

**EXPORT PROSPECTIVE AND COMPETITIVENESS OF PADDY
FROM INDIA**

By

Miss. Atla Jyoti Sukaru

(Reg. No. Ph.D./ 015/47)

A Thesis submitted to the
**MAHATMA PHULE KRISHI VIDYAPEETH
RAHURI – 413 722, DIST. AHMEDNAGAR
MAHARASHTRA, INDIA**

in partial fulfillment of the requirements for the degree

of

DOCTOR OF PHILOSOPHY (AGRICULTURE)

in

AGRICULTURAL ECONOMICS



DEPARTMENT OF AGRICULTURAL ECONOMICS

**POST GRADUATE INSTITUTE
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RAHURI – 413 722, DIST. - AHMEDNAGAR
MAHARASHTRA, INDIA.**

2021

CANDIDATE'S DECLARATION

I hereby declare that this thesis or part
thereof has not been submitted
by me or other person to any
other University or Institution
for a Degree or
Diploma

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This is to certify that the thesis entitled, “**EXPORT PROSPECTIVE AND COMPETITIVENESS OF PADDY FROM INDIA**”, submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri Dist. Ahmednagar (M.S.) in partial fulfillment of the requirements for the degree of **DOCTOR OF PHILOSOPHY (AGRICULTURE)** in **AGRICULTURAL ECONOMICS**, embodies the results of a piece of *bonafide* research work carried out by **Miss. ATLA JYOTI SUKARU**, under my guidance and supervision and that no part of the thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation have been duly acknowledged.

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Date : / /2021

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LIST OF ABBREVIATIONS

\$:	Dollar
%	:	Per cent
₹	:	Rupees
Acre	:	43560 sq. feet/ Acre
AVC	:	Average Variable Cost
C.V.	:	Coefficient of variation
CGR	:	Compound Growth Rates
CDVI	:	Cuddy Della Valle Instability Index
EPR	:	Export performance ratio
et al.	:	et alli (and other)
EVMP	:	Estimated Value of Marginal Product
FAO	:	Food and Agriculture Organization
GAA	:	Growth Accounting Approach
GDP	:	Gross Domestic Product
GoI	:	Government of India
ICAR	:	Indian Council of Agricultural Research
IRR	:	Internal Rate of Return
K	:	Kilogram
m.ha	:	Million Hactores
KI	:	Kendrick Index
m.tons	:	Million Tonne
N to P ratio	:	Nitrogen to Phosphorous ratio
NARS	:	National Agricultural Research System
NEPZ	:	North Eastern Plane Zone
NPV	:	Net Present Value
PFA	:	Production Function Approach
PPP	:	Purchasing Price Parity
q	:	Quintal
R&D	:	Research and development
S.E. ±	:	Standard Error
SCH	:	Single cross Hybrids
SI	:	Solow Index
t	:	Tonne
TFP	:	Total Factor Productivity
TFPI	:	Total Factor Productivity Index
TII	:	Total Input Index
TLI	:	Translog Index
TOI	:	Total Output Index
TTI	:	Tornqvist-Theil Index
U.K	:	United Kindom
U.S.	:	United States
U.S.A.	:	United States of America
WTO	:	World Trade Organisation

ABSTRACT

EXPORT PROSPECTIVE AND COMPETITIVENESS OF PADDY FROM INDIA

By

Atla Jyoti Sukaru

A candidate for the degree of

DOCTOR OF PHILOSOPHY (AGRICULTURE)

in

AGRICULTURAL ECONOMICS

2021

Research Guide	: Dr. V.G. Pokharkar
Department	: Agricultural Economics

The present study was conducted to evaluate the export prospective and competitiveness of paddy from India by the way of studying the changes in area, production and productivity of paddy, growth rate and instability in area, production and productivity of paddy during pre-WTO period (1970-71 to 1994-95), post-WTO period (1995-96 to 2017-18) and overall period (1970-71 to 2017-18). The polynomial function was used for analyzing trends in domestic and international prices of paddy. In addition to this export competitiveness of paddy, structural changes in paddy export and determinants of paddy export were also examined. The area of paddy in the world during 1970-71 was 132.66 m.ha which increased to 160.76 m.ha in 2017-18. The production increased to 729.10 m.tons in 2017-18 from 316.40 m.tons in 1970-71. The productivity of paddy was also increased to 4535 kg/ha in 2017-18 from 2385 kg/ha in 1970-71. The area of paddy in India during 1970-71 was 37.59 m.ha which increased to 42.95 m.ha in 2017-18. The production increased to 111.01 m.tons in 2017-18 from 42.22 m.tons in 1970-71. The productivity of paddy also increased to 2584.63 kg/ha in 2017-18 from 1123.17 kg/ha in 1970-71. In Maharashtra, the area of paddy in 1970-71 was 1.36 m.ha which increased to 1.45 m.ha. in 2017-18. The production increased to 2.66 m.tons in 2017-18 from 1.66 m.tons in 1970-71. The productivity of paddy also increased to 1834.48 kg/ha in 2017-18 from 1220.59 kg/ha in 1970-71. The area, production and productivity of paddy increased at the rate of 0.33, 2.22 and 1.88 per cent per annum,

respectively, in India during the entire period. In India, the growth rates of area, production and productivity were positive and significant in Uttar Pradesh, West Bengal, Karnataka, Maharashtra, Punjab and Assam and the growth rate in area was negatively significant while, that for the production and productivity was positively significant in Andhra Pradesh and Tamil Nadu for entire period.

Trend in international prices of paddy more fluctuated than domestic prices of paddy during the entire study period. Fluctuations in domestic and international prices of paddy due to time factor was to the extent of 97 and 70 per cent respectively, as indicated by R^2 . Growth rate estimated for domestic prices i.e. 8.21 per cent per annum is higher than for international prices i.e. 7.02 per cent per annum during entire period (1970-71 to 2017-18). Instability index of domestic and international prices of paddy shown that domestic prices were more consistent than international prices of paddy, i.e. 37.99 and 53.23 per cent respectively, during overall period.

India's total export share in the World total export has been ranging from 1.03 to 1.30 per cent, the average share of India's agricultural export was less than 4 per cent in the World agricultural export, India's paddy export share in World agricultural export was less than 1 per cent, India's agricultural export share in India's total export has declined, While India's paddy export share in the India's agricultural export trade gradually increased from 1.43 to 12.60 per cent and India's paddy export share in paddy production has continuously increased from 1990-91. Direction of trade in World total export-import was negative during the entire study period shown positive. India's total export-import shown negative balance of trade during entire study period, trade balance of India's agricultural export-import was negative during initial study period but it was changed to positive trade balance from 1970-71 to 2017-18 and the World paddy export-import shows negative trade balance over the study period.

On an average the Nominal Protection Coefficient (NPC) and Export Performance Ratio were 0.62 and 11.74, which means that Indian paddy production was competitive in international market during study period.

The trade direction has been explored by Markov chain analysis using export quantity and value. It was observed that UAE and USA were the most stable markets among the major importers of Indian paddy and they retained their original export quantity and value share of 67.93 and 76.34 per cent, respectively. Trade direction of basmati paddy export was observed that UAE was the most stable market among the major importers of basmati paddy and it retained its original export quantity and value share of 79.37 and 79.62 per cent, respectively. Belgium and Kuwait were the most stable markets among the major importers of Indian non-basmati paddy and they retained their original export quantity and value share of 44.09 and 42.90 per cent, respectively.

The factors determining paddy export indicate that the domestic production, wholesale price of paddy and exchange rate were significantly declined whereas international price of paddy and EPR were significantly increased during the study period.

1. INTRODUCTION

Agriculture is the mainstay of the Indian economy. Agriculture and allied sectors contribute nearly 17.32 and 18 per cent of Gross Domestic Product (GDP of India) during 2016-17 and 2017-18, respectively (Economic Survey 2018-19). The agricultural output, however, depends on monsoon as nearly 55.7 per cent of area sown in India is dependent on rainfall. Agriculture contributes approximately one-fifth of total Gross Domestic Product (GDP). It provides the means of livelihood to about two-thirds of the country's population (Central Statistical Organisation). The sector provides employment to 50 per cent of the country's work force and is the single largest private sector occupation. Agriculture accounts for about 10 per cent of the total export earnings and provides raw material to a large number of industries. Besides, the rural areas are the biggest markets for consumer goods, including consumer durables, apart from a major source of domestic savings. Above all, agriculture is the only source of food security for the nation.

Historical evidence suggests that paddy (*Oryza sativa* L.) was originated either in southern parts of India or in the parts of India and Burma. It is also being cultivated in China since ancient times and occupies the first place in paddy production in the World. The region of India, Burma, Thailand and Cambodia is the centre for many wild paddy varieties. Paddy is not a tropical plant but is still associated with a wet, humid climate. It is generally believed that the domestication of paddy began somewhere in the Asian arc. From its place of birth, lost forever in the mists of time, the plant and its grain spread all over the world.

From India, the plant spread to China and then onwards to Korea, the Philippines (about 2000 B.C.), Japan and Indonesia (about 1000 B.C.). The Persians are known to be the importers of this grain. From there its popularity spread to Mesopotamia and Turkistan. It is believed that when Alexander the Great invaded India in 327 B.C., one of the prized possessions he carried back with him was paddy.

1.1 Global Scenario

Paddy is the most widely grown cereal in the World and is staple food for more than 60 per cent of World's population. World paddy production has increased

steadily but at a slow pace from about 400 million tonnes to 477 million tonnes in the past 15 years.

Paddy is believed to be the first cultivated crop in the World. Asia dominates in paddy production accounting for over 90 per cent of the total World's production. It is the second largest cereal produced in the World after corn.

China is the largest producer of paddy contributing for over 30 per cent of the World's paddy output. India occupies the second position accounting for about 22 per cent followed by Indonesia with 8 per cent, Bangladesh with 7 per cent and Vietnam with 6 per cent of total paddy production in the World.

In terms of consumption also, China and India occupied the first two places contributing for about 31 and 20 per cent, respectively. Indonesia accounts for about 8.4 per cent of World's rice exports followed by Bangladesh for about 7.4 per cent and Vietnam for about 4.3 per cent to the total paddy consumption in the World.

There exists a high degree of volatility in the world paddy market because a small change in production or consumption brings a relatively large change in its total trade. Since most of the paddy is produced, consumed and traded by Asian countries and main Asian exporters are Thailand, Vietnam, India, Pakistan and China. Now, the international trade under World Trade Organisation (WTO) rules is free from quantitative restrictions. A country's trade is mostly based on its comparative and competitive advantage in international trade. So, obviously every country faces a tough competition in international market and tries not only to maintain but also to increase its share in market.

India has emerged as the major paddy exporter since 2017-18 onwards replacing Thailand and accounts for about 26.3 per cent of total paddy exports in the World. Apart from India, exports from Vietnam also increased significantly from the year 2017-18 onwards, taking it to the second position with about 7.5 per cent share in the total paddy exports.

1.2 National Scenario

India is the second largest producer as well as consumer of paddy in the World. Similar to the trends in world production, paddy production in India has also increased at a slow pace with 109,000 thousand tonnes in the year 2018-19 primarily due to rise in yields.

Export estimates of paddy have also gone up steadily from about 13000 thousand tonnes in 2017-18. India maintains buffer stocks as per the norms specified to meet the domestic requirements. In view of the comfortable domestic stock position and surplus production, export of non-basmati rice was liberalised and exports have gone up to 10 million tonnes during the past few years.

1.3 State-wise Production

West Bengal has been the largest producing state accounting for about 14 per cent of total paddy output in the country followed by Uttar Pradesh and Andhra Pradesh competing for the second position with about 12-13 per cent share in production. Tamil Nadu, Bihar and Orissa are the other major paddy producing states contributing together to about 20 per cent of country's rice output.

1.4 Importance of paddy in the Economy

World trade figures are very different to those for production, as only about 5-6 per cent of paddy produced is traded internationally. In economic terms, the global paddy trade was a small fraction of 1 per cent of world mercantile trade. Many countries consider paddy as a strategic food staple, and various governments subject their trade to a wide range of controls and interventions.

