	3.80	9.82	5230.42	8272.93	-5226.62	-8263.11
TE2010	16.90	49.68	4783.39	17766.93	-4766.49	-17717.25
TE2015	598.61	827.64	7311.43	62294.27	-6712.82	-61466.64
TE2019	131.37	806.42	9755.84	64264.01	-9624.47	-63457.58

Note: Estimated using data from WITS

Figure 51 Share of Sri Lanka in black pepper imports to India (Per cent)



Note: Estimated using data from WITS

India is not a major exporter of black pepper to Sri Lanka and had a negative balance of trade with Sri Lanka even before 1990s. India's trade deficit with Sri Lanka for black pepper has increased after signing of ISLFTA and SAFTA. The black pepper imports to India from Sri Lanka has increased considerably after 2003 due to tariff elimination and Sri Lanka became one of the major importing countries to India. The import value of black pepper from Sri Lanka was 1165 thousand US$ during TE 1990, which increased over the years and was 17,767 thousand US$ in TE 2010, and in 2019 it became 64,264 thousand US$. Whereas, India imported 508.69 tonnes from Sri Lanka during TE1990 in terms of quantity which increased to 9755.8 tonnes in TE2019 (Table 4.37).

It could be observed from Figure 51 that the share of Sri Lanka in black pepper imports to India has shown a decreasing trend from 1988 to 2000 and later the share of Sri Lanka ranged between 20 and 50 per cent, even though the imports have increased in absolute terms, which could be attributed to the increase in imports from other countries

4.3.4.1.1 Tariff concessions for black pepper imports to India under ISLFTA and SAFTA

The imports of black pepper to India from Sri Lanka under the SAFTA was at eight percent customs duty, while it was duty-free under the ISFTA (Indo-Sri Lanka Free Trade Agreement) with licence from the Directorate-General of Foreign Trade (DGFT). India levies zero duty on the import of black pepper from Sri Lanka and the imports is capped at 2,500 tonnes. Any imports above 2500 tonnes is charged eight percent duty as per SAFTA. The black pepper imports below Rs 500 are allowed under advance authorisation scheme for 100 percent Export-Oriented Units and those functioning in Special Economic Zones to meet the needs of the processing industry including pepper oil and oleoresin.

4.3.4.2 SMART simulation for impact of ISLFTA and SAFTA on black pepper

Simulations using SMART model was carried out to analyze the trade creation and trade diversion effects of ISLFTA and SAFTA on Indian black pepper and the results of the simulation analyses are presented in Table 4.38. This analysis indicated

that the actual amount of black pepper imports from Sri Lanka to India has increased after the implementation of ISLFTA and SAFTA. The import value of black pepper to India from Sri Lanka in the base year (2000) was 70.45 lakh US$, which has slightly increased by 0.4 per cent after the formation of ISLFTA and SAFTA. Even though there was an increase in imports, it was also found that these agreements have caused trade diversion among the non-member countries than trade creation between India and Sri Lanka. The trade diversion that has happened because of these agreements were found to be in favour of Sri Lanka.

The results highlighted that Sri Lanka was benefitting from the agreements through the welfare gain, while there are risks of welfare loss for India in the coming years under these FTAs. In general, an FTA would lead to some amount of trade creation and trade diversion. If the trade diversion is sufficiently large relative to the trade creation effects, the FTA could conceivably end up being harmful to the member countries (Choudhry *et. al*., 2013).

Table 4.38 Impact of tariff reduction under ISLFTA and SAFTA on black pepper trade (Values in '000 US$)

Simulation results	Finite export supply elasticity	Infinite export supply elasticity
Base Year Import (2000)	7045.985	7045.985
Total increase in imports	7072.771	7071.357
Change in export revenue	26.786	25.372
Price effect	0.992	0
Trade creation	10.896	11.147
Trade diversion	13.906	14.226
Tariff revenue loss	-22.594	-22.664
Total welfare	4.352	4.281

Source: Simulations using the SMART model (WITS)

The trade diversion effect means that the FTA would replace imports of highly efficient non-member countries by imports from less efficient FTA members. Besides, trade diversion has a negative impact on non-members, as they lose the opportunities for exporting. Thus, while consumers in FTA member countries may have increased welfare as the FTA enables them to buy imports at lower prices, an FTA member

country in totality may face a loss if the decline in government's tariff revenue exceeds the consumers' gain (GoI, 2013).

Table 4.39 Country-wise value of trade diversion due to ISLFTA and SAFTA ('000 US$)

Countries	Finite export supply elasticity	Infinite export supply elasticity
Indonesia	-8.081	-8.267
Malaysia	-2.092	-2.14
Singapore	-1.809	-1.85
Vietnam	-1.692	-1.731
Belgium	-0.121	-0.124
China	-0.054	-0.055

Source: Simulations using the SMART model (WITS)

Table 4.39 provides a list of non-member countries that account for the trade diversion. This list shows the major non-member countries whose exports to India are affected as a result of the higher imports from Sri Lanka. It could be observed that Indonesia was the most affected country among the non-member countries, followed by Malaysia, Singapore and Vietnam.

4.3.4.3 Interrupted Time Series Analysis (ITSA)

The Interrupted time series analysis (ITSA), also known as quasi-experimental time series analysis, is a method of statistical analysis which invloves tracking a long-term period before and after a point of intervention to assess the effects of the intervention. With this design, outcomes are measured at different time points before and after implementing an intervention, allowing the change in level and trend of outcomes to be compared, to evaluate the intervention effects (Ewusie *et. al.,* 2020). Here, the effect of ISLFTA and SAFTA on black pepper imports to India from Sri Lanka were analysed using ITSA and the results of the analysis are presented in Table 4.40.

As could be observed from the table, the imports to India from Sri Lanka appeared to increase significantly every year prior to ISLFTA by 78.6 kg. It was found that the first year after ISLFTA (2001) was statistical insignificant, followed by a significant increase in the annual imports of black pepper (relative to the pre-

intervention trend) to 822.2 kg per year. The second intervention was SAFTA, which came into force in 2006. The first intervention period (ISLFTA) was compared with the preintervention period. However, the additional coefficients for the second intervention period (SAFTA), were then compared with those of the previous (first) intervention period. There was a decline in the imports of black pepper from Sri Lanka after the formation of SAFTA. In the first year of the implementation of SAFTA, compared with ISLFTA, there appeared to be a significant decrease in imports of black pepper to India to 4333.5 kg, followed by a significant decrease in the annual imports of black pepper (relative to the preintervention trend) to 449.2 kg per year.

Table 4.40 Estimates of ITSA: Regression with Newey-West standard errors

Variable	Coefficient	New-West Std. Err.	T	P>ltl
t	78.57	41.26	1.90	0.069
x(ISLFTA)	1100.68	814.92	1.35	0.189
x_t(ISLFTA)	822.18	213.00	3.86	0.001
x(SAFTA)	-4333.48	975.88	-4.44	0.000
x_t(SAFTA)	-449.22	254.68	-1.76	0.090
Constant	655.37	243.17	2.70	0.013

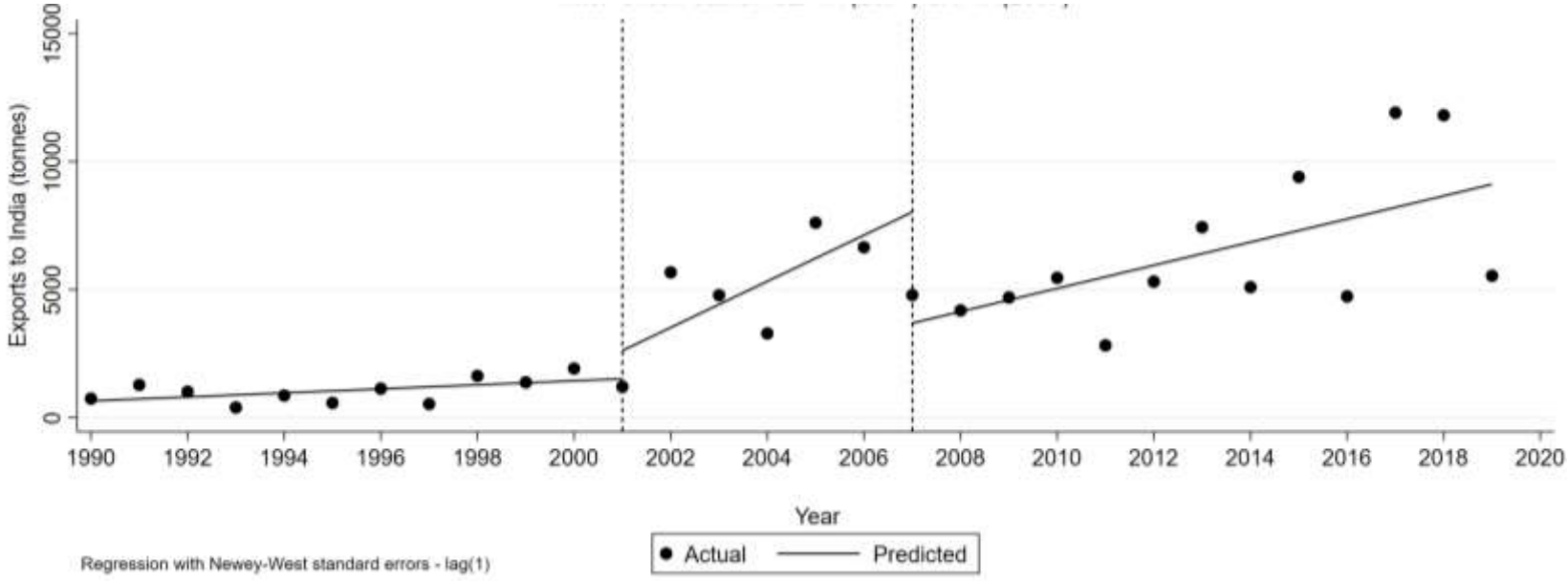
Note: t - time since start of study, x(ISLFTA) - dummy variable representing the intervention periods (Before ISLFTA 0, otherwise 1), x_t(ISLFTA) - interaction of ISLFTA and time, x(SAFTA) - dummy variable representing the intervention periods (Before SAFTA 0, otherwise 1), x_t(SAFTA) - interaction of SAFTA and time

Table 4.41 shows the post-intervention trend of ISLFTA and SAFTA which demonstrates the post-intervention trends separately after the first and second intervention periods. As shown in the post trend output, the annual increase in the imports after ISLFTA was 900.8 kg per year, while the annual increase in imports after SAFTA was less compared to ISLFTA, i.e., 451.5 kg per year (the difference was 449.2, which appears in the original regression table as the interaction between SAFTA and time).

Table 4.41 Comparison of linear post-intervention trend of ISLFTA and SAFTA

Linear Trend	Coefficient	Std. Err.	t	P>ltl	[95% conf. Interval]	
ISLFTA						
Treated	900.75	218.55	4.12	0.0004	449.68	1351.82
SAFTA						
Treated	451.53	132.82	3.39	0.0024	177.40	725.66

Figure 52 Single-group ITSA with Newey–West standard errors and two intervention periods (ISLFTA and SAFTA)



As shown in the regression table and verified by visual inspection of Figure 52, there were evidences of increase in the imports of black pepper to India from Sri Lanka after ISLFTA and there was also increase in imports after SAFTA, but the increase was less compared to increase in imports of black pepper after ISLFTA. This reduction in increase in imports of black pepper to India from Sri Lanka after SAFTA was due to the change in tariff policy. In ISLFTA, tariff reductions and duty-free imports of black pepper to India were allowed. But in SAFTA, India included black pepper in sensitive list and the import of black pepper to India by SAARC countries was allowed at eight per cent tariff duty.

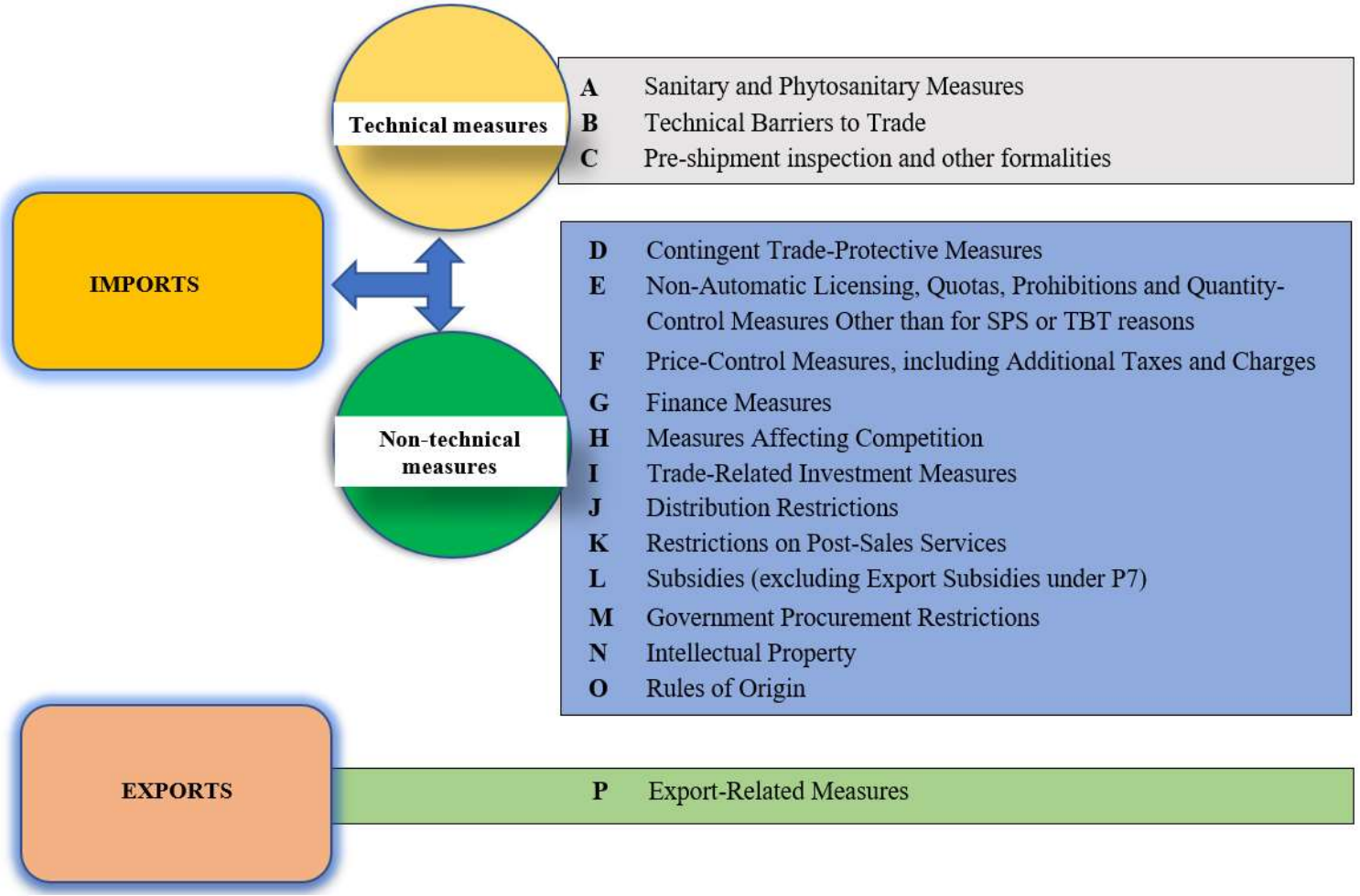
4.4 NON-TARIFF MEASURES (NTMs) AFFECTING BLACK PEPPER EXPORTS FROM INDIA

The non-tariff measures (NTMs) are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on the international trade in goods, causing either change in price or quantity or both (UNCTAD, 2010). The NTMs in goods range from technical regulations, aiming to protect food and beverage supply, consumers, workers, and the environment to more trade-related measures traditionally used as instruments of commercial policy, such as quotas, trade remedies, or rules of origin. The concept of NTM is thus broad and these measures are highly prevalent in the day-to-day conduct of international trade businesses. However, NTMs raise costs of trading and hence the exporters are facing problems in meeting the regulations and remaining competitive. Therefore, it is very important to understand the NTMs applied to commodities and how it affects the trade.

4.4.1 Classification of NTMs

The UNCTAD classification of NTMs develops a tree structure where measures are categorized into chapters, depending on their scope. Then each chapter is further differentiated into several subgroups to allow a finer classification of the regulations affecting trade. The classification of NTMs encompasses 16 chapters (A to P), and each individual chapter is divided into groupings, with depth up to three levels. The chapters of the classification are illustrated in Figure 53.

Figure 53 Classification of Non-Tariff Measures by chapter



Source: UNCTAD, 2017

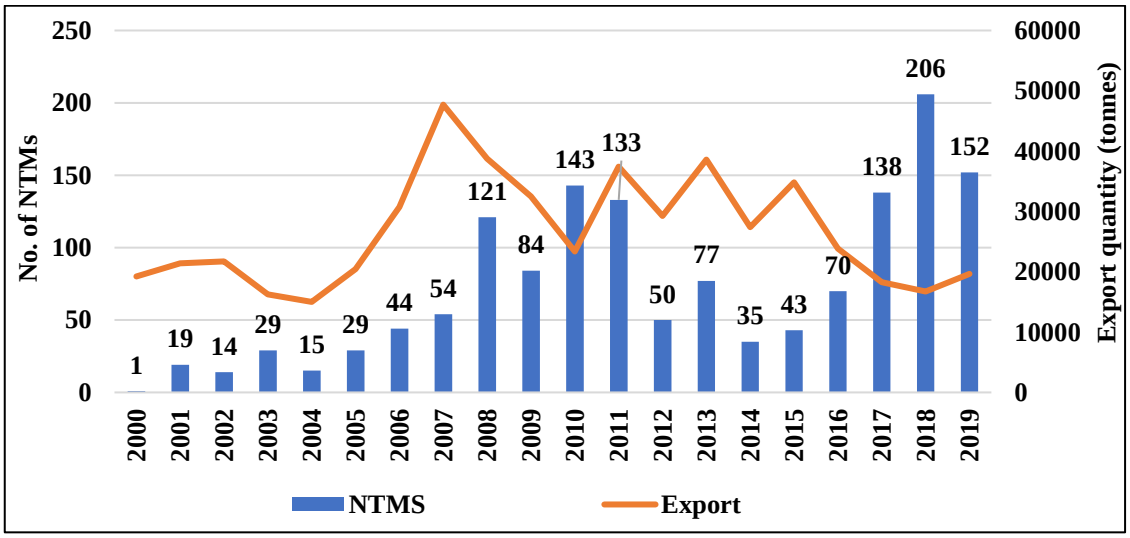
The import measures are mainly divided into technical measures and non-technical measures. The first group comprises of three chapters (A to C): Sanitary and Phytosanitary Measures (SPS), Technical Barriers to Trade (TBT), and pre-shipment inspection and other formalities. The non-technical measures are further subdivided into twelve chapters (D to O). All chapters reflect the requirements of the importing country on its imports, with the exception of measures imposed on exports by the exporting country (chapter P).

Among the different types of NTMs, SPS measures and TBTs are the most prevalent in international trade. Together, SPS measures and TBTs cover more products and trade value than price- and quantity-control measures. Furthermore, SPS measures are more prevalent than TBT in agri-food products (WTO, 2012).

4.4.2 NTMs affecting black pepper exports from India

The relationship between number of NTMs and black pepper export quantity from India for the period from 2000 to 2019 is shown in the Figure 54. The quantity of black pepper exported from India and number of NTMs affecting Indian black pepper exports are showing an inverse relationship. As the number of NTMs increases in a particular year, then the quantity of black pepper exported from India in the succeeding year was found to decrease and *vice versa*.

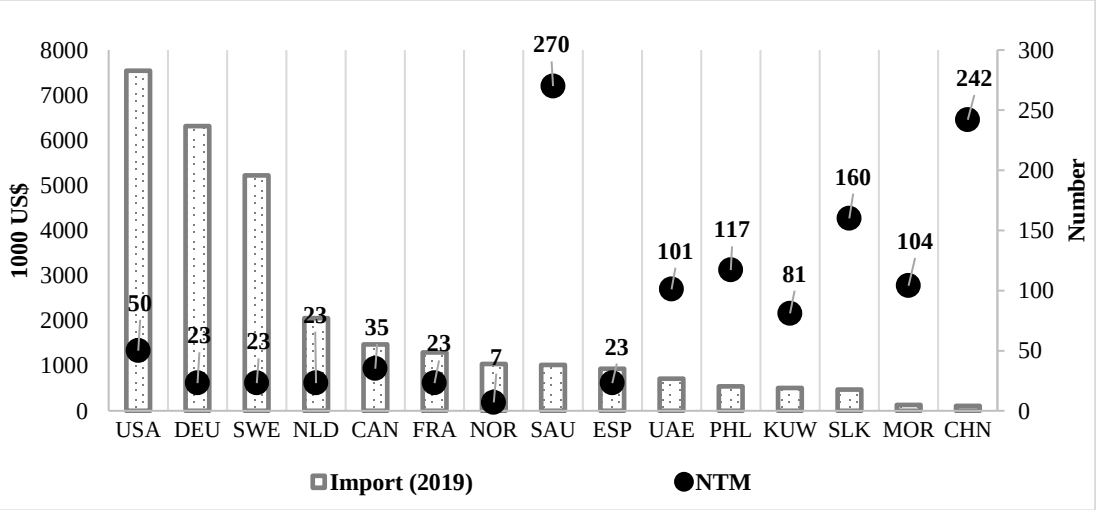
Figure 54 NTMs and black pepper exports from India



Note: Estimated using ITC Market Access Methodology

The major problem among the NTMs faced for the export of spices from India is the Sanitary and Phytosanitary measures and the multiplicity of rules governing them. Indian spices have faced rejection from developed nations on account of aflatoxin and Hazard Analysis Critical Control Point (HACCP) standards, sub-standard processes and product certifications, pesticide residues etc. The details of the NTMs applied by major importing countries on black pepper exports from India are presented in Figure 55. USA was the major importer of black pepper from India in 2019, with an import value of 7544 thousand US$ and the country has 50 NTMs covering the trade of black pepper. Even though Saudi Arabia was having the highest number of NTMs (270), followed by China with 242 NTMs, these countries accounted for only minor share in India's black pepper exports. A breakdown of number of NTMs of major importers of Indian black pepper (USA and European Union) showed that more than 90 per cent of NTMs applied were SPS and TBT measures. Among these two, SPS contributed 76 per cent of the total NTMS on Indian black pepper in USA and 78 per cent in European Union (Table 4.42).

Figure 55 Imports of Indian black pepper to major importing countries and import requirements



Note: USA – United States of America, DEU – Germany, FRA – France, NLD – Netherlands, NOR – Norway, SAU – Saudi Arabia, ESP - Spain, CHN – China, CAN – Canada, UAE – United Arab Emirates, PHL - Philippines, KUW - Kuwait, SLK - Sri Lanka, MOR - Morocco, SWE – Sweden
Source: Estimated using data from ITC Market Access Map

Table 4.42 NTMs affecting black pepper trade by type and countries, 2019

Countries	SPS	TBT	Others	Total
USA	38 (76.00)	11 (22.00)	1 (2.00)	50 (100.00)
European Union	18 (78.26)	3 (13.05)	2 (8.69)	23 (100.00)

Note: Figures in the parentheses show per cent to row total

Table 4.43 Import standards of black pepper in USA (2019)

Ch. No.	Measures	Numbers
A.	**SANITARY AND PHYTOSANITARY MEASURES**	
A12	Geographical restrictions on eligibility	3
A13	Systems approach	2
A14	Authorization requirement for SPS reasons for importing certain products	1
A15	Authorization requirement for importers for SPS reasons	1
A19	Prohibitions/restrictions of imports for SPS reasons, not elsewhere specified	1
A22	Restricted use of certain substances in foods and feeds and their contact materials	10
A31	Labelling requirements	5
A33	Packaging requirements	3
A42	Hygienic practices during production related to SPS conditions	2
A52	Irradiation	1
A64	Storage and transport conditions	1
A82	Testing requirement	1
A84	Inspection requirement	1
A85	Traceability requirements	1
A851	Origin of materials and parts	1
A852	Processing history	2
A89	Conformity assessment related to SPS conditions	1
A9	SPS measures, n.e.s.	1
B.	**TECHNICAL BARRIERS TO TRADE**	
B21	Tolerance limits for residues of or contamination by certain substances	1
B31	Labelling requirements	5
B33	Packaging requirements	2
B6	Product identity requirement	1
B8	Conformity assessment related to TBT	1
B82	Testing requirement	1
C.	**PRE-SHIPMENT INSPECTION AND OTHER FORMALITIES**	
C9	Other formalities, n.e.s.	1
	Total measures	**50**

Source: ITC Market Access Map

In terms of composition of the NTMS, the rise in the NTMs were driven by SPS and TBT measures in all the importers of black pepper. Table 4.43 shows the details of the measures applied on black pepper by USA. And it could be observed that USA had imposed 38 SPS, 11 TBT and one pre-shipment and other formalities on Indian black pepper imports making a total import standards of 50 in 2019**.** The restricted use of certain substances in foods and feeds and, their contact materials and labelling requirements were the major measures under the category of SPS measures.

With regard to black pepper, a lower level of official requirements and scrutiny are practiced in India because of the lower use of agrochemicals in the production of black pepper and also due to the absence of the risk from aflatoxin. The United States has been India's largest export market for black pepper since the disintegration of the Soviet Union. Relatively stringent official attention is given to cleanliness parameters, proper fumigation, and the submission of documentation of inspection for the export of black pepper by the Indian Export Inspection Agency. Strong commercial attention is also given to compliance with microbiological parameters and measures to prevent contamination by potential allergens.

Tables 4.44 and 4.45 summarise the operative requirements of black pepper for entering various international markets. These tables compare and contrast the regulatory enforcement and the commercial importance of traditional quality/cleanliness parameters, various health/hygienic and phytosanitary requirements. These results are based on the experiences/perceptions of Indian spice exporters, as represented by the Indian Spice Exporters Association (Jaffee, 2005). The codes used in the tables signify whether the provision is legally required and enforced and, whether it is required or advantageous for commercial purposes. The primary legal requirement relates to proper labelling, although in the EU there is also some testing for pesticide residues. There are very strict commercial requirements with regard to physical properties, microbiological limits, active ingredient specifications, and cleanliness. The extent of buyer attention to certified HACCP or ISO 9000 systems varies across import markets.

As per the CODEX rules, clear instructions regarding the method of packing to be adopted, quality and characteristics of spices are explained explicitly for spices.

Table 4.44 Process and system requirements for black pepper exports in US, Canada and European Union

Parameters	US/Canada		European Union	
	Legal Requirement	Commercial Requirement	Legal Requirement	Commercial Requirement
Quality				
Compliance with physical and chemical parameters	Not legally mandated	Fully required	Not legally mandated	Fully required
Compliance with cleanliness parameters	Legally mandated and strict enforcement	Fully required	Not legally mandated	Fully required
ISO 9000/1 certification	Not legally mandated	Not required and unnecessary	Not legally mandated	Mostly required (relaxed at certain times)
Export Inspection Agency Certificate	Legally mandated and strict enforcement	Fully required	Not legally mandated	Not required and unnecessary
Food safety				
Compliance with MRLs	Not legally mandated	Not required yet somewhat beneficial	Legally mandated and sample enforcement	Not required yet somewhat beneficial
Compliance with microbiological limits	Not legally mandated	Fully required	Not legally mandated	Fully required
HACCP program requirement	Not legally mandated	Not required yet somewhat beneficial	Not legally mandated	Not required yet somewhat beneficial
Allergen Policy	Not legally mandated	Fully required	Not legally mandated	Fully required
Compliance heavy metal limits	Not legally mandated	Not required yet somewhat beneficial	Legally mandated yet minimal enforcement	Not required yet somewhat beneficial
Plant Health				
Phytosanitary Certificate	Not legally mandated	Not required and unnecessary	Not legally mandated	Not required and unnecessary
Fumigation requirements	Legally mandated and strict enforcement	Fully required	Not legally mandated	Fully required

Table 4.45 Process and system requirements for black pepper in Singapore and Japan

Parameters	Singapore		Japan	
	Legal Requirement	Commercial Requirement	Legal Requirement	Commercial Requirement
Quality				
Compliance with physical and chemical parameters	Not legally mandated	Fully required	Not legally mandated	Fully required
Compliance with cleanliness parameters	Not legally mandated	Fully required	Not legally mandated	Fully required
ISO 9000/1 certification	Not legally mandated	Not required and unnecessary	Not legally mandated	Not required and unnecessary
Export Inspection Agency Certificate	Not legally mandated	Fully required	Not legally mandated	Fully required
Food safety				
Compliance with MRLs	Not legally mandated	Not required yet somewhat beneficial	Legally mandated yet minimal enforcement	Not required yet somewhat beneficial
Compliance with microbiological limits	Not legally mandated	Fully required	Not legally mandated	Fully required
HACCP program requirement	Not legally mandated	Not required yet somewhat beneficial	Not legally mandated	Not required yet somewhat beneficial
Allergen Policy	Not legally mandated	Not required yet somewhat beneficial	Not legally mandated	Not required yet somewhat beneficial
Compliance heavy metal limits	Legally mandated yet minimal enforcement	Not required yet somewhat beneficial	Legally mandated yet minimal enforcement	Not required yet somewhat beneficial
Plant Health				
Phytosanitary Certificate	Not legally mandated	Not required and unnecessary	Not legally mandated	Not required and unnecessary
Fumigation requirements	Not legally mandated	Fully required	Not legally mandated	Fully required

Under the 'In process quality control' (IPQC), only units having all prescribed facilities as per rules to produce safe product shall be approved for the processing and packaging of black pepper export under their own supervision and control (Arati, *et al*, 2012). In US, the United States Food and Drug administration (USFDA) fixes the standards for black pepper to be sold in USA in consultation with the American Spice Trading Association (ASTA). The Indian export consignments to the US are inspected based on the standards and requirements of USFDA. Table 4.46 shows the ASTA cleanliness specifications of the ASTA for black pepper. The ASTA cleanliness specifications for black pepper establish the limits for macroscopic extraneous matter for black pepper imported to the U.S. The cleanliness specifications do not address microbiological contamination or the adulteration of black pepper through the inclusion of dyes or other materials not permitted in black pepper. The ASTA cleanliness specifications are widely recognized within the spice industry and should be applied in transactions between buyers and sellers of spices, including instances when an ASTA contract is utilized. For the purposes of this guidance, extraneous matter is defined as everything foreign to the product itself and includes, but is not limited to: stones, dirt, wire, string, stems, sticks, nontoxic foreign seeds, excreta, manure and animal contamination (ASTA, 2011). The level of contaminants permitted by the cleanliness specifications for black pepper fall below those shown in Table 4.46, except for the "whole insects, dead" which cannot exceed the limits shown.