Developing countries are the main players in the world paddy trade, accounting for 83 per cent of exporters and 85 per cent of imports. While there are numerous importers of paddy, the exporter of paddy are limited. Just five countries viz., Thailand, Vietnam, China, the United States and India – in decreasing order of exported quantities, accounted for about three quarters of world paddy exports in the year 2002. In the year 2010, the three largest exporters of paddy, in decreasing order of quantity exported were Thailand, Vietnam and India. Together, they accounted for nearly 70 per cent of the world paddy exports. The primary variety exported by Thailand and Vietnam was Jasmine paddy, while exports from India included aromatic Basmati variety. China, an exporter of paddy in early 2000s, was a net importer of paddy in the year 2010. Major importers include Nigeria, Indonesia, Bangladesh, Saudi Arabia, Iran, Iraq, Malaysia, Philippines, Brazil and some African and Persian Gulf countries.

Although China and India are the two largest producers of paddy in the World, both countries consume the majority of the paddy produced domestically, leaving little to be traded internationally.

International trade plays an important role in the economic development of a country. The participation of India in international trade is largely confined to primary products, especially of the agricultural sector. Indian trade policy for agricultural commodities is guided by the twin objectives of ensuring national food 2012-13. The major markets for export of Indian paddy were: United Arab Emeritus, Saudi Arabia, Iran, Kuwait and Iraq.

Improving productivity and quality are the key challenges facing farmers today, in an effort to increase their income from limited land under cultivation. Selection of the right type of seed, growth of weeds, onset of insect pests & diseases in the crop, inefficient water management and unpredictable weather conditions are the main factors which affect yield of the paddy crop and it turn the export of paddy. It is very important to use good quality seed and protect the crop from weeds, insect pests and diseases and thus to increased crop production.

The new multilateral trade regime coupled with the policy changes adopted by the most nations aiming towards globalization, provided new opportunities as well as posed several challenges for expanding trade in agricultural products. India too has been able to derive significant benefits from the changed global environment. Since global trade environment is highly dynamic and export is influenced by both micro and macro policies, it is important to understand the product-specific dynamics to improve export performance of agricultural commodities. The global markets for Indian paddy are highly dynamic and the barriers to trade are being lowered gradually all around the world (Singh, 1993). The export of paddy is also related with the buffer stock of paddy held by the government. Because of comfortable buffer stock, India became a major exporter of paddy in 2018. There is a strong demand for Indian paddy in the international markets. The increasing consumer demand for paddy and India's strength for production of basmati as well as non-basmati paddy, coupled with liberal export policy, and large public stock have created ample scope for paddy export. In recent years, the African

countries have also shifted to Indian non-basmati paddy because of price competitiveness (Nethrayani *et al.*, 2012).

The future performance of any product in international markets can be judged in the light of its past performance. Therefore, evaluation of past performance of paddy is necessary to work out its export potential, challenges and opportunities. The present study has analysed major markets for Indian paddy, in terms of its future share. Paddy export from India is determined by various factors and therefore, reliable estimates of determinants of export are essential for the formulation of appropriate policies. The present study *viz.*, export prospective and competitiveness of paddy from India has examined the growth performance and instability of paddy, direction of trade, with competitiveness for export in future and determinants of export of paddy in India.

1.5 Objectives of the study

1. To estimate the growth rates of area, production and productivity of paddy in India.
2. To estimate the trends in domestic and international prices of paddy.
3. To examine the competitiveness of Indian paddy.
4. To analyze the direction of trade of paddy export from India.
5. To study the determinants of export of paddy from India.
6. To suggest the policy measures for export of paddy.

1.6 Hypothesis

1. The production of paddy increased due to both area expansion and productivity improvement in India.
2. Domestic and international prices of paddy are fluctuating.
3. Indian paddy is competitive in the international markets.
4. The dynamics in the direction of paddy export is changing.

1.7 Need of the study

Communication has encouraged trade in the pre-historic times, but in the present century, import-export of paddy business is essential for survival. Now, both import and export are fundamental aspects of any international trade, but a country should have more focus on export of paddy so, the top five reasons are given as follows:

1.7.1 Economic Stability

A good export rate of paddy helps to minimize excessive fluctuations in the financial system of the country. In such a scenario, people gain confidence in their economy and investment increased in the country thus ensures economic stability.

1.7.2 Foreign Investment

A good export rate of paddy encourages investors to invest in countries, especially developing countries like India. Again, foreign investment is vital to fill up the gap between national savings and investment in an economy to have a high economic growth rate.

1.7.3 Inflation Rate

A high export rate keeps the inflation rate under a check and a low inflation rate does not allow the export of goods to slump. Thus, as said earlier, export of a country has a strong co-relation to the inflation rate. For example, India has performed well in the export of paddy in the recent years to control the inflation rate, which has increased the capacity to create widespread public protest.

1.7.4 Internal Trade

It may sound surreal that export promotes internal or domestic trade within a country, but it is true. When there are more paddies of international standards in a surplus amount that an industry can export, a sense of competitiveness encourages industries in the domestic market to become more productive and internal trade prospers.

1.7.5 Foreign Currency

Lower export of paddy of a country mean less foreign exchange, *i.e.* less foreign currency to make necessary imports from other countries, which could prove disastrous. For India, having an adequate foreign currency reserve is a matter of great significance.

Apart from all the above reasons, a country needs to focus on export of paddy to contribute a big share of the country's GDP growth.

1.8 Scope and utility of the study

India exports paddy to various countries around the globe. India had export tradition, especially in agricultural and allied sectors. The expansion of export sector helped India to integrate into the World economy as a supplier of many

agricultural commodities and raw material. The instability in prices of agricultural commodities has been one of the major factors affecting the income levels of the farmers as well as tempo of agricultural production.

The study which focuses on growth performance, export performance, trends in domestic and international prices and structural changes in paddy export from India may help to formulating alternative management strategies and policies to boost paddy export in India.

The findings of this study would be useful to the farmers for making an appropriate decision or planning regarding when to grow and when to sell. It helps to understand the dependence of paddy markets with respect to fluctuation in prices. It would be useful for planners for formulating appropriate paddy export and import policies. Thus the findings of the study would also be useful to all paddy cultivators, exporters, export and import agencies.

1.9 Limitation of the study

The study is depicted only on single crop paddy during the year 1970-71 to 2017-18 and it is focused on trends in domestic and international prices, instabilities, export competitiveness in the World market and direction of trade. One thing that limits the quality of the study is that absence of imports of paddy. Also the study was mostly based on the secondary data collected from various published sources. Often data from various sources may not agree with each other and some efforts to choose the better among them are inevitable. Care has been taken to avoid personal bias in such decisions. However, the limitations inherent in the secondary data are to be recognized.

1.10 Organization of thesis

This thesis shows that, the whole study has been depicted in five chapter, Chapter I highlights the introduction to the topic, Global and national scenario of paddy, importance of paddy in the economy, objective of the study and hypotheses of the study.

Chapter II includes the review of earlier studies connected with present investigation.

Chapter III explains the methodology *i.e.* description of the study area, nature and source of data, and the tools and techniques of analysis adopted for evaluating the objectives of the study.

Chapter IV the of results obtained in consistence with the objectives of the study which are discussed and presented in detail.

Chapter V is the a last chapter which summarizes the entire study and brings about the major policy implications.

2. REVIEW OF LITERATURE

The review of the past literature forms an integral part of any systematic research work. Moreover, it becomes imperative on the part of a research worker to have knowledge of research work carried out by previous researchers in a specific research area of interest so as to plan for his own research work on more systematic lines. This requires review of findings of closely related previous research studies from various sources. The knowledge obtained through such review of literature enables the research to gain insight in respect of the manner in which a given research problem has been tackled, the nature of results obtained and the conclusions drawn. Many times, it may be true that the previous research work might have been carried out under different set of conditions. Nevertheless such knowledge is always useful for improving efficiency and effectiveness of all relating to designing of research problems, adopting suitable methodology and interpreting research results. This chapter reviews in brief available literature on different methodological issues and empirical research results given by various research scholars from similar studies. For the sake of the convenience, the reviews collected from the various sources have been grouped under the following major headings.

- 2.1 Growth rates of area, production and productivity of paddy in India
- 2.2 Trends in domestic and international prices of paddy
- 2.3 Competitiveness of paddy
- 2.4 Direction of trade of paddy export
- 2.5 Determinants of paddy export
- 2.6 Policy measures for export of paddy

2.1 Growth rates of area, production and productivity of paddy in India

Ananthi (2000) analysed the growth of area, production, productivity and export of Indian Non-basmati and basmati rice. The compound growth rates were calculated by exponential function. The area, production and productivity were shown positive trend during first period *i.e.* 1949-50 to 1969-70 and second period *i.e.* 1970-71 to 1997-98. The growth rates of export of basmati and non-basmati rice were positive and significant during the period 1980-81 to 1998-99.

Rajesh *et al.* (2002) studied the trend in export of major spices in India for the period 1970-71 to 1999-2000 and found that black pepper registered a positive annual growth rate of 2.38 per cent in quantity and 12.78 per cent in value. While large cardamom registered 12.76 per cent of export quantity and 21.4 per cent export value, ginger registered 4.05 per cent growth in quantity and 10.15 per cent in value. Turmeric export registered 4.14 per cent in quantity and 13.08 per cent in volume during the study period.

Shivaraya and Hugar (2005) evaluated the compound growth rate in export of tomato in quantity and value with the help of exponential function. The results have shown that growth in both quantity and value of exports increased significantly during both pre-liberalised and post-liberalised periods. The growth in quantity of exports (77.85 %) was found to be higher than their value of export (74.19 %) due to impact of globalisation of Indian economy.

Mohalkar (2005) estimated the state wise compound growth rates of area, production and productivity of rice in India during the period (1989-90 to 2001-2002). The area under rice was highest with significantly increased at 5.58 per cent per annum in Haryana state but growth rate of production and productivity of rice were highest and significantly increased with 5.10 and 6.93 per cent per annum in Mizoram and Karnataka respectively.

Kumar *et al.* (2008) estimated the annual compound growth rates for production and export of cucumber and gherkin for India and the World for the period 1991- 2005. The production of cucumber and gherkin has increased at the per annum rate of 0.97 per cent in India and 6.32 per cent for the World. Similarly, growth in area and yield has also increased, though at a slower rate in India than the World. India has registered a significant ACGR in the export of all the three categories of cucumber and gherkin products in comparison to the World. In the case of 'fresh' cucumber and gherkin, India has achieved an ACGR of 33.37 per cent in physical terms and 30.85 per cent in value terms, whereas export growth in the World was of only 3.13 per cent in physical and 4.25 per cent in value terms. Among all the three categories of cucumber and gherkin, the preserved category had registered the highest ACGR of 48.17 per cent in physical and 43.76 per cent in value terms, followed by provisionally preserved category.

The unit value of export in all the three categories had registered a significantly negative growth rate of 3.7 per cent per annum on overall basis, while for the World it had increased by 0.37 per cent per annum, though it is non-significant.

Nethrayani *et al.* (2012) estimated compound growth rates of Indian basmati and non-basmati rice export from 1998-99 to 2009-10. The study reveals that quantity and value wise compound growth rates of basmati rice export at an annual rate of 10.23 per cent and 15.98 per cent per annum, respectively and these growth rates were statistically significant at 1 per cent level of significant. In case of non-basmati rice, both quantity as well as value wise it shows negative growth rate and statistically non-significant.

Acharya *et al.* (2012) analyzed the growth in the area, production and productivity of different crops in Karnataka was estimated using the exponential function for the period 1982-83 to 2007-08. Growth rates showed a significant and positive growth in area under pulses, vegetables, spices, fruits and nuts while cereals showed significant and negative growth. The area under rice has recorded a mild annual increment. The growth in area under oilseeds and commercial crops was negative and insignificant. Similarly the production of cereals, pulses, vegetables and fruits showed a significant positive growth. The production of oilseeds and commercial crops registered insignificant positive growth. The productivity of different crops recorded significant growth in the case of cereals, pulses and fruits, productivity of oilseeds recorded moderately positive growth. The productivity of commercial crops registered insignificant positive growth and for vegetables the growth in productivity was insignificant and negative.

Naik *et al.* (2013) examined the production and export performance of turmeric in India for the period 1974-75 to 2009-10 by using exponential form of growth function. The results of the study revealed that, there were significant growth rates in production and export of turmeric. Instability index has been worked for the production and export for pre-WTO and post-WTO periods. Instability has been observed high for production, export quantity and export value.

Prabakaran and Sivapragasam (2013) the growth pattern in area, production and yield of rice showed an upward trend at state and regional level except in Rayalaseema region which showed a decline in area and production. Telangana region

showed highest growth rates in area, production and yield during the study period. Coastal Andhra region showed highest growth rates in terms of area, production and yield next only to Telangana region. In case of sorghum the growth rates of area and production showed a downward trend in all the regions and the state as a whole. The growth of yield in sorghum crop Rayalaseema region was highest during 1970-80 and total period followed by state as a whole and Telangana region.

Kusuma and Basavaraja (2014) analyzed the compound growth rates of mango production, area and yield, export quantity and export value during the period 2001-02 to 2010-11. The results revealed that both area 6.77 per cent and production 3.70 per cent exhibits positive growth, while productivity -0.72 per cent of mango found to be negatively growing. The study also depicted the growth in export quantity and value of export where in growth of value of export was increasing at 9.98 per cent per annum than quantity of export 5.65 per cent.

Patil and Yeledhalli (2016) analyzed the growth instability in area, production and productivity of different crops in Bengaluru division. The results revealed that Bengaluru urban had the highest CAGR which was 24.26 per cent in productivity was significant at 5 per cent level. In Bengaluru Rural the highest CAGR was 22.26 per cent in productivity significant at 1 per cent level. Production of chrysanthemum had growth of 22.36 per cent was the highest annual growth and 4 per cent (area of tamarind) was found to be lowest instability for selected crops in Chitradurga, In Davanagere the highest CAGR was observed in productivity of tomato (9.12 %). In Kolar district, 19.65 per cent instability observed in production was significant at one per cent. In Shivamogga district highest CAGR observed in production of sunflower to an extent of 29.57 per cent. In Tumkuru area under green chillies was growing at rate of 34.46 per cent per annum.

Adhikari *et al.* (2016) analysed compound growth rate, instability index of rice export to different countries. The higher growth observed in value of basmati rice export (15.87 %) was due to higher growth in unit value than quantity of export (7.55 %) during 1980-81 to 2012-13. The growth rate of unit value of rice export was higher in period I (13.48 %) than period II (5.06 %). The growth rates in export of non-basmati rice in terms of quantity, export earnings and unit value were 10.87, 17.74 and 6.20 per cent, respectively during the study period. The instability index has been found highest for

quantity (43.37 %) in case of basmati rice and value (141.36%) in case of total rice during the entire period.

Jain (2018) analysed 41 years data (1970-71 to 2011-12) on area, production and yield under paddy to understand the question of instability in rice production in India. The analysis shows that at all India level compound annual growth rates of area, production and yield of rice were positive but it had been declining gradually over the periods. In the recent decade (2000-01 to 2011-12) there is increase in instability at all India level in area, production and yield of rice. The possible reasons for increase in instability were low percentage of irrigated area to total cropped area, decline in use of seeds and manure and other inputs necessary for agriculture. In the post reform period (1990-91 to 2016-17) the instability has increased in case of wholesale price of paddy across various states while instability has declined in case of farm harvest price of paddy.

Samal *et al.* (2018) analysed the decadal growth in an area, production and yield of rice in India and for different states were computed and compared for the period 1970-71 to 2015-16. It was found that area growth in most of the states has either exhausted or declined. The production growth was mainly from the growth in productivity. Therefore, future growth in rice production has to come from yield growth through technological improvement. This requires more investment in rice research to increase the yield.

Kasula Sekhara (2019) estimated the compound growth rates of area, production and productivity of paddy in the global during 1991-92 to 2015-16. The study period was divided into four periods *i.e.* first period (1991-92 to 1999-00), second period (2000-01 to 2009-10), third period (2010-11 to 2015-16) and overall period (1991-92 to 2015-16). The compound growth rate of the area, production and productivity of paddy was significantly increased with 0.77, 1.99 and 1.21 per cent per annum respectively, during (1991-92 to 1999-2000). But the area, production and productivity were significantly decline with 0.51, 1.61 and 1.09 per cent per annum respectively during (2000-01 to 2009-10). The area and productivity were non-significantly declined with 0.21 and 0.65 per cent per annum respectively and production was significantly decline with 0.93 per cent per annum during (2010-11 to 2015-16). At the overall period (1991-

92 to 2015-16), the compound growth rate of the area, production and productivity of paddy were significantly increased with 0.39, 1.33 and 0.94 per cent per annum respectively.

Myneni Yamini (2019) estimated annual compound growth rates of area, production and productivity of cotton in India. The area of cotton has been increased at the rate of 0.98 per cent per annum during the entire period. The annual compound growth rate in area of cotton in India during period-I (1970-71 to 1994-95) and period-II (1995-96 to 2016-17) was 0.56 and 1.86 per cent respectively. The annual compound growth rate in production of cotton in India during period-I (1970-71 to 1994-95) and period II (1995-96 to 2016-17) was 2.57 and 7.01 per cent, whereas the production of cotton in India has been increased with a growth rate of 4.06 per cent per annum during entire period. The annual compound growth rate in productivity of cotton during period-I (1970-71 to 1994-95) and period-II (1995-96 to 2016-7) was 2 and 5.06 per cent, respectively. The productivity has increased with annual growth rate of 3.05 per cent per annum during the entire period.

From the foregoing reviews, it is noted that, the production of paddy was increased highly due to area expansion and slightly due to productivity improvement increased over a study period except in some years where production was declined.

2.2 Trends in Domestic and International Prices

Lekshmi *et al.* (1996) studied that the trend in annual average price of natural rubber in India during the 27 year period from 1968-69 to 1994-95 for the different phases. Natural rubber price in India did not show any significant pattern of consistent movement towards a particular direction in the long run. Two broad phases (1968-69 to 1984-85 and 1985-86 to 1994-95) of natural rubber price movement were identified based on the observed trend. Wide but less frequent fluctuations and mild but frequent fluctuations were the characteristics of the first and second phases respectively. Role of the non-quantifiable factors in price determination could not be ascertained; and therefore, a price forecasting based on the empirical modelling is less likely to approximate reality.

Guledgudda *et al.* (2002) studied the trend in world tea production and export. They reported that India's share in the world tea production has slipped gradually

from 38.12 per cent in 1960-61 to 28.83 per cent in 1990-91 and further marginally came down to 27.45 per cent in 1999-2000. Whereas its share in world tea exports has been similarly decreased gradually from 36.41 per cent in 1960-61 to 18.33 per cent in 1990-91 and further decreased to 17.86 per cent in 1998-99.

Rajesh *et al.* (2002) studied the trend in export of major spices in India for the period 1970-71 to 1990-00 and found that black pepper registered a positive annual growth rate of 2.38 per cent in quantity and 12.78 per cent in value. While large cardamom registered 12.76 per cent of export quantity and 21.4 per cent export value, ginger registered 4.05 per cent growth in quantity and 10, 15 per cent in value. Turmeric export registered 4.14 per cent in quantity and 13.08 per cent in volume during the period under study.

Reddy *et al.* (2015) examined the production trends of food and non-food crops in India. Before the advent of the British rule, crops such as cotton, tobacco and sugarcane were grown fairly extensively since land revenue had to be paid mostly in cash and the prices of these crops, relative to those of food grains, were much higher at that time. Even during the British rule, the situation did not change much. Indian agriculture recorded a significant acceleration in growth and productivity after independence as compared with the pre-independence period. The contribution of the agriculture and allied sector to total GDP of current prices in 2000-2001 is 23.35 per cent and it gradually reduced and stood at 17.1 per cent by the year 2009-10.

Savitha and Kunnal (2016) analysed the trends in arrival and prices of paddy by orthogonal polynomial regression in the pace and pattern of market arrivals and prices of paddy in Sindhanur and Sirguppa markets. The seasonal variability of price was less when compared to the variability in arrivals of paddy in both the markets. The cyclical variation in arrivals and prices over the years was found to be an uneven cycle which was being observed in both markets. Both the markets have shown an increasing trend for both for arrivals and price. Strong relationship between arrivals and price was ascertained as the co-efficient of correlation and regression between arrivals and prices was positive and significant in both the markets.

Mittal *et al.* (2018) examined the patterns, trends and volatility in domestic and international prices of rice and wheat, and found that although both the

international and domestic prices are volatile, the degree of volatility is higher in the international prices. The volatility in domestic prices is mainly due to internal production shocks and is not influenced much by the international prices. This disconnect is attributed to domestic policy measures, such as market support to farmers and public stockholding of food grains for public distribution and price stabilization.

From the above reviews, it is noted that polynomial function is the best function for analysing the trends in domestic and international prices of paddy. Polynomial function shows the more fluctuations in international prices than domestic prices. Therefore, paddy is advantageous crop to export in international market.

2.3 Competitiveness of Indian Paddy

Jayesh (2001) used the Nominal Protection Coefficient technique for the export competitiveness of Indian pepper. The nominal protection coefficient value were found to be lesser than unity (0.849) in Calicut and (0.817) in Sirsi markets, indicating that the Indian pepper is competitive in the international market and which is an efficient export oriented commodity.

Kumar *et al* (2001) computed the nominal protection coefficient under exportable hypothesis in order to measure the export competitiveness of selected livestock products in the global market from the period 1974 to 1998. Their results showed that butter has not been competitive internationally after T.E. 1982. India also lacks international competitiveness in poultry products, but India exhibited international price advantage in beef, pork and mutton. They concluded that beef was highly export competitive in all reference year and its NPCs varied from 0.162 in TE 1994 to 0.414 in TE 1985.

Shivaraya and Hugar (2005) attempted to evaluate the export competitiveness with the help of Nominal Protection Co-efficient (NPC). The NPC (0.60) indicated that tomato was highly potential and competitive over a period of 11 years for its export to other countries. Thus, there is a comparative advantage in the export of these commodities and can be achieved with the concerted efforts of government by developing air conditioned transport facilities to export the fresh tomato.

Sadavati (2006) analyzed export competitiveness of Basmati rice with the help of Nominal Protection Coefficient (NPC) for the period 1980-81 to 1989-99.

Although Basmati rice trend is positive, it is not smooth and steady. Around 60 to 70 per cent of the entire basmati rice exports are going to Saudi Arabia, Kuwait and UAE. The study reveals that there is ample scope for USA, one of the important importers of Basmati rice. The estimated NPC of the basmati rice with respect to USA with an average of 0.82 reveals that basmati rice export is competitive and enjoys advantages in exports. Basmati rice is a good exportable product. There is ample scope to export basmati rice to USA. But there is stiff competition from Pakistan.

Kumar *et al.* (2008) analysed export performance ratio to estimate the competitiveness. The major export destinations for cucumber and gherkin have been identified as France, USA, Russia, Belgium and Spain. An increasing and high value of revealed comparative advantage (RCA) and a positive and increasing value for revealed symmetric comparative advantage (RSCA) have indicated high potential in their export, particularly for the provisionally-preserved and prepared/preserved products. One per cent increase in volume of international trade in cucumber and gherkin may increase the demand from India by 5.96 per cent. This indicates that India is highly competitive in export of cucumber and gherkin and has ample scope to further increase its export. The study has also revealed that exchange rate is a more dominant determinant of export from India than price of commodity.

Thumar *et al.* (2012) analysed the export competitiveness of selected seed spices grown in India by estimating nominal protection coefficient (NPC) for the year 2007-08 under exportable hypothesis. Their finding showed that export of coriander was found moderately competitive to Canada (0.57) and less competitive to South Africa (1.00). The export of cumin was moderately competitive to Japan (0.57), less competitive to Netherland (0.93) and non-competitive to Bangladesh (1.46). The export of fennel found non-competitive indicating that fennel exported from India was not profitable. The export competitiveness for the fenugreek indicated that the NPC values were between 0.75 and 1.00 thereby concluding less profitable export of fenugreek.