Table 4.46 ASTA cleanliness specifications for black pepper

Parameters	Unit	Specifications for black pepper
Whole insects, dead	count	2
Excreta Mammalian	mg/lb	1
Excreta other	mg/lb	5
Mold	% by wt.	1
Insect defiled/ infested	% by wt.	1
Extraneous foreign matter	% by wt.	1

For Europe, the European Spice Association (ESA) fixes the standards for black pepper imports and also imposes rules regarding the procedure to be adopted for sample test. ESA also specifies methods to be adopted by the black pepper exporting countries for testing the physical parameters. In EU, eradication is banned, unless

agreed mutually by the buyer and the seller. The AGMARK Standards regarding organic extraneous matter are 250 per cent stricter than the ESA (European Spice Association) standards. For inorganic extraneous matter, the Indian AGMARK standards are stricter compared to those of US, Malaysia and International Pepper Community (IPC) by 500 per cent and ESA by 1000 per cent. With respect to moisture content, the Indian AGMARK standards are 190 per cent higher than that of US, EU and IPC. The Japanese and Indian standards are found to be on the same level. The Spices Board of India is designated as the competent authority to issue health certificates to countries of the European Union for the export of spices and they issue such export certification within a period of 48 to 72 hours after receiving the sample from the exporter.

4.4.2.1 Standard specifications for black pepper

There are three commercial forms of black pepper (black, white and dehydrated green pepper), each varied based on size/shape, colour and sensory property. Table 4.47 shows the basic characteristics of black pepper. Black pepper is available in whole dried and crushed or ground form. It is extensively used for flavoring and pre-serving processed foods and has medicinal properties. The basic characteristics of whole dried black pepper is that it should be unbroken with wrinkled pericarp, is about 2.5 to 7 mm diameter, globular in shape, brownish to dark coloured and free from added colours. Black pepper is having characteristic flavour with penetrating odour and hot, biting pungent taste.

Table 4.47 Basic characteristics of black pepper

Basic Parameter	Black pepper (All forms)
General size/shape	• Whole dried black pepper berries shall be unbroken with wrinkled pericarp • Diameter 2.5 -7.0 mm (approx.) and in globular shape
Colour	• Brownish to dark • Brownish or blackish colour and free from added colouring
Sensory property	• The flavour shall have a penetrating odour and hot, biting pungent taste • Characteristics of black pepper excluding mouldy and rancid odours • The product shall be free from foreign odours, flavours and free from any other harmful substances

Source: Codex Alimentarius, 2017 and AGMARK, 2012

4.4.2.1 Standard specifications for black pepper

The quality of black pepper is as important as yield. The quality factors for black pepper are determined based on the physical, chemical, microbiological, heavy metal and aflatoxin contents, as given below in Table 4.48 and 4.49 for both black pepper neither crushed nor ground and crushed or ground black pepper. In accordance with the physical and chemical characteristics, black pepper neither crushed nor ground is classified into three grades, *i.e.*, Grade I, II and III. Physical, chemical, microbiological and aflatoxin contents for three grades of black pepper neither crushed nor ground are presented in Table 4.48. Minimum bulk density of black pepper neither crushed nor ground ranges between 450 to 500 g/l. Presence of insect filth and mammalian excreta has created lot of quality issues in the international trade of Indian black pepper, so that the exporters are at present more careful with regard to the presence of extraneous matter.

Table 4.48 Standard specifications for black pepper neither crushed nor ground

Parameters	Black pepper neither crushed nor ground		
	I	II	III
Physical			
Bulk density (g/l), min	550.0	500.0	450.0
Light berries/corns (m/m) %, max	2.0	5.0	10.0
Extraneous matter (m/m) %, max	1.0	2.0	2.0
Mouldy berries/corn (m/m) %, max	1.0	3.0	3.0
Insect defiled berries/corns (% by wt.), max	1.0	2.0	2.0
Whole insects, dead or alive (by count), max	Nil	Nil	Nil
Mammalian/other excreta (by count), max	Nil	Nil	Nil
Pinheads or broken berries % (m/m), max	1.0	2.0	4.0
Chemical			
Moisture (m/m) %, max	12.0	12.5	13.0
Total ash, % (m/m), max, on dry basis	6.0	7.0	7.0
Non-volatile ether extract % (m/m), min, on dry basis	7.0	7.0	7.0
Volatile oil % (ml/100 g) min, on dry basis	2.0	2.0	2.0
Piperine content, % (m/m), min	4.0	3.5	3.0
Microbiology			
Escherichia coli (MPN/g)	Less than 3	Less than 3	Less than 3
Salmonella (detection/25 gm)	Negative	Negative	Negative
Aflatoxin			
Aflatoxin total (B1+B2+G1+G2) (μg/kg), max	20	20	20

Source: Codex Alimentarius, 2017 and IPC, 2015

The components of black pepper contributing to its value as a food additive are the essential oil for aroma and alkaloid compounds for pungency. The presence of piperine is the major contributor to the fragrance and pungency of black pepper (Ravindran, 2000). Major difference between black pepper neither crushed nor ground and crushed or ground black pepper is the difference in non-volatile content and volatile oil. Non-volatile content and volatile oil are higher in black pepper neither crushed nor ground compared with crushed or ground black pepper. (Table 4.48 and 4.49). Black pepper grown in Idukki district (Rajakumari area) of Kerala state is gaining demand and preferred by spice exporters and processors because of its relatively high density with premium oleoresin content, which decides its quality, taste and aroma (Nair, 2018).

Table 4.49 Standard specifications for crushed or ground black pepper

Parameters	Crushed or ground black pepper
Chemical	
Moisture (m/m) %, max	12.0
Total ash, % (m/m) max, on dry basis	6.0
Acid insoluble ash, % (m/m) max, on dry basis	1.2
Non-volatile ether extract % (m/m), min, on dry basis	6.0
Volatile oil % (ml/100 gm), min, on dry basis	1.0
Piperine content, % (m/m), min, on dry basis	3.5
Crude fiber, insoluble index, % (m/m) max, on dry basis	17.5
Microbiological	
Escherichia coli (MPN/g)	Less than 3
Salmonella (detection/25 gm)	Negative
Heavy Metal	
Arsenic mg/kg, max	5
Lead mg/kg, max	10
Cadmium mg/kg, max	1
Aflatoxin	
Aflatoxin total (B1+B2+G1+G2) (μg/kg), max	20

Source: Codex Alimentarius, 2017 and IPC, 2015

4.4.2.1 Issues on SPS Standards for Indian black pepper

Between December 1986 and May 1987, out of the 60 shipments of whole black pepper that were sampled by the US Food and Drug Administration, 20 were detained for “filth,” especially insect and mammalian excreta (FDA, 2017). The

problem was not limited to one or a few suppliers and the 20 detentions represented 11 different shippers, including some of the bigger exporters. As a result, the US placed black pepper from India under automatic detention in July 1987, and thus the exports were disrupted. Discussions between the FDA and the Government of India during 1988 resulted in the creation of a black pepper certification program, to be implemented by India's Export Inspection Council (EIC). The EIC of India, with 59 Export Inspection Agencies across the country, carries out inspections of black pepper for export to the United States, based on the standards and requirements of USFDA and issues corresponding inspection certificates for use by the US authorities (WTO, 2005). The US lifted its automatic detention and subsequently audit sample only certified lots to ensure the effectiveness of the clearance program. In addition to normal certificates of inspection, consignments meant for export to the US were also to contain a separate certificate showing test results related to salmonella, insect filth and/or mold, mammalian excreta, and foreign matter.

Addressing the problems of quality/cleanliness in black pepper was among the first tasks of the Spices Board under the Ministry of Commerce, which was established in 1986. The widespread presence of mammalian excreta in black pepper could be attributed to the traditional drying methods followed by the farmers. They applied cow dung to bamboo mats to preserve these mats and the pepper was being commonly sun-dried on such mats. An alternative approach involved applying a fenugreek (a spice) paste to the mats that preserved these for extended use, yet that did not affect the quality of the black pepper. A program was developed to distribute such mats, at subsidized prices, to smallholder pepper growers and to make farmers aware of the problems associated with the traditional practices. The issue of cleanliness in black pepper was also a reason for the establishment of a Quality Evaluation Laboratory by Spices Board in 1989, to monitor the quality of spices being exported. Over the next several years, this laboratory was equipped to conduct basic tests on the chemical and physical properties of spices and gauge the compliance with the standards of cleanliness as established by ASTA/FDA.

In the late 1980s and early 1990s, several spice exporters began to upgrade their black pepper cleaning and preparation systems. Previously, virtually all

operations had been done by hand, with pepper being shaken through sieves, hand-washed, sun-dried, and hand-packed in sacks. The companies invested in mechanical cleaning, washing, drying, and packing equipments, with some of their US and other buyers offering modest price premiums for the cleaner and better-graded product. Another incentive to undertake this investment came from the EIC, which in 1991 introduced an "in-process quality control" option. This option enabled firms to have their black pepper cleaning/processing/packing systems and facilities inspected and pre-certified, thereby avoiding to have each export consignment certified by the Council. This arrangement involved lower inspection and other transaction costs for the qualified firms. The bigger black pepper exporters who have made improvements in their systems, became certified under this program in the early 1990s and subsequently. The USFDA's concern about possible Salmonella or other microbiological contamination of black pepper was the main reason for several exporters and other firms to invest, in the mid-to-late 1990s, in sterilization facilities and equipments, especially involving use of ethylene oxide.

The combination of increased farmer awareness, improved post-harvest practices, company investment in processing/cleaning/sterilization equipment and improved management practices, and the EIC inspection system have helped to limit the further incidence of quality/cleanliness problems in black pepper over the past decade. As many of the smaller trading companies have made little or no such investments, a certain proportion of India's supply falls below the necessary standards. For example, from 1995–96 to 2002–03, the proportion of consignments initially rejected by the EIC has generally been 10 per cent–20 per cent. In many years, the USFDA has detained dozens of Indian black pepper consignments because of the "filth" or suspected microbiological contamination, although many of such consignments were subsequently allowed in the US following additional treatments undertaken by the importers.

Since the mid-1990s, these general quality/cleanliness/hygiene concerns, together with more general practices within the international spice industry, have stimulated a growing number of companies in spice industry to adopt HACCP, ISO 9000, and other certified food safety or quality assurance management systems. By

2003, 14 units were certified under ISO 9000, and 19 companies were approved under the “Indian Spices Logo”, a program initiated by the Spices Board to promote good hygiene and manufacturing practices within the industry. Not all firms have made sufficient advances in their quality assurance and hygiene systems. Relative to other countries, large number of consignments of Indian bulk and ground spice products continue to be rejected by the USFDA due to the presence of filth or microbiological contamination. Between May 2003 and April 2004, many dozen consignments were rejected on these grounds. Indian exporters of spices to Canada have reported that the labelling requirements with respect to spices were not standardized and therefore it created difficulties at the time of getting import clearance and sales in the market. India has faced rejection from the developed nations on account of aflatoxin standards, HACCP standards, sub-standard process and product certifications, pesticide residues etc. The major difficulty arises due to the lack of information provided by these countries on quality standards. Often the reasons for rejection are not justified and also lack transparency.

Still, food safety issues have not been the reason why India has recently lost its share of the black pepper market in the United States or elsewhere. India has lost market share to other countries that have relatively greater problems with product quality as in Vietnam or microbiological contamination like Salmonella in Brazilian supplies. Price has been the dominant factor in the black pepper trade, and India has been able to retain only those buyers who have very specific recipes or formulations, who are unwilling to use pepper supplied from elsewhere. The domestic market has easily absorbed the available supply, frequently at prices above the international market levels. Both traders and producers indicate that the domestic market is more stable and that it should continue to expand.

4.5. MEASURES OF TRADE COMPETITIVENESS

The concept of competitiveness has been defined as a measure of country's advantage or disadvantage in selling its products in the international markets (OECD 2014). The dynamics in the competitiveness of a country in a commodity will be closely reflected in the trade pattern of the commodity, which can be measured in terms of growth in export and import, changing shares of export and import markets *etc*.

The current pattern of trade in Indian black pepper is presented in Table 4.50 and 4.51. The pepper neither crushed nor ground exhibited a negative trade balance in 2019 and the major importers of whole pepper from India were USA, Sweden and Germany, contributing a total share of 42 per cent. India's black pepper export as crushed or ground black pepper has increased in the last decade and it has shown a positive trade balance as India is importing only a negligible quantity of crushed or ground black pepper. The growth rates of both quantity and value of exports from India to major countries have shown negative values from 2016 to 2019 period. Though USA has been importing black pepper in both whole and ground forms, they have imported more than double the quantity of crushed black pepper as compared to whole black pepper in 2019. India plays a significant role in the imports of black pepper to USA as evident from the share of India in its imports. As USA is one of the major importers of black pepper in the world, and they are importing more crushed or ground black pepper, India ought to concentrate on value addition of black pepper. The export unit value of whole pepper from India was highest in Germany when compared to other major importers in 2019. The export unit value of crushed or ground black pepper from India was found to be highest in Saudi Arabia, but India exported only 1.6 per cent of its exports to Saudi Arabia.