Guledgudda *et al.*(2014) analysed export competitiveness of Indian cashewnut calculated by nominal protection coefficient. India is facing tough competition from Vietnam and Brazil in the exports of Cashew Kernels. The NPC for the period 2004 under exportable hypothesis was 0.98, which also revealed that the domestic prices

received by the farmers were lower than the international prices, which also implied that the domestic producers were dis-protected or rather taxed compared to a situation prevailing under free trade condition.

Kanaka and Chinnadurai (2015) computed Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), Effective Rate of Protection (ERP) and Domestic Resource Cost (DRC) to reveal the trade competitiveness. Trade competitiveness was estimated using the aforesaid measures for groundnut for the period from 2000-01 to 2009-10. EPC estimates showed that it was less than unity like DRC in the entire study period. However it could be seen that these had been an increasing trend in the values of EPC and DRC from 2003-04. Since NPC value are more than unity it indicates that the state resorted to protection at the state level. The estimates of DRC revealed that the state had comparative disadvantage in groundnut export. The main conclusion is that the usefulness of the policy analysis matrix might be substantially enhanced by simulating profitability after efficiency-improving managerial decisions have been adopted.

Makama *et al.* (2016) calculated the Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), and Domestic Resource Costs (DRC) of rice export using the policy analysis matrix for the period 2010 to 2013. The average value of NPC for the years 2010, 2011, 2012 and 2013 were less than unity (0.47) which indicates that the domestic prices received by the farmers in the country were below the international prices. The average nominal protection coefficient was 0.48 thus indicates that Rice producers in Karnataka (India) were disprotected and the average effective protection coefficient was 0.44 indicating a high export competitiveness of the India Rice. However, the average domestic resource cost was found to be less than one (0.37) this means that domestic resources were efficiently utilized in case of rice crop in above mentioned state of the country and also indicated that they have comparative advantage in the production of rice crop. All the indicators (NPC, EPC and DRC) were less than unity thus a reflection that the domestic price of Rice in the country is lower than the world market price and hence competitive worldwide.

Yamini (2019) calculated the Nominal Protection Coefficient (NPC) of export of cotton was found to be lower than unity for almost all the years, indicating that the domestic prices received by the farmers were lower than the international prices. This

implies that the domestic producers were disprotected. It also indicate that cotton have a high degree of comparative advantage in international market. However during 1996-97 and 1998-99 NPC was observed to be more than unity.

Above reviews reveals that, the major destinations for Indian paddy were Saudi Arabia, UAE, Kuwait, Yemen Arab Republic and USA. Indian paddy was more competitive in all these markets which is measured by Nominal protection coefficient (NPC). In the World market Indian paddy was more competitive except some years which is measured by Nominal protection coefficient and Export performance ratio during the study period 1970-71 to 2017-18.

2.4 The Direction of Trade of Export From India

Mahadevaiah *et al.* (2005) analysed the dynamics of changes have been measured in the export of raw cotton from India to different export markets employing the Markov-Chain model. The results have shown China as the sole stable destination for our cotton exports. This implied that the share of import by china increased from 8.32 per cent during the pre-reforms period to 31.55 per cent during the post-reforms period. The other traditional importing countries such as Bangladesh, Germany, Indonesia, The UK, Japan and Korea have recorded low retention probabilities during pre- and post-economic reforms periods, indicating unstable export share to these markets.

Nethrayani *et al* (2012) studied the direction of trade and changes in the export of rice. The collected data for the period 1998-99 to 2009-10 was analysed using markov chain analysis. The results of markov chain analysis revealed that UAE is the most stable importer of the Indian basmati rice as reflected in probability of retention at 1.00 and the major gainers among importers of Indian basmati rice are other countries. In case of non-basmati rice, South Africa is one of the most stable importer of the Indian non-basmati rice as reflected in probability of retention at 0.792 and the major gainers among importers of Indian non-basmati rice are other countries.

Naik and Hosamani (2013) examined the production and export performance of turmeric in India using markov chain analysis for the period 1974-75 to 2009-10. The results of the Markov Chain analysis revealed that, during pre-WTO period other countries and UK were the stable importers of Indian turmeric as they have retained their share to the tune of 59.74 and 39.91 per cent over the years respectively. Whereas,

during the post-WTO period, other countries, Iran, UAE and UK were the stable importers of Indian turmeric as they retained 83.18, 51.13, 32.93 and 332.40 per cent of their share over the years, respectively.

Kusuma and Basavaraja (2014) studied the Markov chain analysis through linear programming method to assess the transition probabilities for the major mango markets. The major Indian mango export markets were categorized as stable market (Banladesh, U.K. and U.A.E.) and unstable market (Nepal, Saudi Arabia) based on the magnitude of transitional probabilities. The major export markets for Indian mangoes are Bangladesh 46.22 per cent, U.A.E. 33.26 per cent, Nepal 6.06 per cent, Saudi Arabia 3.63 per cent and UK 3.06 per cent. The increasing share of other countries clearly shows the need to explore and exploit the market potential of other countries.

Pavithra *et al.* (2016) analysed the dynamics of changes in the export of floriculture products from India to different export markets employing the Markov-Chain model. The results have been shown that the Netherlands is the stable destination with retention 0.5350 and UAE is the most unstable destination with zero retention for Indian export in floriculture. The USA, UK and Germany were the least stable markets for Indian floriculture products export. The exports may be oriented towards least stable markets and stabilizing the export of floriculture products should be made.

Satitshkumar *et al.* (2016) studied that the dynamics of changes in terms of value of exports of basmati and non-basmati rice from India to different export markets. It has been measured by employing the Markov-Chain model. Iran and Saudi Arab are found to be stable destinations for Indian basmati rice export from Markov-Chain results. Whereas, Benin, Bangladesh and Senegal are found to be major destinations for non- basmati rice importing countries were South Africa and Liberia with the zero per cent retention. So the policies should aim at developing good trade relations with the stable destinations to benefit from it.

Golappanavar and Patil (2017) analysed the direction of structural changes in area of major fruit crops using Markov chain analysis through linear programming method to assess the transition probabilities for major fruit crops. The results revealed that mango crop showed highest retention of area (99.23 %) in Dharwad taluka. In Hubli taluka also mango crop showed highest retention of area (86.44 %). In Navalgund taluka,

guava crop showed highest retention of area (93.69 %). In Kalghatagi taluka also guava crop showed highest retention of area (88.42 %). In Kundgol taluka, sapota crop showed highest retention of area (86.95 %).

Above reviews reveals that, the major destinations for Indian total paddy, Basmati paddy and non-basmati paddy were Saudi Arabia, Kuwait, UK, UAE, Yamen Arab Republic, USA, Canada and Belgium. However share of Canada and Belgium were decreasing over the study period. For future strategy should aim to depict the new markets.

2.5 The Determinants of Export of Paddy in India

Shende *et al.* (1999) fitted Cobb-Douglas type of demand function in order to identify the factor affecting export of tea, coffee and tobacco using time series data for the period from 1970 to 1993. They had taken India's export of tea, coffee and tobacco as a dependent variable and export price (Rs./mt), India's share in world production (%), total world import (mt), ratio of domestic consumption to production, exchange rate (Rs./US dollar) and ratio of domestic price to world export price as independent variable. It had seen that vary high values of coefficient of multiple determination were noticed in all three commodities. Tea export was observed to be influenced by three factors *i.e.* export price, ratio of domestic consumption to production and exchange rate. Similarly in case of coffee ratio of domestic consumption to production and exchange rate found highly significant. In tobacco three 14 factors were highly significant to export *i.e.* export price, world total import and ratio of domestic price to world price.

Haleem *et al.* (2005) had tried to estimate an export supply function for citrus fruit in Pakistan. Annual time series data from 1975-2004 was used for the analysis. Quantity of citrus exported depends upon export unit value index, domestic production, and domestic price index, GDP of Pakistan, and exchange rate. Tabulation method was used to determine export performance. Co-integration was used to estimate elasticity of price for citrus. Dickey Fuller test was used to check unit root. All series were stationary at first difference except domestic production which was stationary at level. Johansen co-integration method was used. Each variable had correct sign except citrus production. Domestic price index was negatively significant. Export price,

exchange rate and GDP were positively affecting citrus exports. All variables were significant.

Kumar *et al.* (2008) identified the factors affecting the export of cucumber and gherkin from India. On the basis of best fit, log linear form was selected. The three basic determinants, *viz.* world market size, exchange rate, and Indian export price, could together explain 96 per cent of the total variation in export of cucumber and gherkin from India. The coefficients for all the variables, except Indian export price were found highly significant. The estimate for international trade volume has shown that for 1 per cent increase in the world trade marketing of these products more economical. Establishment of infrastructure for various sanitary measures will also help in better price realization of Indian cucumber and gherkin in the international market. Gherkin is a short-duration (75-90 days) labour-intensive and highly profitable crop and therefore, its cultivation should be expanded to enhance its export in the world market. The study has also revealed that exchange rate is a more dominant determinant of export from India than price of commodity.

Abolagba *et al.* (2010) tried to determine the factors that can influence the agricultural exports of Nigeria with reference to cocoa and rubber. Time series data from 1970-2005 had been used for this purpose. OLS method was applied. Export of specific commodity was taken as dependent whereas domestic output, domestic consumption, exchange rate, average producer price, average world market price, interest rate and average total rainfall were independent. For Rubber Semi-log and for cocoa linear function were used. Domestic production and average producer prices were positively while exchange rate and domestic consumption were negatively significant. Interest rate and world market prices were positive for rubber and negative for cocoa. In findings output, domestic consumption, average producer price and exchange rate play key role in export.

Sengupta and Roy (2011) analyzed the export behavior of eleven horticultural products by fitting non linear regression model for the period 1961 to 2005(45 years). They assumed that export behavior of horticultural products depend on production, export price, world unit price, world demand and producer price. They had incorporated dummy variable in the model to indicate the structural break in the export

behavior. The result showed that exports of chilli and pepper have responded significantly to producer prices, relative export price and world demand in long run. But, exports of most of other horticultural commodities are found to be responsive to relative export price. Like chilli and pepper, exports of banana and walnut are inversely related to producer prices in the long run. The results also showed that most of the horticultural exports were not significantly determined by world demand in long run except in case of chilli and pepper, mango and walnut. The production is not also significant for long run behaviour of most of the horticultural exports except banana, coffee and spices.

Kannan (2013) examined the factors that influence agricultural production and export with specific reference to the natural rubber in India. The Ordinary Least Squares (OLS) technique was used in analyzing the relevant data. The OLS findings revealed that natural rubber production is significantly ($P < 0.05$) by export of natural rubber ($\beta = 0.21$). For export of natural rubber, the OLS shows that stock of natural rubber ($\beta = 0.29$), World market price ($\beta = 15.96$), domestic price ($\beta = -18.47$) and World population ($\beta = 88.37$) significantly ($p < 0.05$) influence in export of natural rubber.

Bilal and Rizvi (2013) analysed the determinants of rice exports from Pakistan for the period of 1980 to 2010. All variables have been used in log form. For stationary of data Augmented Dickey-Fuller test has been used. All the variables are stationary at their first difference. Johansen co-integration method has been used to check for long run relationship. Rice production, domestic consumption as a proxy for domestic demand, world's total rice exports as a proxy for international demand, rice yield, domestic price and export price have been used as rice exports determinants. Results suggest that production, yield and international demand are positively significant while export price and domestic price are negatively significant. Domestic demand is insignificant. Vector error correction model (VECM) was used to check long run to short run equilibrium adjustment of the model. VECM shows that model is converging 0.56 per cent annually. Finally, they recommended that government should take necessary steps to improve the yield per hectare and also production of rice in order to increase its exports because these are found to be the most effective determinants.

Adhikari *et al.* (2016) identified determinants of rice exports from India with special reference to basmati rice during the period 1980-81 to 2012-13. The time

series data were made stationary before estimating the determinants of Indian rice export. The estimated regression model has shown that export price, international price, lagged production, domestic consumption, and exchange rate are the major determinants of rice export from India. In order to sustain in the international market, Indian export price needs to be competitive besides improvement in quality and sanitary standards. Export price and international price are significant at 1 per cent level of significance. However, other three variables, *viz.* exchange rate, domestic production, and lagged production, are non-significant. In model I, quantity exported was the dependent variable and export price, exchange rate, international price and domestic consumption were independent variables. In model II, export price, exchange rate, international price and lagged production were independent variables.