Table 4.50 Details of Black pepper exports from India to major countries in 2019

Importers	Value (1000 USD)	Trade balance (1000 USD)	Share in India's exports (%)	Share of India in the partner's imports (%)	Quantity (tonnes)	Unit value (USD/ tonnes)	Growth in exported value between 2016-2019 (%)	Growth in exported quantity between 2016-2019 (%)	Share of partner countries in world imports (%)	Concentration of all supplying countries of partner countries
Black pepper neither crushed nor ground										
USA	6705	6705	17.9	3	1515	4426	-30	-13	16.6	0.44
Sweden	5009	5009	13.4	63	904	5541	-17	0	0.8	0.42
Germany	4058	3928	10.9	5.8	491	8265	-25	-18	8	0.28
UK	2590	2589	6.9	16.6	517	5010	-14	-12	1.8	0.14
Japan	2324	2324	6.2	5.7	391	5944	-24	-7	2.1	0.3
Netherlands	1639	1620	4.4	4.9	301	5445	-27	-12	2.1	0.18
Canada	1517	1517	4.1	9.6	348	4359	-10	2	1.7	0.39
Italy	1358	1358	3.6	5.5	410	3312	7	49	1.3	0.18
UAE	1174	376	3.1	2.6	397	2957	-31	-13	4.2	0.5
Poland	1034	1034	2.8	4.8	459	2253	-13	7	1.5	0.63
World	37364	-48206	100	-	8706	4292	-22	-5	100	-
Crushed or ground black pepper										
USA	13838	13580	47.2	18.6	3982	3475	-29	-13	21.8	0.46
UK	3085	3085	10.5	8.5	756	4081	-32	-16	10.5	0.21
Canada	2847	2847	9.7	9.9	784	3631	6	27	5.5	0.25
Australia	1048	1048	3.6	13	328	3195	-19	2	2.1	0.5
Japan	888	888	3	0.6	175	5074	41	55	5.3	0.34
Philippines	734	734	2.5	37.4	257	2856	-2	29	0.5	0.36
Netherlands	648	648	2.2	5.1	122	5311	30	47	3.8	0.28
China	617	617	2.1	16.3	133	4639	-24	-3	1.2	0.23
Saudi Arabia	460	460	1.6	43.5	51	9020	-9	-13	2.1	0.25
Malaysia	399	399	1.4	32.7	107	3729	18	58	1	0.24
World	29297	28948	100	-	8784	3335	-24	-5	100	-

Source: ITC Trade Map database

Table 4.51 Details of import of black pepper to India from major countries in 2019

Exporters	Value (1000 USD)	Trade balance (1000 USD)	Share in India's imports (%)	Share of India in the partner's exports (%)	Quantity (tonnes)	Unit value (USD/ tonnes)	Growth in imported value between 2016-2019 (%)	Growth in imported quantity between 2016-2019 (%)	Share of partner countries in world exports (%)	Concentration of all importing countries of partner countries
Black pepper neither crushed nor ground										
Sri Lanka	35916	-35589	42	82.2	6045	5941	-13	-3	4.3	0.68
Vietnam	23273	-22583	27.2	5.5	10357	2247	-26	2	43.1	0.09
Indonesia	12569	-12569	14.7	10	4713	2667	-26	-7	13.1	0.16
Brazil	9277	-9272	10.8	4.6	4363	2126	7	55	15.6	0.08
Ecuador	2200	-2200	2.6	27.2	963	2285	17	65	0.5	0.17
UAE	798	376	0.9	36.1	289	2761	-	-	0.2	0.31
Madagascar	679	-679	0.8	7.3	308	2205	-27	2	0.8	0.1
Malaysia	479	68	0.6	2.1	189	2534	-	114	1.9	0.2
Germany	130	3928	0.2	0.3	41	3171	99	113	2.9	0.1
France	94	685	0.1	0.5	40	2350	189	-	1.5	0.2
World	85570	-48206	100		27362	3127	-19	3	100	-
Crushed or ground black pepper										
USA	258	13580	73.9	0.6	58	4448	-	46	7.5	0.35
Germany	66	240	18.9	-	18	3667	-	-	9.3	0.09
China	26	172	7.4	-	3	8667	-	-	0.3	0.38
World	349	28948	100	-	79	4418	-3	19	100	-

Source: ITC Trade Map database

Table 4.52 Unit value of black pepper exports from India in different export markets (US$/kg)

Year	AUS	CAN	DEU	ITA	JPN	NPL	NLD	RUS	SRL	SWE	THA	UAE	UK	USA	VNM	Average
1990	1.89	1.70		1.73	1.89	1.80	1.58			1.69		1.90	1.61	1.77		1.92
1991	1.48	1.45	2.56	1.45	1.39	1.46	1.33					1.10	1.30	1.33		1.50
1992	1.17	1.21	2.28	1.27	1.20	1.18	1.30	1.36		1.11		1.23	1.19	1.23		1.28
1993	1.33	1.21	1.33	1.21	1.37	1.34	1.25	1.22	1.18	1.14		1.26	1.27	1.20		1.24
1994	1.84	2.01	2.30	2.07	2.03	2.59	2.11	2.25		2.16		1.79	2.10	1.93		2.05
1995	2.41	2.34	3.08	2.44	2.34	2.42	2.01	2.51		2.21		2.32	2.32	2.10		2.29
1996	2.81	2.28	2.90	2.43	2.31	2.39	2.47	2.52	2.42	2.53		2.07	2.44	2.43		2.45
1997	4.69	3.67	4.10	4.30	4.37	4.42	3.08	3.91	0.95	3.70		4.05	3.38	3.67	3.87	3.72
1998	4.33	4.34	4.30	4.45	5.09	5.20	3.71	4.56	2.74	4.82	4.48	3.88	4.50	4.46		4.42
1999	4.79	4.83	5.46	4.66	4.95	4.68	4.27	4.11	0.90	5.13	6.18	4.31	4.78	4.73		4.65
2000	3.23	4.44	3.74	4.66	4.65	4.54	4.38	3.77	2.64	4.44	3.34	2.86	5.01	4.39		4.35
2001	2.27	2.12	3.27	2.33	2.48	2.58	2.51	2.30	0.67	2.60	3.50	2.57	2.93	2.32		2.40
2002	1.64	1.57	3.43	1.66	2.67	2.05	1.62	1.39	0.97	2.15	2.46	1.94	1.73	1.57		1.74
2003	1.74	1.80	2.87	1.95	1.92	2.12	2.15	1.63	2.30	2.06	2.14	1.96	2.01	1.75		1.98
2004	1.63	1.66	2.67	1.75	1.97	1.72	2.08	1.56	2.87	1.96	2.30	1.54	2.15	1.71	2.10	1.94
2005	1.76	1.58	3.02	1.80	2.17	2.26	2.18	1.52	2.59	2.03	1.45	1.73	2.17	1.61		1.86
2006	2.51	1.65	3.57	2.39	2.39	1.79	2.48	2.17	3.69	2.30	1.56	2.19	2.15	1.88	2.42	2.14
2007	3.23	2.01	3.95	3.45	3.13	3.11	3.43	2.99	3.45	3.70	4.18	3.05	2.98	2.20	3.10	2.63
2008	3.79	2.15	4.94	3.66	3.98	3.00	4.49	2.55	3.36	3.97	3.25	3.01	3.21	2.60	3.02	3.02
2009	3.79	2.37	4.22	2.98	3.02	1.98	2.87	1.32	2.82	3.07	3.39	2.60	3.13	2.04	2.16	2.52
2010	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85
2011	5.95	4.71	7.17	5.08	7.02	5.10	5.61	4.44	7.37	5.50	17.09	6.02	4.03	4.45	6.62	5.22
2012	5.48	4.85	9.39	7.25	7.81	6.37	7.13	2.06	3.59	7.03		5.29	4.34	4.51	5.92	5.04
2013	7.11	5.06	7.41	6.66	7.81	6.44	6.25	1.33	1.13	7.61	1.41	3.44	5.68	6.34	2.25	4.48
2014	8.90	6.03	10.86	10.04	11.89	4.89	7.41	3.72	10.09	11.79	0.86	4.88	7.11	8.02	2.27	6.51
2015	9.75	8.15	9.72	10.06	11.23	9.57	9.38	3.56	4.45	11.37		6.05	9.85	9.17	8.43	8.59
2016	10.18	6.48	10.94	11.58	11.89	2.24	10.06	6.12	7.99	11.20	11.23	7.11	5.72	9.47	7.49	8.33
2017	7.86	8.37	13.10	7.65	10.69	5.13	12.39	3.67	5.95	10.15	2.53	5.52	5.10	9.53	9.51	8.55
2018	4.87	5.68	12.12	6.87	7.06	1.11	8.15	2.47	6.10	7.24	4.26	3.38	4.73	6.39	6.08	5.82
2019	3.65	5.31	9.33	3.34	5.80	1.70	6.95	0.96	6.52	6.25	4.01	2.99	5.48	5.04	4.55	4.81

Note: AUS - Australia, CAN - Canada, DEU – Germany, ITA – Italy, JPN – Japan, NPL - Nepal, NLD - Netherlands, RUS – Russia, SRL – Sri Lanka, SWE – Sweden, THA – Thailand, UAE – United Arab Emirates, UK – United Kingdom, USA – United States of America, VNM – Vietnam

Estimated using data from WITS

The imports from Sri Lanka, Vietnam and Indonesia constituted 84 per cent of India's black pepper imports from the world. These countries export at a very low price, particularly Vietnam and with the rapid expansion in area, production, and export, these countries could export black pepper at a minimal price (Cariappa and Chandel, 2020). Further, reduction in tariffs under AIFTA, led to a greater import of pepper from Vietnam (Kumar, 2019). It could be noted from Table 4.31that the import value of black pepper from Vietnam has shown a negative growth rate during the period from 2016 to 2019 period, whereas the import quantity growth was positive and has slightly increased for the same period. This could rightly be attributed to the import of low-priced black pepper from Vietnam, which was the major exporter of whole black pepper to the world, with a share of 43 per cent in the world exports in 2019. Among the major exporters of black pepper to India, the lowest export unit value of 2247 USD per tonnes was found for exports from Vietnam.

The unit values of black pepper export from India to different countries for the period from 1990 to 2019 are presented in Table 4.52. It could be observed that among the major international markets, unit value was highest for Germany. Export unit value of black pepper from India to different countries has increased in 1990s, but a decline in unit value was visible during 2000 to 2010. This decline was due to the increased availability of black pepper in the international market after trade liberalisation. For all the countries, the highest export unit values were reported during the period from 2014 to 2017, which coincided with high price in the domestic market.

The concept of competitiveness is related to the ability of a commodity to enter foreign markets and the ability to survive in that market, meaning that if a product has competitiveness; it is the product that is in great demand by many consumers (Tatakomara, 2004). Competitiveness could be divided into two aspects, namely, comparative advantage and competitive advantage. The trade competitiveness of Indian black pepper was measured in terms of comparative advantage and competitive advantage. The comparative advantage of black pepper was estimated using Revealed Comparative Advantage (RCA) Index, while the competitive advantage is measured using Policy Analysis Matrix (PAM).

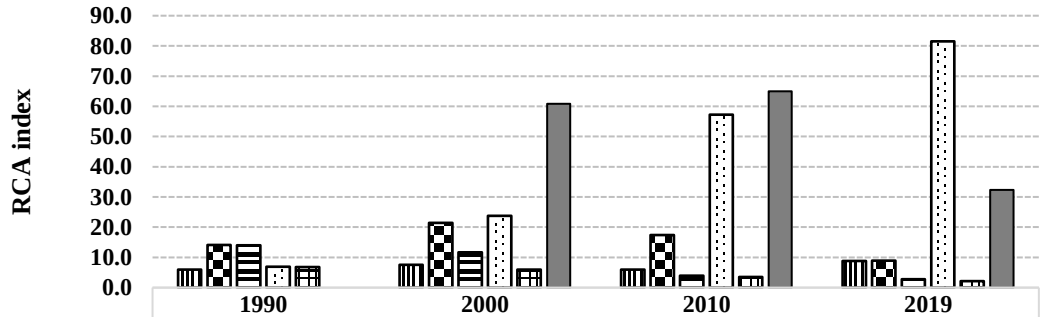
4.5.1 Revealed Comparative Advantage (RCA)

The results of the RCA analyses carried out for major black pepper producing countries are depicted in Figure 56. The RCA index of more than unity indicates a country's international competitiveness, and a lower value indicates the relatively disadvantageous position of a country in relation to the export of black pepper. When a country has a revealed comparative advantage for a given commodity (RCA >1), it is inferred to be a competitive producer and exporter of that commodity relative to a country producing and exporting that commodity at or below the world average price. The higher the value of a country's RCA for black pepper, the greater is that country's export strength in black pepper. A country's comparative advantage in international trade may be influenced by differential rates of change in accumulation of factors of production or due to the increased trade integration with other countries.

It is evident from Figure 56 that all the major black pepper producing countries had comparative advantage in the export of black pepper. India and Indonesia had the highest RCA indices of 14 during 1990, and RCA index of Vietnam was zero because the country was not exporting black pepper during that year. Sri Lanka, Malaysia and Brazil were having RCA indices ranging from six to seven. The RCA indices of Sri Lanka and Vietnam have increased over the years and Sri Lanka recorded the highest RCA index of 81.5 in 2019, whereas for India, the RCA index for black pepper declined over the years and it declined from 14 in 1990 to 2.8 in 2019. The main reason for the declining trend in RCA index was that the denominator was increasing more than the numerator. It implies that the value share of black pepper in the overall export basket of India has been declining compared to the value share of total black pepper exports in the world exports (Veeramani and Saini, 2011). Multiple factors are contributing to the declining export of black pepper from India, and these include increasing domestic demand, stiff competition from other countries, price volatility, poor quality in terms of international norms *etc* (Thomas and Sanil, 2019). Shinoj and Mathur (2008) also reported a similar finding that India is losing its comparative advantage in export of spices, especially black pepper. The RCA index for Sri Lanka increased from seven in 1990 to as high as 81.5 in 2019. In the case of Vietnam, the RCA indices were as high as 60.8 and 64.9 during 2002 and 2010 respectively, which subsequently declined to 32.3 in 2019. The results of the RCA analysis of the six

competing countries cannot give a complete picture of the ability of a country in black pepper trade to compete in the international market because there are still other factors that affect the competitiveness of black pepper (Amorita *et. al.,* 2021).

Figure 56 RCA indices for major black pepper producing countries



	1990	2000	2010	2019
Brazil	6.0	7.6	6.0	8.8
Indonesia	14.1	21.5	17.3	8.9
India	14.0	11.7	4.0	2.8
Sri Lanka	7.0	23.8	57.3	81.5
Malaysia	6.8	6.0	3.5	2.1
Vietnam	0.0	60.8	64.9	32.3

Note: Estimated using WITS data

4.5.2 Policy Analysis Matrix (PAM)

The comparative advantage and policy distortions in the international trade of Indian black pepper was assessed using Policy Analysis Matrix (PAM), an analytical framework developed by Monke and Pearson (1989). For the construction of the PAM, the private as well as social budgets on the basis of financial and social prices were first developed. From the table of PAM, different indicators such as Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), and Domestic Resource Cost Ratio (DRCR) were derived, which indicated the level of protection and trade competitiveness of Indian black pepper. These indices are usually calculated either under exportable hypothesis or importable hypothesis depending upon whether the commodity under consideration is treated as an exportable or an importable item. Under the exportable hypothesis, the domestic good would compete at a foreign port, while with importable hypothesis, the competition is supposed to be taking place at the domestic port. The border price under the exportable hypothesis is the Free on Board (FOB) price, net of the transportation costs (both domestic and international), port clearance charges, marketing costs, traders' margin and processing costs which

are necessary to make the commodity a tradable one. Under importable hypothesis, the relevant border price to be compared to farm gate price is the Cost, Insurance and Freight (CIF) price at the domestic or Indian port plus the domestic transportation cost, port charges, handling cost *etc*.

The PAM contains two accounting identities, one as the difference between revenues and costs which define the profitability of a commodity and the other measuring the effects of divergences (distorting policies and market failures) as the difference between observed parameters and parameters that would exist if the divergences were removed. The PAM is based on the estimation of budgets by using market prices and social prices (Monke and Pearson, 1989).

The data in the first row of the PAM table provide a measure of the private profitability, which assesses the values of outputs and inputs using private prices, which are equal to the actual prices for goods and services that are bought or sold by farmers, merchants, or processors in the agricultural system. The private or actual market prices thus include the underlying economic costs and valuations plus the effects of all policies and market failures. The private profitability illustrates the competitiveness of the agricultural system, given current technologies, output and input prices and policy transfers (Monke and Pearson, 1989; Masters and Nelson 1995; Nelson and Panggabean, 1991). The second row of the matrix in the table measures the social profits that reflects social opportunity costs. The social profits measure efficiency or inefficiency in the use of resources and provide a measure of comparative advantage. To determine the second row of the matrix, social prices, which reflect the underlying scarcity and thus the optimal allocation of resources are used for valuation of inputs and outputs. Social price demonstrates a benchmark policy environment for comparison as these are considered as those that would hypothetically occur in a free market without any policy interventions (Monke and Pearson, 1989; Masters and Nelson, 1995).

PAM analysis for black pepper was carried out under both the scenarios of importable and exportable hypotheses to understand the comparative advantage under import and export situations.

4.5.2.1 PAM under importable hypothesis

For constructing the PAM, the initial step is to estimate the returns and cost of production of the commodity. The returns and cost incurred in producing black pepper per hectare were collected from the farmers through primary survey conducted in Idukki and Wayanad districts during 2019. Using this data, private and social budgets of black pepper per hectare were constructed. In Table 4.53, the PAM for black pepper trade under importable hypothesis is presented. The data in the first row provides the measure of private profitability (Rs. 90,635.5 per ha) that demonstrates the competitiveness of the agricultural system, given the current technologies, prices of inputs and outputs and, policy. The social profit of Rs. 22,000 per ha indicates that the scarce resources were being used efficiently and the country has a static comparative advantage in the production of black pepper. In other words, the cost of domestic production was less than the cost of imports suggesting that the sector can survive without government support at the margin. The difference between the private and social values of revenues, costs and profits was Rs. 68,635.5 per ha which could be explained by the policy interventions.

4.53 PAM for black pepper under importable hypothesis

Basis	Output (Rs./ha)	Input (Rs./ha)		Profit (Rs./ha)
	Tradable	Tradable	Non-tradable	
Private prices	150945	6043.00	54266.5	90635.50
Social prices	92146.05	7233.02	62913.03	22000.00
Divergence	58798.95	-1190.02	-8646.53	68635.50

Note: Estimated using data from survey

The policy interventions in the international trade of Indian black pepper could be explained by the divergence between private and social prices. Based on these values, the competitiveness indices or the measures of competitiveness *viz.*, NPC, EPC and DRCR were estimated. The NPC measures the ratio of domestic price to border price and EPC provides the effect of market distortions on the incentives offered to producers relative to those in the rest of the economy. Compared to NPC, EPC is considered to be a more reliable indicator of effective incentive as it indicates the

combined effects of policies in the markets of tradable commodities which include both output and inputs.

It could be observed from Table 4.54 that Indian black pepper was not an efficient import substitute. NPC was above one (1.64), which indicated that due to the effect of policies, the black pepper price in the domestic market was higher than the world market price. The EPC was also greater than one and the value of EPC exceeded NPC, which means that the domestic processors were being accorded protection to tradable inputs through government policy as they were realizing higher returns as compared to a free-trade situation. The higher values of NPC and EPC implied higher protection for the commodity and greater incentives for production. Thus, the values of NPC and EPC signified that the black pepper from India was less competitive to imports from major countries in the international market.

The DRCR, which measures the efficiency of production, was found to be less than one (0.74) for black pepper indicating India's comparative advantage in producing the commodity, as it implies the efficient utilisation of domestic resources. The DRCR value of less than unity also implies that the cost of domestic resources for producing unit quantity of black pepper was less than the cost of its import.

Table 4.54 Trade indicators derived from PAM analysis under importable hypothesis

Trade indicators	Coefficients
Nominal Protection Coefficient (NPC)	1.64
Effective Protection Coefficient (EPC)	1.70
Domestic Resource Cost Ratio (DRCR)	0.74

Note: Estimated using data from survey

4.5.2.2 PAM under exportable hypothesis

For constructing the PAM under exportable hypothesis, the procedure is the same as that discussed in the case of the estimation of the PAM under importable hypothesis. The only difference is in the calculation of the social price of output under exportable hypothesis, other aspects remaining the same as in the case of importable hypothesis. Hence for this, the export parity price of black pepper was calculated according to the methodology discussed above. Subsequently, the private and social

budgets were constructed in the similar manner as under the scenario of import parity. From the private and social budgets, the PAM framework was developed and the results are shown in Table 4.55.

The interpretations of the figures in the table shown below are more or less similar to Table 4.51. Hence, only the figures with differences are discussed here and they were social revenue, social profit, divergence of output and profit. The social profit of black pepper production under export parity price was Rs. 75,906.10 per hectare, which was also greater than zero. This value indicated that the black pepper production under free trade would favour the producers.

It is evident from the table that output transfer (difference between private revenue and social revenue) was 4892.85. The positive value of output transfer (it was found to be positive in the case of import parity price also) indicated the protective policies implemented by the government positively influenced the producer incentives. On the other hand, the net policy transfers, which is the difference between the private and social profits or social revenue minus social cost of tradable and not tradable inputs, was estimated as Rs. 14729.4, which also turned out to be positive as for import parity price. This positive value illustrated that black pepper producer could earn more profit with government intervention, which means that under free trade, producers will make less profit in contrast to the existing policy situation. It can be concluded that black pepper producers could earn high profit under the current policy orientation of free trade in exports.

4.55 PAM for black pepper under exportable hypothesis

Basis	Output (Rs./ha)	Input (Rs./ha)		Profit (Rs./ha)
	Tradable	Tradable	Non-tradable	
Private prices	150945	6043.00	54266.5	90635.50
Social prices	146052.15	7233.02	62913.03	75906.10
Divergence	4892.85	-1190.02	-8646.53	14729.40

Note: Estimated using data from survey

The protection coefficients were calculated from PAM framework and it is presented in Table 4.56. The results obtained were similar to that of importable hypothesis, with the NPC and EPC values of greater than one and the DRCR of less than one. NPC equal to 1.03 indicates that under exportable hypothesis domestic price

of black pepper was three per cent [(NPC-1)100] higher than export price of Indian black pepper. The results showed that the Indian black pepper was highly protected and non-competitive and hence for traders, the export of black pepper will not be profitable. The EPC was also greater than one and exceeded NPC, which means that the domestic processors were being accorded protection to tradable inputs through government policy as they were realizing higher returns as compared to a free-trade situation. The values of NPC and EPC indicated a higher price of black pepper in the domestic market as compared to the international market, suggesting the inefficiency of the Indian black pepper as an export competitive crop. The DRCR value of less than one indicated that the cost of domestic resources for producing a unit quantity of black pepper was less than the net foreign exchange earned through its export.

Table 4.56 Trade indicators derived from PAM analysis under exportable hypothesis

Trade indicators	Coefficients
Nominal Protection Coefficient (NPC)	1.03
Effective Protection Coefficient (EPC)	1.04
Domestic Resource Cost (DRC)	0.45

Note: Estimated using data from survey

The PAM analysis under importable and exportable hypotheses suggested that Indian black pepper was a non-competitive crop as an export commodity as well as an import substitute.

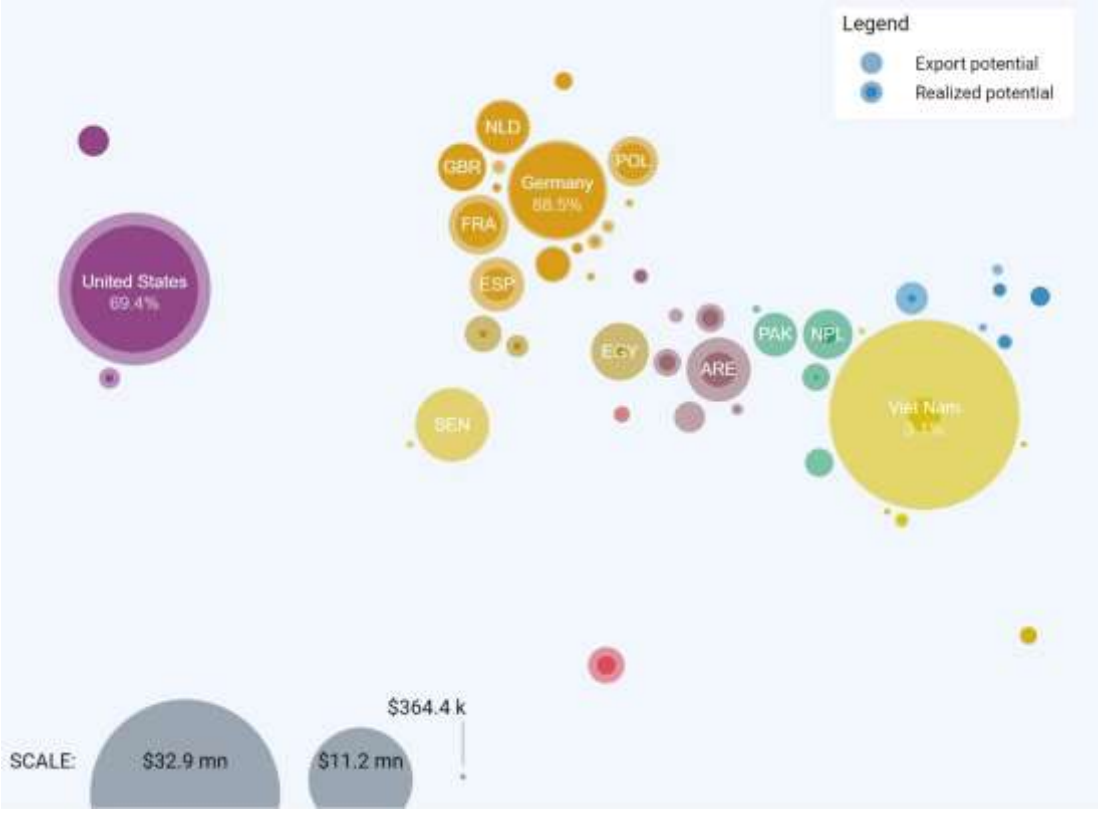
4.5.3 Export potential of Indian black pepper

The export potential of Indian black pepper was visualized using the methodology for estimation of export potential as suggested by International Trade Centre (ITC) Market Analysis Tools. This methodology identifies the potential export value for any exporter in a given product and target market based on an economic model that combines the exporter's supply with the target market's demand, market access conditions and the bilateral links between the two countries (ITC, 2020). It is based on a decomposition of a country’s potential exports of a product to a given target market into three factors: supply, demand and easiness to trade (Decreux and Spies,

2016). The potential export values and untapped potential values for exports of black pepper from India to various countries or export destinations were obtained.

The potential export value means the potential value at which India can export black pepper to a certain target market given its current supply capacities, and the target market's demand and market access conditions. The untapped potential is the gap between actual and potential exports, if any. The reasons for unrealized potentials include lack of information about or difficulties in meeting consumer preferences in the target market, lack of information about or difficulties in meeting market regulations, lack of business contacts or of knowledge about distribution channels, and mismatch of supplied and demanded varieties (ITC, 2020). The export potentials of both black pepper neither crushed nor ground and crushed or ground black pepper were evaluated and the results presented in Figure 57 and Figure 58 respectively.

Figure 57 Export potential of black pepper neither crushed nor ground from India

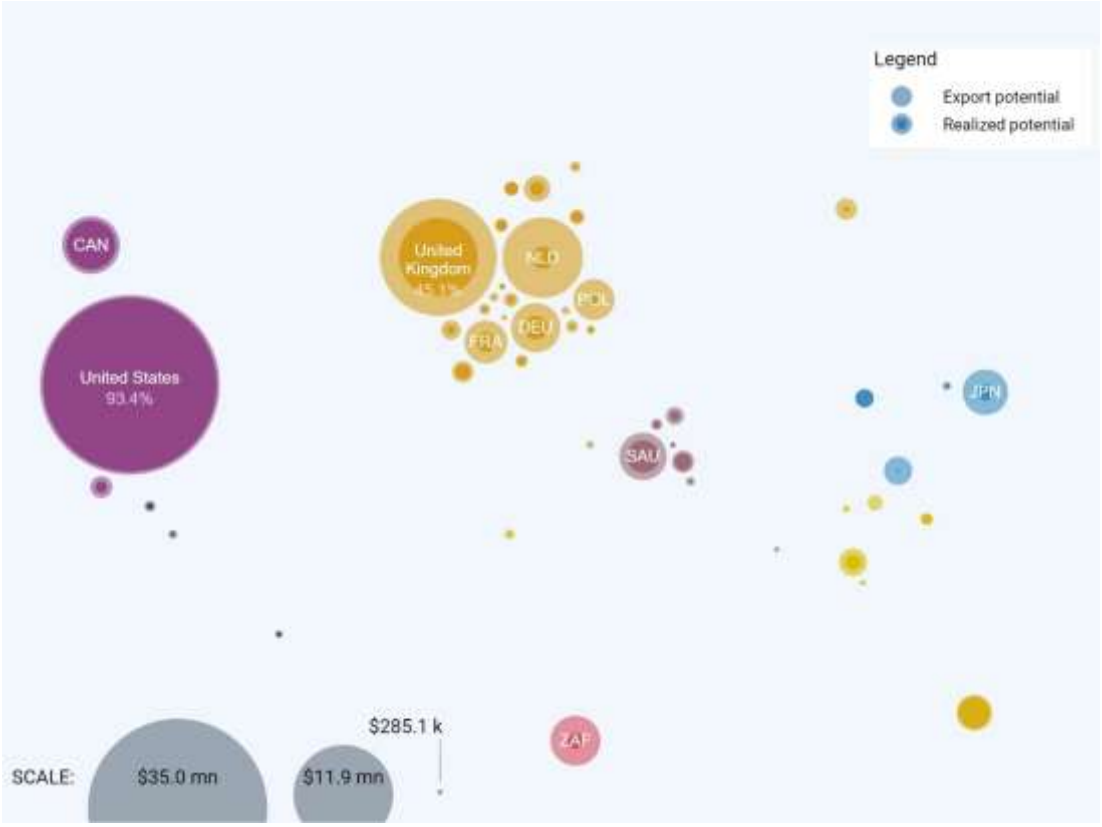


Source: ITC Market Analysis Tool Portal

The potential for exports of black pepper neither crushed nor ground from India is shown in Figure 57. The market with the greatest potential for exports of pepper neither crushed nor ground from India are Vietnam, United States and Germany. India

has closest export links with Nepal. United States is the market with the highest potential demand for Indian whole pepper. Vietnam shows the largest absolute difference between potential and actual exports in value terms, leaving room to realize the additional exports worth $31.9 million (Table 4.57). Even though, Vietnam is the major exporter of black pepper to world, they were also importing black pepper for processing. Currently, they are investing more on modern processing plants for diversifying the product (Sac, 2018). So, India can use this opportunity to tap the export potential in Vietnam.

Figure 58 Export potential of crushed or ground black pepper from India



Source: ITC Market Analysis Tool Portal

Table 4.57 Export potential of black pepper from India

Countries	Export potential (US$ mn)	Actual exports (US$ mn)	Untapped potential (US$ mn)
Black pepper neither crushed nor ground			
Vietnam	32.9	1.0	31.9
US	22.1	15.3	6.8
Germany	10.5	9.3	1.2
Senegal	6.2	0	6.2
UAE	5.0	1.5	3.5
Crushed or ground black pepper			
US	35	32.7	2.3
UK	15.8	7.1	8.7
Netherlands	8.1	0.63	7.5
Canada	4.6	3.3	1.3
South Africa	3.6	0.37	3.3

Source: ITC Market Analysis Tool Portal

The suppliers with greatest potential for export of crushed or ground pepper to world were Vietnam, India and Germany. Vietnam has the highest supply capacity in crushed or ground pepper. The export potential of crushed or ground pepper from India is presented in Figure 58. The markets with greatest potential for India's exports are United States, United Kingdom and Netherlands. Netherlands showed the largest absolute difference between potential and actual exports from India in value terms.