Above reviews reveals that, the multiple regression model where quantity export regressed against domestic production, Wholesale price, international price, World production, exchange rate, NPC and EPR. The study indicates that, the share of paddy in India's total export was more than share of paddy in the World total export.

2.6 Policy measures for export of paddy

Mahadevaiah (2001) conducted study entitled export trade performance of Indian cotton revealed that cotton prices in the domestic and international market are integrated. This implies that domestic market is responsive to changes in the international market prices and producers would benefit from increases in the international market prices. However, this benefit has not been fully exploited by the farmer because the Indian cotton exports are regulated by the governments by export quota system so that farmer can be benefited from price increase in the international market. This will encourage cotton production especially quality cotton, which will also meet the requirement of cotton textile mills who are currently importing the quality cotton.

Barah (2005) reported that rice is the most important crop in India, which plays a critical role in food security. More importantly, it is a choice crop of the millions of poor and small farmers not only for income but also for household food security. However, the rice sector has witnessed rapid dynamism in production processes. After climbing a height of four-fold increase in production during past four decades, the production curves have started showing downward trend and productivity decelerating

since the latter half of the 1990s. Is it the beginning of the agrarian impasse (particularly in the rice system), not only in the core green revolution state of Punjab, but also in several other states such as Tamil Nadu, Andhra Pradesh and Kerala etc. The productivity decline is experienced in other states also including the rainfed areas. Therefore, an in-depth understanding of the changing production and productivity pattern is essential.

Manitra (2006) Analyzed reforms in the global rice market during and after the URUGWE negotiation and states that rice market was highly segmented with a lot of distortions. Rice policy has been based on protecting some social groups at the expense of others. For developing countries, food security concerns, especially the desire to provide cheaper rice to urban consumers, which often have more political power, have been the reasons in the tacking rice farming. These strategies have cased distortions in prices and resource allocation and in trade pattern.

Clarkson *et al.* (2007) conducted protectionist trade policy actions in 2008 resulting from food shortage concerns potently appeared to increase national welfare and limit the transmission of higher world prices to Indian consumers. However, India's greater use of export restrictions vs. export tariffs and its monopoly power in the production of rice could have limited the full effect of the price decrease. Plus the trade restrictions have lowered the overall economic welfare even though consumers benefited by forcing the produces sell product strictly in the domestic market. This paper evaluates the economic effects of such trade policy in the framework of comparative static model that explains the costs and benefits of tariffs and subsidies.

Kerutagi *et al.* (2009) studied on Belgaum and Dharwad district of Northern Karnataka to identify the constraints in Sapota marketing. The study revealed that the major problems in Sapota marketing were lack of storage facility (99.44 %), collection of higher commission charges (83.33 %) and higher transportation cost due to lack of nearer markets and non-availability of proper market information.

Clarkson (2013) observed that India consumed 95 per cent of the rice she produces, rice prices are an integral part of national welfare to both consumers and producers. Protectionist trade policy actions in 2008 resulting from food shortage concerns potently appeared to increase national welfare and limit the transmission of higher world prices to Indian consumers, the evaluated economic effects of such trade

policy in the framework of comparative static model that explains the costs and benefits of tariffs and subsidies.

Neha (2013) reported two channels used for procuring rice are custom-milling of rice and levy. In the rest, the government buys paddy directly from farmers at the minimum support price (MSP) and gets it milled from private millers; while in the second, it purchases rice from private millers at a pre-announced levy price thus providing indirect price support to farmers. Secondary data reveal that although levy imposes a lower unit cost per quintal of paddy procured, over the last decade, custom milling has become predominant, partly on the argument that it provides minimum price support to farmers. We analyze data from auctions of paddy from a year when levy was still important to investigate its impact on farmers' revenues. They use semi-non parametric estimates of millers' values to simulate farmers' expected revenues and these to be rather close to the MSP; a closer analysis shows that bidder competition is critical to this result.

Adhikari (2014) Export of rice from India: performance and determinants. He suggested that quality is an important factor for export competitiveness. So, quality maintenance is prime importance. Most of the pesticides commonly used on paddy in India are not registered in importing countries. Therefore, to capture the higher share in the World trade, much emphasis need to be given on sanitary measures and standardization, packaging and simplification in export procedure so as to gain access of export to the countries, where rice can fetch better price. The growth rate in export of basmati rice increased over a period and is export competitive product. Thus, country has a comparative advantage in the export of basmati rice. There should be efforts by the government for improvement on processing facilities, transportation facilities, and handling and lading facilities at ports in order to facilitate export. Minimum export price of rice should be fixed in such a way that it enables the exporter to compete in international market and also have gain to producer.

Pal *et al.* (2015) observed that the export of pomegranate fruit is around 35000 tonnes per annum in India. Exquisite fruit quality, enriched nutrition values, enormous medicinal values, huge demand in domestic and international market, besides extended shelf life enables it to emerge as an eminent fruit crop of recent times. They

also suggested certain policies to boost pomegranate export such as adoption of scientific management practices, evolving disease free hybrid, use of appropriate post harvest technology, food safety and pesticide residue management.

Above reviews reveals that, the policy's suggest that improvement of quality, price and food security were most important factors to increasing paddy export from India.

3. METHODOLOGY

This chapter explains the characteristics of the study area and sources of data, the study period the statistical tools and techniques employed for analysing the data under the following headings.

- 3.1 Description of the study area
- 3.2 Nature and sources of data
- 3.3 The study period
- 3.4 Analytical tools and techniques

3.1 Description of the study area

In India the area is suitable for cultivation of paddy and scattered in all over India. West Bengal state ranks first in area and production, and it contributes about 14 per cent of the total production of the country. The total area of paddy in India was about 42909.8 '000 ha and the production was 165017 '000 tonnes during the year 2017-18 and this production depends on the climate, soil condition and management aspects in different states. Hence the export performance and competitiveness of paddy was examined at National level.

3.2 Nature and sources of data

The study is completely based on secondary data, Therefore required data for the present study was collected from various reports *viz.*, APEDA, Agricultural statistics at a glance 2015, [https://www.indexmundi.com/commodities/?commodity=rice & months=36](https://www.indexmundi.com/commodities/?commodity=rice&months=36), Maharashtra at A Glance, Economic Survey (GOI), Ministry of Agriculture and Co-operation (Agricoop), Food Corporation of India (FCI), Commission for Agricultural Costs and Prices (CACP), International Monetary Fund (IMF), Food and Agricultural Organization (FAO), World Trade Organization (WTO), International Food and Policy Research Institute (IFPRI), International Rice Research Institute (IRRI), Rice Board of India, Ministry of Food, and various government sector reports etc. was used for the study. The data collected from secondary sources was subjected to appropriate analytical technique in order to arrive at a meaningful conclusion. The data on area, production, and productivity of paddy, domestic and international prices and export etc. was collected for the period 1970-71 to 2017-18.

3.3 The study period

The study period was divided into two periods based on the policy of the government on WTO and of trade at different periods. However, for better understanding, growth rates in area, production and productivity were computed for the period from 1970-71 to 2017-18 which was further divided into two sub periods.

Period-I : Pre-WTO Period (1970-71 to 1994-95)

Period-II : Post-WTO Period (1995-96 to 2017-18)

Overall Period : (1970-71 to 2017-18)

3.4 Analytical Techniques

Keeping in view the objectives of the study, data collected were subjected to analysis through the following statistical techniques.

3.4.1 Compound growth rate analysis

Growth rate on area, production, yield and exports of paddy were computed for a period of 57 years from 1970-71 to 207-18. The linear, log-linear, exponential and power functions are some of the important functional forms employed to study the growth rates. Different functional forms were tried in the past for working out of growth rates in area, yield and production. Some of the important forms tried were the linear growth model ($Y = a + bt$), exponential function ($Y = ab^t$) and quadratic function ($Y = a + bt + ct^2$). However, it was found that the exponential form of the function $Y_t = ab^t$ is the better and most frequently used one. In the present study, compound growth rates in area, production, productivity export of paddy in the country as a whole were estimated by using the exponential growth function of the form,

$$Y = ab^t$$

Where,

Y = Area, production, productivity and export

t = Time period

b = Regression coefficient

a = Intercept

$$\text{CGR (\%)} = (\text{Antilog } b - 1) \times 100$$

3.4.2 Instability analysis

The extent of variability in area, production, productivity and export of paddy were analyzed through coefficient of variation and Cuddy and Della Index.

a. Coefficient of variation

$$C.V. = [S.D./(\bar{X})] * 100$$

Where,

C.V.= Coefficient of variation

S.D.= Standard deviation

X = Mean

b. Cuddy and Della instability index (CV_t)

$$CV_t = CV \sqrt{1 - R^2}$$

Where,

CV = Coefficient of variation

R² = Coefficient of multiple determination

3.4.3 Trend Analysis

To estimate the trend in domestic prices and international prices for paddy the linear trend were computed for the time series data for the period from 1970-71 to 2017-18.

The linear trend equation of the form.

$$Y_t = a + bT + cT^2 + dT^3 + e_t$$

Where,

Y_t = Price (Domestic/International)

a = Intercept

T = Time period

b, c, d = Partial regression coefficient

e_t = Error term

3.4.4 Export competitiveness of paddy

a. Nominal Protection Coefficient (NPC)

Nominal Protection Coefficient is a direct measure of competitiveness of a country towards a commodity in the context of free trade. The nominal protection

coefficient (NPC) is defined as the ratio of the domestic price to the World reference price of the commodity under consideration.

Symbolically,

$$\text{NPC} = \text{Pd} / \text{Pr}$$

Where,

NPC = Nominal protection coefficient of paddy

Pd = Domestic wholesale price of paddy

Pr = World reference price of paddy

If the NPC is less than one, then it indicates that the commodity is competitive compared to the situation that would have prevailed under free trade. However, if the NPC is greater than one, then the commodity is not competitive. 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. Under the exportable hypothesis, the pre assumption is that Indian paddy would compete in the international paddy market. Hence, the price of Indian paddy must be low enough to make it competitive in the foreign market.

b. Export Performance Ratio (EPR)

The Export Performance Ratio (EPR) was estimated to examine the comparative advantage of India in the export of paddy, following the method suggested by Balassa (1965), using Equation (1).

$$\text{EPR} = \text{S}_{it} / \text{S}_{wt}$$

Where,

S_{it} = Share of paddy in India's total export,

S_{wt} = Share of paddy in World total export,

Since EPR is based on the observed pattern of trade flows, it is also called Revealed Comparative Advantage (RCA). If EPR/RCA is greater than unity, the country has comparative advantage in export of the commodity. As suggested by Laursen (1998), RCA was made symmetric by obtaining the index as $(\text{RCA}-1/\text{RCA}+1)$. This index is known as Revealed Symmetric Comparative Advantage (RSCA) and varies from -1 to +1.

3.4.5 Markov Chain Analysis

The dynamic nature of trade pattern was analyzed by applying First Order Markov process and examining the gains and losses in export share of paddy in major importing countries. In the context of current application, the major paddy importing countries were considered since the export of paddy from India was highly inconsistent and unstable. The average export of paddy to particular country was considered to be a random variable following the First Order Markov process.

The basic assumption of first order Markov process is that the average export of a commodity (paddy) from a country to its importing countries in any period depends only on export in the previous period and this dependence is the same among all periods.

This is algebraically expressed

$$E_{it} = \sum_{i=1}^r E_{it-1} P_{ij} + e_{jt}$$

Where,

- E_{jt} = Exports from India during the year t to j^{th} country
- E_{it-1} = Exports to i^{th} country during the year t-1
- P_{ij} = The probability that exports will shift from i^{th} country to j^{th} country
- E_{jt} = The error term which is statistically independent of E_{ij-1} and
- R = Number of importing countries

The transitional probability matrix, which can be arranged in a $(c \times r)$ matrix, has the following properties.

The diagonal elements of matrix P indicate the probability that the export share of a particular country will remain the same from one period to another. The off-diagonal or transfer probabilities indicate the probability that the export share of a particular country will shift to another country over time. Thus, the export share of a country during the period 't' was obtained by multiplying the actual exports in the previous period (t-1) with transition probability matrix. The transitional probability matrix is estimated in the linear programming (LP) framework by a method referred to as minimization of mean absolute deviation (MAD).