4.6 CONSTRAINTS FACED BY PRODUCERS AND EXPORTERS

The constraints faced by producers, exporters and market intermediaries of black pepper were analysed using Garrett ranking technique and correspondence analysis. A brief description of the socio-economic profile of farmers is also included in the first part of this section for providing the necessary background information for a proper understanding of the constrains in increasing the competitive production and exports of black pepper.

4.6.1 Socio-economic profile of the sample farmers

The socio-economic profile of the sample respondents producing black pepper in Idukki and Wayanad districts of Kerala is presented in Table 4.58. It could be observed from the table that majority of the farmers were aged between 45 and 60 years (48 per cent), while 33 per cent of the farmers were aged between 30 and 45 years.

Table 4.58 Socio-economic profile of sample farmers

Particulars	Idukki (50)	Wayanad (10)	Total (60)	
	No. of respondents	No. of respondents	No. of respondents	Per cen to total sample
Age (years)				
Less than 30	0	0	0	0
30-45	18	2	20	33.33
45-60	24	5	29	48.34
Greater than 60	8	3	11	18.33
Gender				
Male	45	8	53	88.33
Female	5	2	7	11.67
Educational status				
Primary	5	2	7	11.67
Up to SSLC	19	4	23	38.33
Pre-Degree/Higher	17	3	20	33.33
Graduation	9	1	10	16.67
Experience in farming (years)				
Less than 10	0	0	0	0.00
10-30	22	4	26	43.33
More than 30	28	6	34	56.67
Area owned (ha)				
Less than 1	8	4	12	20.00
1-2	24	5	29	48.34
2-5	16	1	17	28.33
More than 5	2	0	2	3.33
Family size				
1-3	18	2	20	33.33
4-6	28	5	33	55.00
More than 6	4	3	7	11.67
Occupational status				
Agriculture	46	10	56	93.33
Public sector	3	0	3	5.00
Private sector	0	0	0	0.00
Self employed	1	0	1	1.67
Annual income (Rs.)				
Less than 1 lakh	7	3	10	16.67
1-2 lakh	12	4	16	26.67
2 -5 lakh	18	2	20	33.33
More than 5 lakh	13	1	14	23.33

Note: Last column indicates each sub-category of the sample farmers as a per cent of the total sample size (60)

The gender-wise classification revealed that 88 per cent of the total respondents were males and only 12 percent were females. The farmers were divided into three

categories based on their experience in farming as having less than 10 years, 10 to 30 years and more than 30 years. It is evident from the table that 57 per cent of the farmers were having more than 30 years of experience in farming and rest of the farmers were having 10 to 30 years of experience. Majority of the farmers were having land holding size of one to two hectares. In the case of family size, it could be observed that 55 per cent of the sample farmers belonged to the family size consisting of four to six members and 33 per cent of them were having families with one to three members. Most of the farmers coming under the family size of four to six members were found utilizing the family labour to minimize the cost of production.

As evident from the table, agricultural and allied sectors formed the major source of income for the farmers. 90 per cent and above were deriving their income from farming. The distribution of the sample respondents based on their annual income depicted that majority of the farmers (33 per cent) were having annual income in the range of two to five lakh rupees and about 26 per cent were having an annual income from one to two lakh rupees. Of the remaining farmers, 23 per cent had an annual income of more than five lakh rupees and 17 per cent had annual income less than one lakh rupees.

4.6.2 Garrett ranking technique

4.6.2.1 Constraints faced by the producers

The sample farmers faced several constraints in the production and marketing of black pepper. The major constraints faced by the sample farmers of Idukki and Wayanad were listed and then ranked based on their responses during the sample survey. The ranks were then converted to mean scores (Garett ranking) for getting a real picture of the constraints prevailing in the study area. The constraints in production and marketing of black pepper as identified by the respondent farmers were ranked and are presented in Table 4.59. The price volatility in black pepper, with a Garrett score of 68.5 was identified as the major constraint in the production and marketing of black pepper by the sample farmers. The frequent fluctuations in black pepper prices discouraged the farmers from investing more in black pepper and also following appropriate management practices, which in turn led to low productivity in in the state. Disease and pest incidence was found to be the second major constraint. The other

constraints identified were climate change, labour shortage, high wage rate, lack of market information, inadequate storage and processing facilities, and exploitation by middle men.

Table 4.59 Constraints faced by the farmers

Sl. No	Problems	Garrett's score	Rank
1	Price volatility	68.5	I
2	Inadequate storage and processing facilities	42.6	VII
3	Lack of market information	47.5	VI
4	Exploitation by middle men	32.1	VIII
5	Disease and pest incidence	63.2	II
6	Climate change	59.8	III
7	Labour shortage	54.5	IV
8	High wage rate	52.3	V

4.6.2.2 Constraints faced by the intermediaries and exporters

The exporters and market intermediaries of black pepper were also surveyed and asked to rank their problems in exporting of black pepper. The constraints faced by them were ranked using Garrett's ranking technique and the results are presented in Table 5.60. Price fluctuations of black pepper in the domestic as well as international markets was seen to be the major constraint by the market intermediaries and exporters and it was placed first with a Garrett score of 56. They reported that low priced black pepper from Vietnam was imported through Sri Lanka and Nepal to India. The low cost of production and high productivity of black pepper in Vietnam helped them to maintain a comparative advantage in black pepper trade, creating a stiff competition in the global market. Stiff competition from other producing countries in the global market, with a Garrett score of 52.01, was identified as the second major constraint.

Even though Indian black pepper had superior quality advantage over the black pepper produced from other countries, a high price differential between the two has been favoring the other countries in the export market. Furthermore, the lack of proper storage and processing facilities were also adversely affecting the market intermediaries and exporters of black pepper. Increased domestic consumption and low productivity resulted in inadequate surplus for black pepper exports, which was

one of the problems identified by the intermediaries and exporters, with a Garrett score of 45.3. The other problems expressed were lack of technical guidance on exports of black pepper (40.4), lack of awareness about SPS standards of produce (38.8), high handling cost (34.6) and financial constraints (28.1).

Table 4.60 Constraints faced by intermediaries and exporters

Sl. No	Problems	Garrett's score	Rank
1	Lack of proper infrastructural facilities like storage and processing	49.70	III
2	High handling cost	34.57	VII
3	Financial constraints	28.09	VIII
4	Inadequate surplus for exports	45.30	IV
5	Price fluctuations	56.25	I
6	Lack of awareness about SPS standards of produce	38.78	VI
7	Lack of technical guidance on exports of black pepper	40.37	V
8	Stiff competition from other producing countries	52.01	II

4.6.3 Correspondence analysis

A simple correspondence analysis was carried out to prioritize the problems faced by the farmers, intermediaries and exporters in the production and export of black pepper. Constraints were identified based on the discussion with the respondents and they were asked to indicate the problems into any one of the groups among the four (low, medium, high and severe). Then scores of 1, 2, 3, and 4 were assigned to each of these responses for carrying out the correspondence analysis.

Table 4.61 shows the distribution of farmers based on their responses towards the constrains i.e., whether it is low, moderate, strong or severe. Price variation, disease and pest incidence, and labour shortage were categorized into the severe group based on the responses made by them. Other constrains like lack of market information, exploitation by middlemen, climate change *etc* were grouped under moderate and strong category. Similar to that of the results from Garrett ranking technique, price variation and disease and pest incidence were found to be the severe problem among

the farmers which is visible from the correspondence plot (Figure 59). The results of correspondence analysis carried out to identify the severe problems among intermediaries and exporters of black pepper in black pepper exports from India is shown in Table 4.62 and Figure 60. From the table and correspondence plot, it is visible that price variation, inadequate storage and processing facilities, stiff competition from other countries were found to be the severe problem faced by the exporters and intermediaries in increasing the competitiveness and exports of black pepper.

Table 4.61 Distribution of farmers based on their constraints

Constraints/Severity	Low	Moderate	Strong	Severe	Total
Price variation	1 (1.67)	1 (1.67)	14 (23.33)	44 (73.33)	60 (100.00)
Inadequate storage and processing facilities	5 (8.33)	23 (38.33)	18 (30.00)	14 (23.33)	60 (100.00)
Lack of market information	12 (20.00)	22 (36.67)	23 (38.33)	3 (5.00)	60 (100.00)
Exploitation by middle men	14 (23.33)	18 (30.00)	23 (38.33)	5 (8.33)	60 (100.00)
Disease and pest incidence	1 (1.67	10 (16.67	18 (30.00)	31 (51.67)	60 (100.00)
Climate change	5 (8.33	14 (23.33	18 (30.00)	23 (38.33)	60 (100.00)
Labour shortage	1 (1.67	4 (6.67	27 (45.00)	28 (46.67)	60 (100.00)
High wage rate	5 (8.33	18 (30.00)	23 (38.33)	14 (23.33)	60 (100.00)

Figure 59 Correspondence plot of correspondence analysis for constraints faced by black pepper farmers

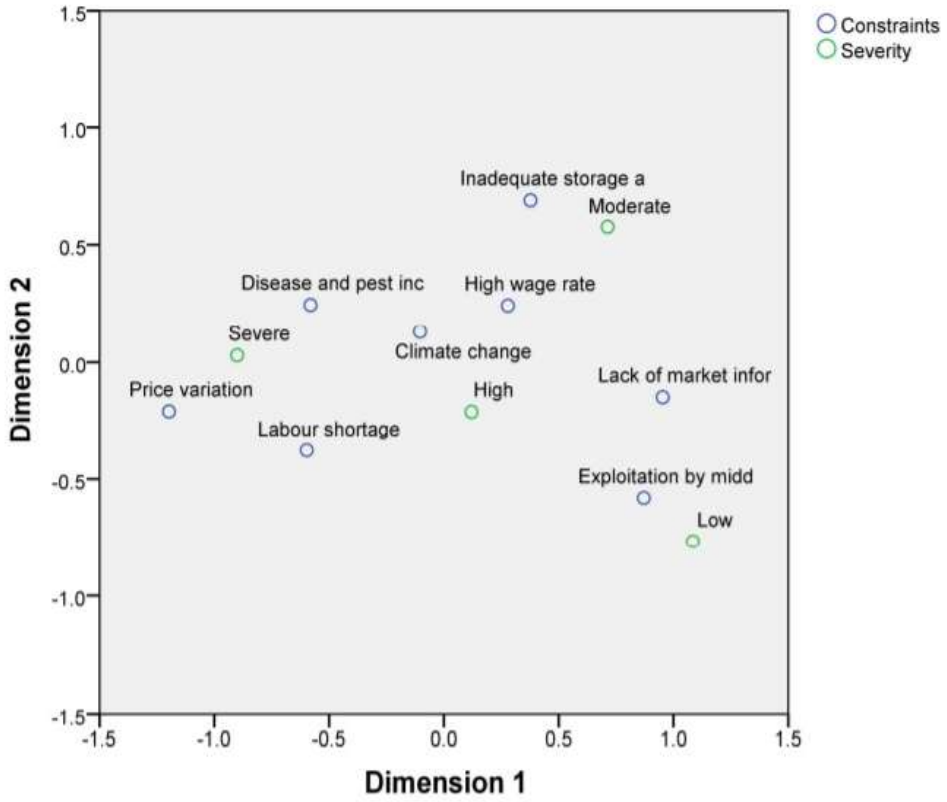
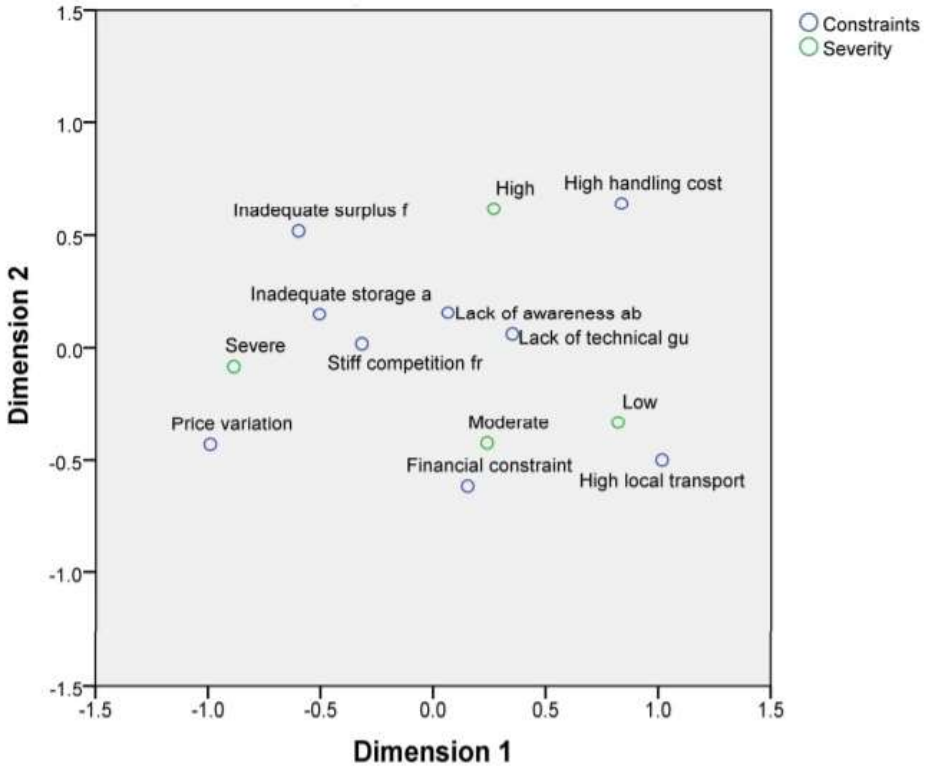


Table 4.62 Distribution of intermediaries and exporters based on their constraints

Constraints/Severity	Low	Moderate	Strong	Severe	Total
Price variation	2 (6.67)	6 (20.00)	4 (13.33)	18 (60.00)	30 (100.0)
Inadequate storage and processing facilities	4 (13.33)	4 (13.33)	8 (26.67)	14 (46.67)	30 (100.0)
High handling cost	8 (26.67)	6 (20.00)	14 (46.67)	2 (6.67)	30 (100.0)
Financial constraints	6 (20.00)	10 (33.33)	6 (20.00)	8 (26.67)	30 (100.0)
Inadequate surplus for exports	2 (6.67)	4 (13.33)	10 (33.33)	14 (46.67)	30 (100.0)
Lack of awareness about SPS standards of produce	4 (13.33)	8 (26.67)	10 (33.33)	8 (26.67)	30 (100.0)
Lack of technical guidance on exports of black pepper	6 (20.00)	8 (26.67)	10 (33.33)	6 (20.00)	30 (100.0)
Stiff competition from other producing countries	4 (13.33)	6 (20.00)	8 (26.67)	12 (40.00)	30 (100.0)
High local transportation cost	12 (40.00)	8 (26.67)	8 (26.67)	2 (6.67)	30 (100.0)

Figure 60 Correspondence plot of correspondence analysis for constraints faced by intermediaries and exporters



Summary and Conclusion

5. SUMMARY AND CONCLUSION

The study entitled "Implications of trade agreements on India's trade in black pepper and its products" was undertaken with the objectives; to analyse the trade performance of Indian black pepper and its products, study the dynamics in the trade policies and tariff structure of black pepper, analyse the impact of multilateral and regional trade agreements on trade, ascertain the Non-Tariff Measures (NTMs) affecting black pepper exports from India, estimate the measures of trade competitiveness and to identify the constraints faced by producers and exporters in increasing the competitiveness and exports of Indian black pepper.

5.1 SUMMARY

The salient findings of the study are summarized below:

5.1.1. Trade performance of Indian black pepper and its products

The study examined the export and import performance of black pepper and its products by analysing the growth and instability in trade, changing patterns of international trade, different components of change in export growth, export diversification, dynamics in trade and export supply and import demand functions.

The rate of growth in black pepper exports from India decreased in the post-2000 period as compared to the pre-2000 period, whereas the growth in imports has increased in the post-2000 period. The exports of black pepper neither crushed nor ground had a similar growth pattern of total black pepper exports till 2000, as the major share of total black pepper exports during that period was accounted by black pepper neither crushed nor ground. The growth rate of crushed or ground black pepper was higher in the pre-2000 period as compared to the post-2000 period. The growth in imports of black pepper was higher than the export growth, and after nineties the growth rate of black pepper imports has considerably increased. India is importing black pepper as black pepper neither crushed nor ground and only a negligible quantity of black pepper is imported to India as crushed or ground black pepper. The instability of black pepper exports has increased in the post-2000 period, while that of imports decreased during the same period. From the instability indices of black pepper

products, it could be observed that the trade in crushed or ground pepper exhibited considerably higher instability when compared to that of pepper neither crushed nor ground.

The contribution of changes in the mean export unit value was found to be the highest among all the decomposed components of the changes in the average export value of black pepper. The increase in the mean export value of black pepper in the post-2000 period compared to the pre-2000 period was mainly due to the change in the mean export unit value of 96.77 per cent, while the change in the mean export quantity contributed only 3.23 per cent to the growth in export value between these two periods. Similar results were observed for changes in the average export value of pepper neither crushed nor ground and crushed or ground pepper. The commodity concentration of black pepper exports from India was high in pre-2000 period and became more diversified in the post-2000 period. The average value of the commodity concentration index for black pepper was 54.1 for the overall period from 1996-97 to 2019-20. During the period from 2000-01 to 2009-10, the average commodity concentration index for black pepper was 52.6, which declined to 48 during the period from 2010-11 to 2019-20. The exports of black pepper neither crushed nor ground from India became increasingly diversified to different countries after 2000, whereas the exports of crushed or ground black pepper were concentrated to few markets in both the periods.

The dynamics in the direction of black pepper exports from India was analysed using Markov chain analysis. The analyses were carried out for black pepper neither crushed nor ground, crushed or ground black pepper, pepper oil and pepper oleoresin. Russia was found to be the most stable market for exports of black pepper neither crushed nor ground from India in pre-2000 period as its probability of retaining the previous period market share was 63.6 per cent. In pre-2000 period, black pepper was mainly exported as black pepper neither crushed nor ground from India. The Markov chain analysis showed that the number of stable export markets for black pepper neither crushed nor ground have increased after 2000 and USA, Sweden, Canada, Turkey, Switzerland and Spain were the stable markets in the post-2000 period. USA was the most stable market for crushed or ground Indian black pepper in all the periods

considered for analyses. The stable markets exports of black pepper oil from India were Germany and USA, with retention probabilities of 62.82 and 53.25 per cent, respectively. For pepper oleoresin exports, the most stable markets were USA, Sweden and Malaysia, with retention probabilities of 65.81, 65.03 and 60.26 per cent respectively. USA remined as the major stable market for exports of black pepper from India in almost all the periods. In the latest period from , the retention probability for US has reduced as India has started exporting black pepper and its products to a greater number of countries.

The trade complementarity indices estimated for both pepper neither crushed nor ground and crushed or ground pepper showed that the export pattern of black pepper from India strongly matched with the import patterns of black pepper in the partner countries, in comparison with the world trade of black pepper. In addition, the falling trend of the trade complementarity indices of India with partner countries in the trade of pepper neither crushed nor ground after 2000 confirmed that India and its partner countries are becoming less complementary, which implied that India's export pattern was not matching with the import requirements of those countries.

The estimated import demand function showed that the import demand for Indian black pepper increased with the increase in the Gross Domestic Products (GDP) of the importing countries and the import price, whereas it was found to decrease in the post-2000 period. Based on the estimated export supply function, it could be concluded that the international price and Indian production of black pepper were positively influencing the export supply, while the export supply was found declining or getting negatively affected in the post-2000 period.

5.1.2 Dynamics in trade policies and tariff structure of black pepper

The tariff profile of Indian black pepper was studied by comparing thevarious tariffs imposed on black pepper and dynamics in the tariff structure was studied using averages and dispersion of tariffs. While examining the changes in the tariff rates of black pepper over the years, it was observed that the *ad valorem* tariffs imposed on black pepper imports to India has reduced below 40 per cent during 2000 as a result of the commencement of liberalisation in India's agricultural trade, which in turn resulted

in increased imports of black pepper to India. Subsequently, India increased the tariff rate of black pepper after 2005. As a result of ASEAN-India FTA, since 2010, India has again reduced the import tariffs of black pepper.

The bound rate and applied rates of import tariffs for black pepper in India were higher when compared to other black pepper producing countries. The bound rates of import duty on black pepper neither crushed nor ground and crushed or ground black pepper are 100 per cent and 150 per cent respectively, whereas the applied tariff rates were 65.6 per cent and 70 per cent, respectively. The MFN, preferential and effectively applied tariff rates for black pepper neither crushed nor ground and crushed or ground black pepper were aggregated using simple average and weighted average methods. After 2005, the weighted average tariff was found to be below the simple average tariff which indicated that the import tariffs applied on black pepper in India were non-uniform and more distortionary. The deviation in the preferential tariffs of black pepper has decreased from 2005 to 2019, whereas for applied tariff the deviation has increased. This shows that the applied tariff of black pepper was much distortionary when compared to other tariffs. The highest deviation between black pepper neither crushed nor ground and crushed or ground black pepper among the different periods was identified during the year 2010, which could be attributed to the implementation of ASEAN-India FTA in which India agreed for a phased reduction of tariffs for black pepper neither crushed nor ground, while crushed or ground black pepper was put under the negative list. The trade policy changes in India have affected the Indian trade in black pepper and the major implication of these policy changes was on the imports of black pepper to India, which has increased after 2000 as evident from the from higher import penetration ratio.

5.1.3 Impact of multilateral and regional trade agreements on black pepper trade

The Regional Trade Agreements (RTAs) having implications on Indian black pepper trade are Indo-Sri Lanka Free Trade Agreement (ISLFTA), South Asian Free Trade Agreement (SAFTA) and Association of South East Asian Nations (ASEAN)-India Free Trade Agreement (AIFTA). The RTAs have caused a significant increase in India's imports of black pepper from Sri Lanka and ASEAN countries.

The impact of AIFTA on Indian black pepper was analysed using SMART and gravity models. The SMART model showed that the tariff reduction under AIFTA increased the imports of black pepper from ASEAN countries after 2000 and it caused a trade creation effect of 19.36 lakh US$, in which Indian consumers were benefitted by low-priced imports of black pepper from ASEAN countries. Indonesia and Vietnam together accounted for nearly 100 per cent of the trade creation. From the results of gravity model it was found thatthe distance between India and ASEAN countries exhibited a negative effect on trade between India and ASEAN countries, whereas GDP of the importing country was having a positive influence on the probability that India and ASEAN countries would engage in trade. The main variable of interest was the AIFTA dummy that captured the effects of trade creation and trade diversion resulting from the RTA. The estimated coefficient of the AIFTA dummy was positive and significant, which indicated a positive trade creation effect among AIFTA member countries as result of the agreement.

The ISLFTA and SAFTA are free trade agreements that are having implications on black pepper trade between India and Sri Lanka. The effects of these two agreements on Indian black pepper were analysed using SMART model and Interrupted Time Series Analysis (ITSA). Even though there was an increase in black pepper imports from Sri Lanka to India, the ISLFTA and SAFTA caused a trade diversion of 10,896 US$ among the non-member countries as compared to a trade creation of 11,147 US$ between India and Sri Lanka and hence these agreements were found to be implemented in favour of Sri Lanka. Indonesia was found to be the most affected country among the non-member countries. The interrupted time series analysis showed that the increase in black pepper imports to India after SAFTA was less when compared to the increase in imports after ISLFTA.

5.1.4 Non-Tariff Measures (NTMs) affecting black pepper exports from India

The NTMs imposed by importing countries have affected the black pepper exports from India. As the number of NTMs initiated by the importing country increased in a particular year, the export quantity of black pepper from India to that country was found to decrease in the subsequent year. A breakdown of number of NTMs imposed by major importers of Indian black pepper (USA and European Union)

showed that more than 90 per cent of NTMs were under the categories of SPS and TBT measures. Among these two, the SPS measures accounted for 76 per cent of the total NTMS imposed on Indian black pepper by USA and in the case of European Union it was found to be 78 per cent.

The cleanliness and microbiological parameters of black pepper are given much importance by the Indian black pepper importing countries. The presence of insect filth, mammalian excreta, and contamination with Salmonella in the black pepper consignment have affected the reputation of the Indian black pepper in the international market. Hence, in addition to normal certificates of inspection, consignments meant for export to the US were also ordered to contain a separate certificate showing the results of the tests related to Salmonella, insect filth and/or mold, mammalian excreta, and foreign matter. Indian exporters of spices to Canada have reported that the labelling requirements for spices were not standardized and therefore, it created difficulties at the time of import clearance and sale in the international market.

India has faced rejection of export consignments of black pepper by the developed nations on account of aflatoxin standards, HACCP standards, sub-standard process and product certifications, pesticide residues etc. The major difficulty arises due the provision of incomplete information on quality standards provided by the importing countries. Often the reasons for rejections are not fully justified and also lack transparency.

5.1.5 Measures of trade competitiveness

The trade competitiveness of Indian black pepper in India was measured in terms of comparative and competitive advantages. The comparative advantage of black pepper was estimated using Revealed Comparative Advantage (RCA) index, while the competitive advantage was measured using Policy Analysis Matrix (PAM).

The RCA analysis was carried out for major black pepper producing countries and the results showed that all the countries were having comparative advantage in the export of black pepper. The RCA indices of Sri Lanka and Vietnam have increased

over the years and Sri Lanka recorded the highest RCA index of 81.5 in 2019, whereas for India, the RCA index for black pepper declined over the years and it declined from 14 in 1990 to 2.8 in 2019.

The PAM analysis for black pepper was carried out under both the scenarios of importable and exportable hypotheses to understand the comparative advantages of Indian black pepper under import and export situations. Under the importable hypothesis, the estimated NPC was above one (1.64), which indicated that due to the effect of policies, the black pepper price in the domestic market was higher than the world market price. The EPC was also greater than one and the value of EPC exceeded NPC, which means that the domestic processors were being accorded protection to tradable inputs through the government policies as they were realizing higher returns as compared to a free-trade situation. The DRCR, which measures the efficiency of production, was found to be less than one (0.74) for black pepper indicating India's comparative advantage in the production of black pepper, as it implied the efficient utilisation of domestic resources. Even though, DRCR value was less than one, the values of NPC and EPC signified that the black pepper in India was less competitive to imports from major producing countries.

The results obtained under exportable hypothesis were similar to that of importable hypothesis, with the NPC and EPC values of greater than one and the DRCR of less than one. NPC equal to 1.03 indicates that under exportable hypothesis domestic price of black pepper was 3 per cent [(NPC-1)100] higher than export price of Indian black pepper. The results showed that the Indian black pepper was highly protected and non-competitive and hence for exporters, the export of black pepper will not be profitable. The EPC was also greater than one and exceeded the NPC. The values of NPC and EPC indicated a higher price of black pepper in the domestic market as compared to the international market, suggesting the inefficiency of the Indian black pepper as an export competitive crop. The DRCR value of less than one indicated that the cost of domestic resources for producing a unit quantity of black pepper was less than the net foreign exchange earned through its export. The PAM analysis under importable and exportable hypotheses suggested that Indian black pepper was a non-competitive crop as an export commodity as well as an import substitute.

5.1.6 Constraints faced by producers and exporters

The constraints faced by producers, exporters and market intermediaries of black pepper were analysed using Garrett ranking technique and correspondence analysis. The price volatility in black pepper was identified as the major constraint in the production and marketing of black pepper by the sample farmers. The frequent fluctuations in black pepper prices discouraged the farmers from increasing investing in the production of black pepper and also from following the appropriate management practices, which in turn led to low productivity of black pepper in the state. Disease and pest incidence was found to be the second major constraint. The other constraints identified were climate change, labour shortage, high wage rate, lack of market information, inadequate storage and processing facilities, and exploitation by middle men.

The price fluctuations of black pepper in the domestic as well as international markets was found to be the major constraint by the market intermediaries and exporters. They reported that low priced black pepper from Vietnam was imported through Sri Lanka and Nepal to India. The low cost of production and high productivity of black pepper in Vietnam helped them to maintain a comparative advantage in black pepper trade, creating a stiff competition in the global market. Stiff competition from other producing countries in the global market was identified as the second major constraint. The other problems were lack of technical guidance on exports of black pepper, lack of awareness about SPS standards of the produce, high handling cost and financial constraints.

5.2 POLICY IMPLICATIONS

The policy implications emerging out of the study are outlined below under different sub-headings as suggestions for solving the existing constraints in Indian black pepper trade, and also for improving the production of black pepper in India.

5.2.1 Trade agreements

- Inclusion of black pepper under the exclusion list in trade agreements

  India's Free trade agreements with other countries have adversely affected the black pepper sector as these have resulted in increased imports of low-priced black pepper to India. Hence, in order to reduce the low-priced imports of black pepper, India must try to renegotiate the existing trade agreements, whichever possible and make efforts to include black pepper under the exclusion list in the existing as well as the forthcoming free trade agreements.

- Implementation of a safeguard mechanism from surge in imports with provisions for volume trigger and price trigger for imposing additional tariffs

  The surges in import of black pepper can disrupt the domestic market, which in turn will affect the black pepper producers. In order to solve this, a special safe guard mechanism can be implemented in response to increased import quantity and lower import prices. The volume trigger mechanism means determining a trigger as well as a remedy based on the current import quantity and a reference quantity, which could be the average of the import quantities of black pepper to India in the previous three years or tiennium. That means, if the current year's import quantity of black pepper to India has increased by 25 per cent or more from the reference quantity, provision for imposition of an additional tariff on black pepper imports to India need to be made. The price trigger mechanism can be implemented based on the import price, *i.e.,* if the import price of black to India has decreased by 30 percent or more of the average of the import price in the preceding triennium, then provision for the imposition of an additional tariff must be imposed on black pepper imports to India, so as to protect the domestic producers from dumping.

- Strict verification of the country of origin of imported black pepper by proper implementation of Rules of Origin

Sri Lanka is the major exporter of low-priced black pepper to India. Hence, India needs to strictly verify the country of origin of imported black pepper by proper implementation of Rules of Origin so as to prevent entry of black pepper from Vietnam to India through Sri Lanka, because of the low production of Sri Lanka in comparison to its exports.