The LP formula is stated as,

$$\text{Min } [(OP)]^* + Ie$$

Subject to- $XP^* + V = Y$

$$GP^* = 1$$

$$P^* \geq 0$$

Where,

P^* is a vector in which probability P are arranged,

0 is a vector of zeros,

I is an appropriately dimensioned vector of area,

e is the vector of absolute errors ($|U|$)

Y is the vector of export to each country

X is a block diagonal matrix of lagged values of Y and

V is a vector of errors.

G is a grouping matrix to add the row-elements of P arranged in P^* to unity.

3.4.6 Determinants of export of paddy in India

To determine the factors affecting the export quantity of paddy from India, export function was estimated. To examine the influence of price and non-price factors on export of paddy, the following variables were selected.

Export Function

To determine the factors affecting the export quantity of paddy from India, export function was estimated by multiple regression model.

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + u$$

Where,

Y = Export quantity of paddy (Tonnes)

X_1 = Domestic production of paddy (Tonnes)

X_2 = Wholesale price of paddy (₹/q)

X_3 = International price of paddy (₹/q)

X_4 = World production of paddy (Tonnes)

X_5 = Exchange rate

X_6 = NPC

X_7 = EPR

a = Intercept

b_i 's = Regression coefficients

u_t = Error terms

4. RESULTS AND DISCUSSION

This chapter is devoted to express the results obtained from the present study which are briefly discussed, under following headings.

- 4.1 Growth and Instability of Area, Production and Productivity of Paddy in India
- 4.2 Trends in Domestic and International Prices of Paddy
- 4.3 Export Performance and Competitiveness of Indian Paddy
- 4.4 Structural Changes in Paddy Export From India.
- 4.5 Determinant of Paddy Export From India

4.1 Growth and Instability of Area, Production and Productivity of Paddy in India

4.1.1 Changes in area, production and productivity of paddy in the World, India and Maharashtra

The changes in area, production and productivity of paddy in absolute figures for the year 1970-71 to 2017-18 is depicted in Table 4.1.

Table 4.1 reveals that area, production and productivity of paddy in the World during study period were increased gradually from 132.66 m.ha in 1970-71 to 160.76 m.ha in 2017-18. The per cent change recorded over the base period was 21.18 per cent. The production increased to 729.10 m.tons in 2017-18 from 316.40 m.tons in 1970-71. The per cent change recorded over the base period was 130.47 per cent. The productivity of paddy was also increased to 4535 kg/ha in 2017-18 from 2385 kg/ha in 1970-71. The per cent change recorded over the base year was 90.19 per cent.

In case of India, the production and productivity of paddy during study period were increased. However, the area was fluctuating over the base year 1970-71. The area of paddy in India during 1970-71 was 37.59 m.ha which increased to 42.95 m.ha in 2017-18. The production increased to 111.01 m.tons in 2017-18 from 42.22 m.tons in 1970-71. The productivity of paddy also increased to 2584.63 kg/ha in 2017-18 from 1123.17 kg/ha in 1970-71. The per cent change recorded over the base period was 130.12 per cent. There was a sudden increase in production and yield of paddy after 1990-91 and this could be attributed to introduction of high yielding varieties of paddy and adoption of modern technologies.

Table 4.1 Changes in Area, Production and Productivity of Paddy in the World, India and Maharashtra

Area - Million ha.
Production - Million tons.
Productivity- kg/ha

Sr. No.	Year	Area	% Change over (1970-71)	Production	% Change over (1970-71)	Productivity	% Change over (1970-71)
	World						
1.	1970-71	132.66	100	316.40	100	2384.67	100
2.	1980-81	144.40	8.85	397	25.49	2749.17	15.29
3.	1990-91	146.98	10.79	519.5	64.20	3534.22	48.21
4.	2000-01	152.76	15.15	594	87.76	3888.39	63.06
5.	2010-11	158.31	19.34	672.40	112.52	4247.17	78.10
6.	2017-18	160.76	21.18	729.10	130.44	4535.33	90.19
	India						
1.	1970-71	37.59	100	42.22	100	1123.17	100
2.	1980-81	40.15	6.81	53.63	27.03	1335.74	18.93
3.	1990-91	42.69	13.57	74.29	75.96	1740.22	54.94
4.	2000-01	44.72	18.97	84.98	101.28	1900.27	69.19
5.	2010-11	42.86	14.02	95.97	127.31	2239.15	99.36
6.	2017-18	42.95	14.26	111.01	162.93	2584.63	130.12
	Maharashtra						
1.	1970-71	1.36	100	1.66	100	1220.59	100
2.	1980-81	1.50	10.29	2.36	42.17	1573.33	28.90
3.	1990-91	1.58	16.18	2.31	39.16	1462.03	19.78
4.	2000-01	1.51	11.03	1.93	16.27	1278.15	4.72
5.	2010-11	1.52	11.76	2.70	62.65	1776.32	45.53
6.	2017-18	1.45	6.62	2.66	60.24	1834.48	50.29

In Maharashtra, the area, production and productivity of paddy during study period were fluctuating over the base year 1970-71. The area of paddy in 1970-71 was 1.36 m.ha which increased to 1.45 m.ha in 2017-18. The per cent change recorded over the base period was 6.62 per cent. The production increased to 2.66 m.tons in 2017-18 from 1.66 m.tons in 1970-71. The per cent change recorded over base period was

60.24 per cent. The productivity of paddy also increased to 1834.48 kg/ha in 2017-18 from 1220.59 kg/ha in 1970-71. The per cent change recorded over the base period was 50.29 per cent. In Maharashtra, the production and yield of paddy considerably increased after 2000-01. It is the contribution of new improved varieties of paddy in the state.

From the foregoing discussion, it is noted that, the area, production and productivity of paddy was gradually increased in the World and India during different decades. However, the area, production and productivity of paddy were fluctuating over different decades in Maharashtra. The similar observations were reported by Satish Kumar (2016) and Ananthi, (2000).

4.1.2 Compound growth rates of area, production and productivity of paddy in major states of India

An attempt has been made to examine the changes in area, production and productivity of paddy in major states of India. The state wise growth rates in area, production and productivity of paddy were studied by estimating compound growth rates for sub-periods as Pre-WTO period (1970-71 to 1994-95), Post-WTO period (1995-96 to 2017-18) and Overall period (1970-71 to 2017-18). The annual percentage growth rates of area, production and productivity of paddy are presented in Table 4.2.

It is revealed from the Table 4.2 that, the growth rates of area, production and productivity of paddy at National level were observed to be positive and highly significant at one per cent level for the overall period (1970-71 to 2017-18). The area, production and productivity of paddy increased at the rate of 0.33, 2.22 and 1.88 per cent per annum, respectively, during the entire period. It indicates that the production of paddy at National level was increased by both area expansion and productivity improvement. The same trend was observed in Pre-WTO period (1970-71 to 1994-95) at National level where the growth rate of area, production and productivity was positive and highly significant which increased at the rate of 0.54, 3.05 and 2.50 per cent per annum, respectively. However, in Post-WTO period (1995-96 to 2017-18) the production and productivity of paddy was highly significant and increased at the rate of 1.53 and 1.55 per cent per annum, respectively. Whereas, the area under paddy was declined by 0.02 per cent per annum. It indicates that, the production of paddy in Post-WTO period (1995-96 to 2017-18) was mainly increased by productivity improvement.

In major states of India, the growth rates of area, production and productivity of paddy were positive and significant in Uttar Pradesh, West Bengal, Karnataka, Maharashtra, Punjab and Assam for overall period (1970-71 to 2017-18) indicating that, the production of paddy was influenced by both area expansion and productivity improvement in these states. The growth rate in area was negatively significant while, the production and productivity was positively significant in Andhra Pradesh and Tamil Nadu for overall period, indicating that the production of paddy was increased only due to productivity improvement in these two states. However, in Madhya Pradesh and Kerala, the growth rates of area and production of paddy was negatively significant and the growth rates of productivity were positively significant at overall period. The rate of growth decline in area was higher than the positive growth rate of productivity of paddy in Madhya Pradesh and Kerala, that's why the production of paddy was declined in these states, even though, there was a improvement in productivity.

Among the two periods *i.e.* Pre-WTO and Post-WTO period, the growth rates of area, production and productivity was more satisfactory in Pre-WTO period (1970-71 to 1994-95) than Post-WTO period (1995-96 to 2017-18) in all the states under study. In Post-WTO period (1995-96 to 2017-18) the production of paddy was increased due to new hybrid varieties in West Bengal, Uttar Pradesh, Maharashtra and Assam. Whereas, the production of paddy increased by both area expansion and productivity improvement in Punjab state. However, the production of paddy was declined only due to decrease in area in Andhra Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu and Kerala. It is due to the diversification in cropping pattern and different competing crops for paddy in these states.

In Pre-WTO period (1970-71 to 1994-95), the production of paddy was significantly increased at the rate of 5.28, 3.31, 3.18, 2.22, 10.34 and 2.75 per cent per annum due to both productivity improvement and area expansion in Uttar Pradesh, West Bengal, Andhra Pradesh, Maharashtra, Punjab and Madhya Pradesh. Whereas, the production of paddy was significantly increased due to only yield improvement in Tamil Nadu and Assam.

Table 4.2. Annual Compound growth rates of area, production and productivity of paddy in major states of India

Sr. No.	State	ACGR %								
		Pre-WTO(1970-71 to 1994-95)			Post WTO(1995-96 to 2017-18)			Overall Period(1970-71 to 2017-18)		
		Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
1.	Uttar Pradesh	0.92***	5.28***	4.32***	1.1 NS	1.24 NS	0.6**	0.54**	2.97***	2.53***
2.	West Bengal	0.61***	3.31***	2.69***	-0.69 NS	0.81***	1.52***	0.29**	2.45***	2.16***
3.	Andhra Pradesh	0.52**	3.18***	2.64***	-2.96***	-1.64**	1.36***	-0.68***	1.16***	1.85***
4.	Karnataka	1.05**	1.84***	0.78 NS	-0.81*	-0.47 NS	0.55 NS	0.36**	1.41***	0.82**
5.	Punjab	8.97***	10.34***	2.34***	1.22***	2.28***	1.05***	3.85***	5.23***	1.33***
6.	Maharashtra	0.64***	2.22***	1.56***	0.1 NS	0.96**	0.87**	0.2***	1.25***	1.05***
7.	Madhya Pradesh	0.67***	2.75***	2.06***	-4.18***	-0.89 NS	3.43***	-2.73***	-1.28**	1.49***
8.	Tamil Nadu	-1.61***	1.29***	2.96***	-1.18***	-1.05 NS	0.13 NS	-1.03***	0.15 NS	1.19***
9.	Assam	0.46 NS	2.08***	1.61***	-0.27 NS	2.11***	2.43***	0.48***	2.1***	1.62***
10.	Kerala	-2.57***	-1.31***	1.29***	-4.55***	-2.75***	1.89***	-3.84***	-2.53***	1.37***
11.	India	0.54***	3.05***	2.5***	-0.02 NS	1.53***	1.55***	0.33***	2.22***	1.88***

Note: ***, **, * indicates level of significance at 1 %, 5 % and 10 % respectively.

To sum up in case of yield improvement the pre-WTO period (1970-71 to 1994-95) was more satisfactory than post-WTO period (1995-96 to 2017-18). The sources of growth of paddy crop production have been achieved primarily from yield increases in pre-WTO period as it is a green revolution period. The findings of the study Satish Kumar (2016) and Prabhakaran (2013) aptly support the finding of the study. The hypothesis viz; the production of paddy was increased due to both area expansion and productivity improvement in India has been proved.

4.1.3 Instability indices of area, production and yield of paddy

The coefficient of variation and Cuddy and Della index were used to measure the stability and instability in area, production and yield of paddy.

The study period was divided into three periods, the pre-WTO period (1970-71 to 1994-95), post-WTO period (1995-96 to 2017-18) and overall period (1970-71 to 2017-18). The major paddy cultivating states in India considered for the analysis of instability in area, production and yield of paddy were Uttar Pradesh, West Bengal, Andhra Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu, Assam, Kerala, Maharashtra and Punjab.