5.2.2 Trade policies

- Monitoring of Advance Authorization Scheme for imports of black pepper

Strict monitoring of black pepper imports to India through Advance Authorization Scheme is required. The duty-free imports under this scheme shall be permitted only for activities like crushing, grinding, sterilization and manufacturing of oils and oleoresins. Hence, authorisation should not be given for cleaning, grading and packing. The input-output norms in processing need to monitored and amended based on the changes in the processing techniques.

5.2.3 Non-Tariff Measures

- Publication of details regarding NTMs imposed by major importers of Indian black pepper on a real time basis

The major problem regarding the NTMs is the unawareness of exporters on SPS and TBT measures which are specific to black pepper. Hence, the government should publish the details regarding NTMs imposed by major importers of Indian black pepper through the website of the Ministry of Commerce and Industry, Government of India on a real time basis.

- Ensure quality production, post-harvest handling and value addition adhering to strict norms

- Actions should be taken at each stage of the supply chain to minimize the potential for contamination of black pepper by mammalian excreta, rodent hair, insect

fragments and other foreign materials. Filth can be minimized in black pepper processing and storage facilities through a number of measures.

- ✓ Adhere to Good Agricultural Practices (GAP) during production, Good Manufacturing Practices (GMPs) during processing and storage of black pepper, particularly those concerning pest control, worker's personal hygiene, sanitation, and inspection of incoming raw materials.
- ✓ Implement product- and process-specific Hazard Analysis Critical Control Point (HACCP) standards

5.2.4 Export promotion

- Product diversification

Only few products of black pepper are being exported from India and hence in order to reduce the risks in the exports of black pepper, India has to diversify into export of more number of black pepper products. The value addition of black pepper should be encouraged from the level of producers.

- Diversifying into a greater number of export markets

Along with product diversification of black pepper, India should strive for diversification of export markets. More than 50 per cent of the exports of crushed or ground black pepper is to USA. Hence, to reduce the risk in exporting, instead of concentrating on a single market or few markets, India has to identify a greater number of markets for black pepper exports.

- Strengthening position in stable markets with suitable policies

As indicated by the Markov chain analysis, USA, Sweden, Canada, Turkey, Switzerland and Spain are the major markets for Indian black pepper. India can concentrate on export promotion in these countries for further exploitation of these stable markets.

- Developing policies to enter non-traditional markets

India must develop strategies for gaining entry into non-traditional and potential markets like Netherlands, New Zealand and Poland.

5.2.4 Price volatility

- Price stabilisation mechanism

  Price volatility was one of the major problems faced by producers as well as exporters. Hence, a black pepper specific price stabilisation mechanism should be implemented by the government to guarantee a stable price.

- Price deficiency payment scheme

  Similar to that implemented for Natural Rubber in Kerala, government must provide a price deficiency payment to black pepper farmers. Under this scheme, farmers need to be compensated for the difference between the reference price, which needs to be arrived based on the cost of production of black pepper, and the farm harvest or selling price.

- Dissemination of timely market intelligence based on price forecasting will help the farmers in making suitable selling decisions based on the price movements.

5.2.5 Low production and productivity

- Proper management of black pepper plantations.

  Production and productivity of black pepper in India is low compared to other countries. Immediate steps should be taken through Sspices Board or through Krishi Bhavans for the better management of black pepper plantations and the farmers also need to be encouraged to adopt replanting of the senile plants.

- Reducing per unit cost of production by improving the productivity can help to improve the trade competitiveness of Indian black pepper.

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Appendices

APPENDIX I

Survey questionnaire for farmers

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE, VELLANIKKARA, THRISSUR
Department of Agricultural Economics

Implications of trade agreements on India's trade in black pepper and its products

Interview Schedule

District: Block: Panchayath:

1 Name of the Farmer :

2 Address, Phone Number :

3 Age :

4 Educational Level :

5 Experience in farming (Years)/Crop :

6 Annual Income :

7 Family Details :

Sl No	Member	Age	Education	Occupation		Annual Income	
				Primary	Secondary	Primary	Secondary
1.							
2.							
3.							
4.							
5.							

8. Number of members engaged in agriculture as full time/part time occupation:

9. Alternate sources of income:

10. Is this crop the sole source of income?

11. Details of the Operational Holding:

I	Area of Operational Holding (ha)	Wetland	Garden land
(i)	Owned (with /without patta)		
(ii)	Leased-in (From which year)		
(iii)	Leased-out (From which year)		
	Total		

When leased out /leased in (year)

12. Cropping Pattern:

Sl. No	Crop	Variety Local/HYV	Area/ No.	Main Product		By-product	
				Quantity	Value	Quantity	Value
I	Perennial Crops						
Mono-crop – Specify Pre-bearing / Peak-bearing / Over-aged – denote age							
Mixed –crop							
II Annual Crops							

If replanting of over-aged plants not done, reasons for that

13. Details of non-crop/Allied activities:

Sl No	Activities	Area/No	Annual maintenance expenses	Gross returns
1	Dairy			
2	Poultry			
3	Fish farming			
4	Self-employment			
5	Others			

14. Production and Price of Pepper

i. Quantity Produced / Sold
ii. Average Price
iii. Peak Price
iv. Lowest Price

15. Cost of Cultivation of pepper

Age of plantation

Wage rate (Rs/day):

Particulars	**Input**		**Human labour**					
			Hired labour		**Family Labour**		**Total**	
	No./ unit	**Cost**	**No.**	**Amount**	**No.**	**Amount**	**No.**	**Amount**
Land preparation								
Digging of pits, Filling up of pits								
Planting material								
Planting/staking								
Mulching								
Pruning/Training								
Manures								
Fertilizers								
Plant protection measures								
Intercultural operation								
Others/Live hedge/Intercropping								
Harvesting								
Cleaning, drying, packing								
Land tax/cess								
Other expenses								
Total								

16. Details of credit:

Have you availed any credit? Yes / No (Specify year also)

Sl. No.	Sources of Finance	Type of Loan			Loan Amount	
		ST	MT	LT	Taken	Outstanding
1	Nationalised bank					
2	Co-operative bank					
3	Gold Loan					
4	Money lender					
5	Friends & relatives					
6	Others					

17. Replanting, land improvement and others (last five years)

Activity	Extent of coverage	Total expenditure	Amount of subsidy & Source	Year
Replanting (No. of plants)				
Replanting (No. of plants) – Shift to other crops				
Land improvement (area)				
Irrigation (area)				
Farm machinery				
Any other investment				

18. Any transaction

Sl. No.	Transaction	Year	Amount
1	Selling of land		
2	Any other property		
3	Buying of land		
4	Buying of any property		
5	Cutting down of trees/selling		
6	Selling of Animals		
7	Any other		

19. Details on Marketing:

1	Main mode of Disposal (Code)
2	Total Marketed Quantity
3	When do you sell the produce?
4	To whom do you sell the produce? (Code)
5	Reason for sales to local dealer
6	Distance to the market
7	Any market charges
8	Mode of Transport
9	Price received per kg:
10	Mode of Payment
11	Storage
(i)	Time period of storage
(ii)	Method of storage
(iii)	Cost of Storage
(iv)	Other remarks
11	Loading and unloading charges
12	Transport charges
13	Source of information on price

20. Constraints faced by farmers

i. Rank the constraints

Sl. No.	Problems	Rank
1	Price variation	
2	Inadequate storage and processing facilities	
3	Lack of market information	
4	Exploitation by middle men	
5	Disease and pest incidence	
6	Climate change	
7	Labour shortage	
8	High wage rate	
9		
10		

ii. Indicate the severity of the problem

Sl. No.	Problems	Severe	Strong	Moderate	Low
1	Price variation				
2	Inadequate storage and processing				
3	Lack of market information				
4	Exploitation by middle men				
5	Disease and pest incidence				
6	Climate change				
7	Labour shortage				
8	High wage rate				
9					
10					

APPENDIX II

Survey questionnaire for intermediaries

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE, VELLANIKKARA, THRISSUR
Department of Agricultural Economics

Implications of trade agreements on India's trade in black pepper and its products

Interview Schedule

1. Name and address of respondent:
2. Age:
3. Sex:
4. Type of market intermediary:

Village merchant/wholesaler/ retailer/ exporter

5. No of years of experience in black pepper trading:
6. Main product(s) dealt with:
7. Quantity (volume) of transaction/year:
8. Do you have any shop or stall for marketing the produce?
9. Place of operation:
10. From whom you mostly purchase?
11. Mode of purchase:
12. Quantity purchased/ year:
13. Average price paid/unit:
14. Purchase place and distance from market:
15. Mode of transport:

16. Transporting charges:

Details (in case of export: fright charges, tariffs etc.)

17. Loading and unloading charges:

18. Processing charges if any (Mention the processing done) :

19. Packaging cost:

20. Storage cost:

21. Average loss in handling:

22. Brokerage:

23. Other expenses:

24. Average retention time:

25. To whom the product sold:

26. Mode of sales:

27. Market fee:

28. Other charges:

29. Price received /kg:

30. Known marketing channel through which produce reach ultimate consumer:

31. Challenges faced:

i. Rank the constraints faced by traders and exporters

Sl. No.	Problems	Rank
Traders		
1	Price variation	
2	Inadequate storage and processing facilities	
3	High handling cost	
4	Financial constraints	
5	Inadequate surplus for exports	
6	Lack of awareness about SPS standards of produce	
7	Lack of technical guidance on exports of black pepper	
8	Stiff competition from other producing countries	
9	High local transportation cost	
10		
11		
Exporters		
1	Price variation	
2	Inadequate storage and processing facilities	
3	High handling cost	
4	Financial constraints	
5	Inadequate surplus for exports	
6	Lack of awareness about SPS standards of produce	
7	Lack of technical guidance on exports of black pepper	
8	Stiff competition from other producing countries	
9	High local transportation cost	
10	High international freight charges	
11	Tariff and NTMs imposed by countries	
12	Delay at port	
13		
14		
15		

ii. Indicate the severity of the problem

Sl. No.	Problems	Severe	Strong	Moderate	Low
Traders					
1	Price variation				
2	Inadequate storage and processing facilities				
3	High handling cost				
4	Financial constraints				
5	Inadequate surplus for exports				
6	Lack of awareness about SPS standards of produce				
7	Lack of technical guidance on exports of black pepper				
8	Stiff competition from other producing countries				
9	High local transportation cost				
10					
11					
Exporters					
1	Price variation				
2	Inadequate storage and processing facilities				
3	High handling cost				
4	Financial constraints				
5	Inadequate surplus for exports				
6	Lack of awareness about SPS standards				
7	Lack of technical guidance on exports				
8	Stiff competition from other producing countries				
9	High local transportation cost				
10	High international freight charges				
11	Tariff and NTMs imposed by countries				
12	Delay at port				
13					
14					
15					

IMPLICATIONS OF TRADE AGREEMENTS ON INDIA'S TRADE IN BLACK PEPPER AND ITS PRODUCTS

By

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ABSTRACT OF THE THESIS

Submitted in partial fulfillment of the requirement for the degree of

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(Agricultural Economics)

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ABSTRACT

Black pepper is one of the most traded spices in the world. The exports of black pepper from India as a share of world exports almost halved from 15.1 per cent in Triennium Ending (TE) 1992 to 7.8 per cent in TE 2017. India became one of the major importers of black pepper, accounting for a share of 7.4 per cent in world imports during 2018. In this context, the present study was undertaken with the objectives, to analyse the trade performance of Indian black pepper and its products, study the dynamics in the trade policies and tariff structure of black pepper, analyse the impact of multilateral and regional trade agreements on trade, ascertain the Non-Tariff Measures (NTMs) affecting black pepper exports from India, estimate the measures of trade competitiveness and to identify the constraints faced by producers and exporters in increasing the competitiveness and exports of Indian black pepper.

The rate of growth in black pepper exports decreased in the post-2000 period as compared to the pre-2000 period, whereas the import growth has increased in the same period. The instability of black pepper exports has increased in the post-2000 period, while that of imports decreased during the same period. The export unit value contributed 96.77 per cent growth in the export value of black pepper between pre- and post-2000 periods. The commodity concentration of black pepper exports from India was high in pre-2000 period and became more diversified in the post-2000 period. The exports of black pepper neither crushed nor ground from India were diversified to different countries after 2000, whereas the crushed or ground black pepper exports were concentrated to few markets in both the periods. The Markov chain analysis showed that number of stable export markets for black pepper neither crushed nor ground have increased after 2000 and USA, Sweden, Canada, Turkey, Switzerland and Spain were found to be the stable markets in the post-2000 period. USA was the most stable market for crushed or ground Indian black pepper in all the periods. The trade complementarity of black pepper neither crushed nor ground was found to be less when compared to crushed or ground black pepper. The estimated import demand function showed that the import demand for Indian black pepper increased with the increase in the Gross Domestic Products (GDP) of the importing countries and the import price, whereas it was found to decrease in the post-2000 period. The estimated export supply function showed that the international price and

Indian production of black pepper were found to be positively influencing the export supply, while post-2000 period was found to be negatively affecting the export supply. The trade policy changes in India have affected the trade of black pepper and the major implication was on the imports of black pepper to India, which has increased after 2000 due to the removal of quantitative restrictions and reduction of tariffs on black pepper.

The Regional Trade Agreements (RTAs) that are having implications on Indian black pepper trade are Indo-Sri Lanka Free Trade Agreement (ISLFTA), South Asian Free Trade Agreement (SAFTA) and Association of South East Asian Nations (ASEAN)-India Free Trade Agreement (AIFTA). The RTAs have caused a significant increase in India's imports of black pepper from Sri Lanka and ASEAN countries. The SMART model showed that the tariff reduction under AIFTA increased the imports of black pepper from ASEAN countries after 2000 and it created a trade creation effect of 19.36 lakh US$, in which Indian consumers were benefitted by low-priced imports of black pepper from ASEAN. Even though there was an increase in black pepper imports from Sri Lanka to India, the ISLFTA and SAFTA caused trade diversion of 14,226 US$ among the non-member countries as compared to trade creation of 11,147 US$ between India and Sri Lanka and the agreements were found to be in favour of Sri Lanka. The interrupted time series analysis showed that the increase in black pepper imports to India after SAFTA was less when compared to increase in imports after ISLFTA. The NTMs imposed by the importing countries affected the black pepper exports from India. As the number of NTMs initiated by the importing country increases in a particular year, the export quantity of black pepper from India was found to decrease in the subsequent year. The values of Nominal Protection Coefficient (NPC) and Effective Protection Coefficient (EPC) were greater than one, which indicated that the export of black pepper from India was non-competitive in the international market. The major constraints faced by the producers were price volatility and disease and, pest incidence, while the constraints faced by exporters were price volatility, stiff competition from other countries and inadequate storage facilities.

The trade policy measures to regulate black pepper imports to India should include bringing black pepper under the exclusion list in trade agreements, implementing a safeguard mechanism from surge in imports by imposing additional

tariffs on the basis of volume and price triggers, strictly verifying the country of origin of imported black pepper and monitoring the Advance Authorization Scheme. To increase the awareness of exporters on SPS and TBT measures specific to black pepper, the details of NTMs imposed by major importers of black pepper need to be published. In order to enhance the export competitiveness of Indian black pepper, farmers should be encouraged to increase the productivity and reduce the per unit cost of production. The country also needs to formulate trade policies for stable export markets and develop strategies for gaining entry into non-traditional markets. A market intelligence system with a crop specific price stabilization mechanism and provision for price deficiency payment ought to be developed to tackle the volatility in black pepper prices.