The results in Table 4.3 show that, the area of paddy is most consistent and stable with 5.47 per cent C.V. for overall period (1970-71 to 2017-18) in India and was followed by productivity (25.61 % C.V.) and production (29.61 % C.V.). In post-WTO period (1995-96 to 2017-18) the area, production and productivity of paddy with 2.52, 11.68 and 11.2 per cent C.V. were more stable and consistent than in pre-WTO period (1970-71 to 1994-95) with 4.62, 23.72 and 19.51 per cent C.V. of area, production and productivity of paddy in India. During the pre-WTO period (1970-71 to 1994-95) the area under paddy cultivation have shown more stability in states viz., Uttar Pradesh, West Bengal, Andhra Pradesh, Madhya Pradesh, Assam, Kerala and Maharashtra with 8.14, 6.35, 9.30, 5.19, 12.26, 18.89 and 5.93 per cent variability respectively, whereas area under paddy in Karnataka, Tamil Nadu and Punjab was fluctuated as observed by coefficient of variation.

During post-WTO period (1995-96 to 2017-18), the area under paddy cultivation have shown more consistency in states viz., West Bengal, Karnataka, Tamil Nadu, Assam, Maharashtra and Punjab as analysed by both coefficient of variation and

Cuddy and Della Wella Index, but in case of Uttar Pradesh, Andhra Pradesh, Madhya Pradesh and Kerala, there was inconsistency in area under paddy as shown by Cuddy and Della Wella Index.

At overall period (1970-71 to 2017-18), the area under paddy cultivation have shown more consistency in states *viz.*, Uttar Pradesh, West Bengal, Andhra Pradesh, Karnataka, Assam, and Maharashtra with 17.75, 14.03, 18.37, 18.44, 17.55, 4.74 per cent variability respectively, whereas Madhya Pradesh, Tamil Nadu, Kerala and Punjab have shown fluctuated area under paddy cultivation.

The production of paddy was stable and consistent in states *viz.*, Karnataka, Tamil Nadu, Assam and Kerala with 18.30, 17.34, 17.96 and 10.64 per cent in coefficient of variation whereas in remaining states *viz.*, Uttar Pradesh, West Bengal, Andhra Pradesh, Madhya Pradesh, Maharashtra and Punjab the paddy production were fluctuated during pre-WTO period.

During post-WTO period (1995-96 to 2017-18) , the production of paddy was more consistent in states *viz.*, Uttar Pradesh, West Bengal, Assam, Maharashtra and Punjab with 18.71, 7.39, 17.75, 13.45 and 15.27 per cent respectively, whereas in remaining states *viz.*, Andhra Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu and Kerala the paddy production were fluctuated.

At overall period (1970-71 to 2017-18), the production of paddy was not consistent in all selected states as shown by coefficient of variation.

The yield of paddy have been shown consistent in states *viz.*, Andhra Pradesh, Kerala, Maharashtra and Punjab with 19.90, 10.25 18.33 and 17.63 per cent respectively, whereas in remaining states yield of paddy were fluctuated during pre-WTO period as measured by coefficient of variation.

During post-WTO period (1995-96 to 2017-19), the yield of paddy have shown consistency in states *viz.*, Uttar Pradesh, West Bengal, Andhra Pradesh, Karnataka, Kerala, Maharashtra and Punjab with 8.46, 13.31, 11.36, 12.57, 16.92, 12.31 and 8.01 per cent, respectively as measured by coefficient of variation.

At overall period (1970-71 to 2017-18), the paddy yield was not stable in all selected states except two states *viz.*, Maharashtra and Punjab with 18.73 and 18.49 per cent respectively, measured by coefficient of variation.

The results indicate that there was considerable increase in paddy production followed by paddy yield and paddy area during the study period. The similar findings were reported by Satishkumar *et al.* (2016) and Patil *et al.* (2016).

Table 4.3. Instability indices of area, production and yield of paddy

Sr. No.	State	Particular	Pre-WTO Period (1970-71 to 1994-95)		Post-WTO Period (1995-96 to 2017-18)		Overall Period (1970-71 to 2017-18)	
			C.V.	Cuddy & Della Index	C.V.	Cuddy & Della Index	C.V.	Cuddy & Della Index
1.	Uttar Pradesh	A	8.14	4.70	21.52	20.87	17.75	16.68
		P	39.02	16.41	18.71	17.84	39.86	21.51
		Y	33.01	15.49	8.46	7.42	32.77	15.06
2	West Bengal	A	6.35	4.52	17.26	16.18	14.03	13.10
		P	28.51	14.31	7.39	5.14	32.47	12.20
		Y	22.76	11.16	13.31	9.92	30.00	11.02
3	Andhra Pradesh	A	9.30	8.50	24.89	15.59	18.37	16.19
		P	25.06	11.64	23.15	20.16	27.71	22.75
		Y	19.90	6.84	11.36	6.66	25.35	7.76
4	Karnataka	A	22.34	19.87	12.95	11.92	18.44	17.52
		P	18.30	12.36	21.29	21.02	28.23	19.53
		Y	130.41	129.5	12.57	11.85	93.93	89.34
5	Madhya Pradesh	A	5.19	1.69	59.89	47.89	41.82	27.21
		P	26.46	18.99	59.87	59.57	43.93	41.29
		Y	22.50	18.09	34.05	24.89	33.46	25.58
6	Tamil Nadu	A	23.14	18.39	14.10	11.60	23.22	16.21
		P	17.34	14.85	25.79	25.05	21.91	21.83
		Y	25.88	17.02	21.54	21.53	26.19	21.78
7	Assam	A	12.26	11.94	18.66	18.50	17.55	15.96
		P	17.96	8.76	17.75	10.63	30.81	9.52
		Y	20.61	15.00	20.38	13.65	27.52	14.53
8	Kerala	A	18.89	5.17	35.63	13.76	49.16	11.02
		P	10.64	4.85	20.64	7.59	34.13	8.65
		Y	10.25	3.50	16.92	13.27	22.07	11.45
9	Punjab	A	91.00	32.87	8.63	3.48	55.9	30.05
		P	57.16	16.63	15.27	5.16	51.77	21.72
		Y	17.63	8.37	8.01	4.11	18.49	8.20
10	Maharashtra	A	5.93	3.76	2.35	2.26	4.74	3.89
		P	21.79	17.54	13.45	11.94	21.22	15.49
		Y	18.33	15.77	12.31	11.03	18.73	13.9
11	India	A	4.62	2.37	2.52	2.52	5.47	3.08
		P	23.72	8.20	11.68	5.77	29.61	8.21
		Y	19.51	6.74	11.2	4.05	25.61	6.26

4.2 Trends in Domestic and International Prices of Paddy

The analysis of trend in domestic and international prices of paddy movement during the entire period *viz.*, 1970-71 to 2017-18 was studied. The cubic

(polynomial) function was fitted to assess the trend in domestic and international prices of paddy in India due to its superiority over other functions in terms of better coefficient of determination (R^2). The trends during the three broad phases were subjected to a detailed analysis to confirm the results obtained. With regard to fitting of different models for export of paddy, it was found that polynomial function was good fit.

4.2.1 Trends in domestic prices of paddy

The trends in domestic prices of paddy are presented in Table 4.4. It is observed from the Table that, the domestic prices were declined in first stage at the rate of 6.60 ₹/qtl. In second stage it increased at the rate of 0.42 ₹/qtl and in terminal stage domestic prices of paddy significantly increased at the rate of 0.02 ₹/qtl. The overall trend equation was statistically significant, as revealed by F value (483.58) and fluctuation in domestic prices of paddy due to time factor to extent of 97 per cent as indicated by R^2 . The polynomial curve of domestic prices of paddy (Fig. 4.4) behaved almost constant in the initial study years. But after 1990-91 it started increasing at increasing rate till the end of the year 2017-18. The volatility of domestic prices of paddy is mainly due to the internal production stocks and is not influenced much by the international prices (Mittal *et al.*, 2018).

Table 4.4. Polynomial trend analysis of domestic price of paddy in India

Sr. No.	Variables	Coefficients	S.E.
1	Intercept	125.77*	83.56
2	T	-6.60	13.70
3	T^2	0.42	0.64
4	T^3	0.02**	0.009
5	R^2	0.97	
6	F	483.58	

$$Y_t = 125.77 - 6.60T + 0.42T^2 + 0.02T^3 + e_t$$

Where, Y= Domestic prices of paddy

T= Time period

4.2.2 Trends in international prices of paddy

The trend in international prices of paddy is presented in Table 4.5. It is observed from the Table 4.5 that, the growth trend in international price increases for first stage at the rate of 31.40 ₹/qtl. Then in second stage decline at the rate of 0.82 ₹/qtl and in terminal stage increase at the rate of 0.04₹/qtl. The overall trend equation was statistically significant, as revealed by F value (34.66) and fluctuation in international prices of paddy due to time factor to extent of 70 per cent as indicated by R^2 . The analysis of trend in international prices of paddy movement indicated more fluctuation (Fig.4.5) during the entire period (1970-71 to 2017-18).

Table 4.5 Polynomial trend analysis of international prices of paddy

Sr. No.	Variables	Coefficients	S.E.
1	Intercept	222.94	482.84
2	T	31.40	79.14
3	T^2	-0.82	3.68
4	T^3	0.04	0.049
5	R^2	0.70	
6	F	34.66	

$$Y_t = 222.94 + 31.40T - 0.82T^2 + 0.04T^3 + e_t$$

Where, Y= International price of paddy (₹/qtl)

T= Time period

4.2.3 Compound growth rates of domestic and international prices of paddy

The exponential growth function was used for estimation of growth in domestic and international prices of paddy. The data related to domestic and international prices of paddy were collected for 48 years from 1970-71 to 2017-18 and results are presented during Pre-WTO (1970-71 to 1994-95), Post-WTO (1995-96 to 2017-18) and over all period (1970-71 to 2017-18) in Table 4.6.

The growth rates of domestic and international prices of paddy have been presented in Table 4.6. The results revealed that during the pre-WTO period the domestic market prices of paddy was estimated significant growth at 5.92 per cent per annum whereas the international prices had a growth rate of 8.71 per cent per annum. However,

during post-WTO period, the growth rate in paddy prices was estimated to be 6.71 per cent per annum for domestic prices and 6.84 per cent per annum for international prices. As such growth rate for domestic price is higher than international price *i.e.* for domestic price growth rate was estimated 8.21 per cent per annum and 7.02 per cent per annum for international price during overall period (1970-71 to 2017-18).

Table 4.6 Compound growth rates of domestic and international prices of paddy

Price	Periods		
	Pre-WTO (1970-71 to 1994-95)	Post-WTO (1995-96 to 2017-18)	Overall (1970-71 to 2017-18)
Domestic price	5.92***	6.71***	8.21***
International price	8.71***	6.84***	7.02***

Note: *** indicates 1% level of significance

4.2.4 Instability indices of domestic and international prices of paddy

The coefficient of variation and Cuddy and Della index of domestic and international prices of paddy have been presented in Table 4.7. It is revealed from the Table 4.7 that the instability index of domestic (45.95) and international (61.77) prices of paddy was higher in both pre-WTO period and post-WTO (33.77 and 42.03 %) and overall (37.99 and 53.23 %) period, respectively. This indicate that the growth of domestic and international prices of paddy in post-WTO period did not fluctuates more due to less restrictions and growing demand of Indian paddy. In general, domestic prices of paddy were more consistent than international prices of paddy in both pre and post-WTO period.

From the forgoing discussion it is noted that, the international prices of paddy were more fluctuating than that of domestic prices of paddy. The international paddy market is characterised by high volatility with inelastic supply and demand. The global trade of rice is very low in comparison to its production. Similar observations were reported by Adhikar *et al.* (2016) and Mittal (2018). The hypothesis viz; the domestic and international prices of paddy are fluctuating has been proved.

Table 4.7 Instability indices of domestic and international prices of paddy

Indices	Domestic price of paddy			International price of paddy		
	Pre-WTO (1970-71 to 1994-95)	Post-WTO (1995-96 to 2017-18)	Overall (1970-71 to 2017-18)	Pre-WTO (1970-71 to 1994-95)	Post-WTO (1995-96 to 2017-18)	Overall (1970-71 to 2017-18)
C.V.	49.92	45.8	98.98	77.26	58.72	92.33
Cuddy and Della Index	45.95	33.77	37.99	61.77	42.03	53.23

4.3 Export Performance and Competitiveness of Indian paddy

The export performance and competitiveness of Indian paddy has been assessed on the basis of time series data on export, import, its share, trade balance, Nominal Protection Coefficient (NPC), etc., of Indian paddy and the results are discussed in this section.

4.3.1 India's total export share in the World total export

Analysis of the Table 4.8 reveals that, India's total export share in the World total export trade has been registered during the study period at 1.03 per cent in 1960-61 ranging up to 1.30 per cent in 2017-18.

Table 4.8 India's total export share in the World total export

Sr. No.	Year	World Total Export	India's Total Export	(₹'000 Crore)
				India's Share in World Total Export (%)
1	1960-61	61.92 (-)	0.64 (-)	1.03
2	1970-71	238.52 (285.21)	1.52 (137.5)	0.64
3	1980-81	1610.84 (575.35)	6.71 (341.45)	0.42
4	1990-91	6117.46 (279.77)	32.53 (384.80)	0.53
5	2000-01	28998.07 (374.02)	201.36 (519.00)	0.69
6	2010-11	69976.50 (141.31)	1142.92 (467.60)	1.63
7	2017-18	156027.63 (122.97)	2022.72 (76.98)	1.30

(Figures in the bracket indicates the per cent change over consequent decade)

Source : www.statista.com; www.indiaagrstatat.com

India's total export share *i.e.* 1.03 per cent in the World total export during 1960-61 was declined up to 0.42 per cent during 1980-81 then it increased during 2010-11 *i.e.* 1.63 per cent and again declined during 2017-18 *i.e.* 1.30 per cent. India's export share in World total export is less than 2 per cent during 1960-61 to 2017-18. The World and India's total export was fluctuating over a consequent decade.

4.3.2 India's agricultural export share in World agricultural export

Table 4.9 reveals that India's agricultural export share in the World agricultural export trade has registered during the period at 1.6 per cent in 1960-61 ranging up to 3.7 per cent in 2017-18.

It is seen from Table 4.9 that India's agricultural export share in the World agricultural export was increased up to year 1980-81 but declined in 1990-91 at 0.8 per cent, then it continuously increased up to 3.7 per cent during 2017-18. The average share of India's agricultural export was less than 4 per cent in the World agricultural export during the year 1960-61 to 2017-18.

Table 4.9 India's agricultural export share in World agricultural export

(₹'000 Crore)

Sr. No.	Year	World Agricultural Export	India's Agricultural Export	India's Share in World Agricultural Export (%)
1	1960-61	16.86 (-)	0.28 (-)	1.66
2	1970-71	15.82 (-6.17)	0.37 (32.14)	2.31
3	1980-81	92.32 (483.57)	2.38 (543.24)	2.57
4	1990-91	725.77 (686.15)	6.01 (152.52)	0.83
5	2000-01	2481.81 (241.96)	28.66 (376.87)	1.15
6	2010-11	6248.87 (151.79)	117.48 (309.91)	1.88
7	2017-18	10168.50 (62.73)	380.66 (224.02)	3.74

(Figures in the parentheses indicates the per cent change over consequent decade)

Source: The State Food And Agriculture 1962, 1970, 1980; Changing Pattern in India's Agricultural Exports under WTO By Shabana Anjum and Arifa Khan; www.indiaagristat.com

4.3.3 India's paddy export share in World agricultural export

Table 4.10 reveals that India's paddy export share in the World agricultural export was very negligible. It ranged from 0.02 to 0.47 per cent during the period under study.

India's paddy export share in World agricultural export was 0.02 per cent during 1960-61 then it continuously increased up to 1980-81. But it declined from 1990-91 onwards. It is noted that India's paddy share in World total agricultural export was less than one per cent.

India ranks second in the production of paddy after China and accounted for 15.23 per cent of global paddy production in 2017-18. However, the global trade of Indian paddy is very low as compared to its production. It is less than one per cent.

Table 4.10. India's paddy export share in World agricultural export

(₹ '000 Crore)

Sr. No.	Year	World Agricultural Export	India's Paddy Export	India's Share of Paddy in World Agricultural Export(%)
1	1960-61	16.86 (-)	0.004 (-)	0.02
2	1970-71	15.82 (-6.17)	0.004 (0.00)	0.03
3	1980-81	92.32 (483.57)	0.136 (3300.00)	0.15
4	1990-91	725.77 (686.15)	0.452 (232.35)	0.06
5	2000-01	2481.81 (241.96)	2.946 (551.77)	0.12
6	2010-11	6248.87 (151.79)	10.496 (256.28)	0.17
7	2017-18	10168.50 (62.73)	47.968 (357.01)	0.47

(Figures in the bracket indicates the per cent change over consequent decade)

Source : The State Food And Agriculture 1962, 1970, 1980; Changing Pattern in India's Agricultural Exports under WTO By Shabana Anjum and Arifa Khan; www.ricestat.com

4.3.4 India's agricultural export share in India's total export

It is noted from the Table 4.11 that India's agricultural export share in the India's total export trade was 43.69 per cent in the year 1960-61 and it was 18.82 per cent in the year 2017-18.

It indicates that share of service sector was increased than primary sector. After WTO period *i.e.* 1990-91 Onwards, the agricultural export share in total export has been declined.

Table 4.11. India's agricultural export share in India's total export
(₹ '000 Crore)

Sr. No.	Year	India's Total Export	India's Agricultural Export	Agricultural Export Share in Total Export (%)
1	1960-61	0.64	0.28	43.69
2	1970-71	1.52	0.37	24.03
3	1980-81	6.71	2.38	35.41
4	1990-91	32.53	6.01	18.48
5	2000-01	201.36	28.66	14.23
6	2010-11	1142.92	117.48	10.28
7	2017-18	2022.72	380.66	18.82

Source : Export Potential of Indian Agriculture, Editor- Dr. Gurshan Singh Kainth; www.Indiaagristat.com

4.3.5 India's paddy export share in India's agricultural export

It is noted from the Table 4.12 that India's paddy export share in the India's agricultural export trade was gradually increased from 1.43 per cent in 1960-61 to 12.60 per cent in 2017-18.

Table 4.12. India's paddy export share in India's agricultural export
(₹'000' Crore)

Sr. No.	Year	India's Agricultural Export	India's paddy Export	India's paddy Share in Agricultural Export (%)
1	1960-61	0.28	0.004	1.43
2	1970-71	0.37	0.004	1.15
3	1980-81	2.38	0.136	5.74
4	1990-91	6.01	0.452	7.52
5	2000-01	28.66	2.946	10.28
6	2010-11	117.48	10.496	8.93
7	2017-18	380.66	47.968	12.60

Source : www.indiaagristat.com; www.ricestat.com Export Potential of Indian Agriculture, Editor- Dr. Gurshan Singh Kainth

India exported paddy worth ₹ 4.00 crores in 1960-61 which is 1.43 per cent of India's agricultural export. India's paddy export increased up to ₹ 47968 crores which is 12.60 per cent of India's agricultural export. Hence, the share of paddy export in agricultural export is quite satisfactory. It was drastically increased in post-WTO period *i.e.* after 1990-91.

4.3.6 India's paddy export share in India's paddy production

India's paddy export share in the India's paddy production has been presented in Table 4.13.

It is seen from Table 4.13 that, the share of paddy export in total paddy production during 1960-61 was 0.62 per cent while it increased to 11.93 per cent in 2017-18. The per cent share of paddy export in India's total paddy production was increases from 1990-91 to 2017-18. Domestic paddy production is the main determinant of paddy export. Paddy production was continuously increased from the year 1960-61. Whereas, the India's paddy export share in paddy production has continuously increased from post-WTO period *i.e.* after 1990-91.

Table 4.13. India's paddy export share in India's paddy production

(Qty: '000 tonnes)

Sr. No.	Year	India's paddy Production	India's paddy Export	India's paddy Export Share in paddy Production (%)
1	1960-61	34574.00	214.36	0.62
2	1970-71	42225.00	16.00	0.04
3	1980-81	53631.00	919.00	1.71
4	1990-91	74291.00	712.00	0.96
5	2000-01	84976.00	1936.00	2.28
6	2010-11	95970.00	4637.00	4.83
7	2017-18	109000.00	13000.00	11.93

Source: www.ricestat.com; Constraints and potential of Indian rice export-shodhganga

4.3.7 Direction of trade-World total export and World total import

Direction of trade provides critical data on the value of merchandise exports and imports between each country and all its trading partners. It reports total bilateral and multilateral exports and imports aggregates at national or regional level.

Negative values denote countries in deficit, while positive values denote countries with a surplus.

It is seen from Table 4.14 that, in 1960-61, the World total export was worth ₹ 61.92 thousand crores and World total import was worth ₹ 75.53 thousand crores. There was a continuously negative balance of trade up to 2010-11 then it was changed in the year 2017-18. The World total export was worth ₹ 156027.63 thousand Crores and World total import was worth ₹152215.67 thousand crores during 2017-18 and it shown positive trade balance.

Table 4.14. Direction of trade-World total export and World total import
(₹'000 Crores)

Sr. No.	Year	World Total Export	World Total Import	Trade Balance
1	1960-61	61.92	75.53	-13.61
2	1970-71	238.52	287.85	-49.33
3	1980-81	1610.84	1851.03	-240.19
4	1990-91	6117.46	7635.25	-1517.79
5	2000-01	28998.07	35502.60	-6504.53
6	2010-11	69976.50	84134.05	-14157.55
7	2017-18	156027.63	152215.67	3811.96

Source : www.dataworldbank.org.com

4.3.8 Direction of trade-India's total export and India's total import

Analysis of the Table 4.15 reveals that in 1960-61, the India's total export was worth ₹ 0.64 thousand crores and India's total import was worth ₹ 1.12 thousand crores. The negative balance of trade in India did not change over the last 57 years, in spite of all government policies regarding export promotions. It is important to note that India's total export- import trade balance was drastically increased after post-WTO period.

Table 4.15 Direction of trade-India's total export and India's total import
(₹ '000 Crores)

Sr. No.	Year	India's Total Export	India's Total Import	Trade balance
1	1960-61	0.64	1.12	-0.48
2	1970-71	1.52	1.62	-0.10
3	1980-81	6.71	12.47	-5.76
4	1990-91	31.75	43.17	-11.42
5	2000-01	203.57	228.31	-24.74
6	2010-11	1142.92	1683.47	-540.55
7	2017-18	2022.72	2684.60	-661.88

Source : Export Potential of Indian Agriculture, Editor- Dr. Gurshan Singh Kainth;
www.Indiaagristat.com

4.3.9 Direction of trade-India's agricultural export and import

Table 4.16 reveals that in 1960-61, the India's agricultural export was worth ₹ 0.28 thousand crores and India's total import was worth ₹ 0.30 thousand crores, It denotes negative trade balance. It means that India was deficit during 1960-61. India's agriculture export trade balance was positive from 1970-71 to 2017-18. It means that India was with a surplus trade balance from 1970-71 to 2017-18, in agricultural export.

Table 4.16. Direction of trade-India's agricultural export and import
(₹'000 Crores)

Sr. No.	Year	India's Agriculture Export	India's Agriculture Import	Trade Balance
1	1960-61	0.28	0.30	-0.02
2	1970-71	0.37	0.33	0.04
3	1980-81	2.38	1.02	1.36
4	1990-91	6.01	1.21	4.81
5	2000-01	28.66	12.09	16.57
6	2010-11	117.48	57.33	60.15
7	2017-18	380.66	240.43	140.23

Source : Export Potential of Indian Agriculture, Editor- Dr. Gurshan Singh Kainth
www.Indiaagristat.com

4.3.10 Direction of trade-World paddy export and World paddy import

Table 4.17 shows that in 1960-61, the World paddy export was worth ₹ 0.27 thousand crores and World paddy import was worth ₹ 0.36 thousand crores. It indicates the negative trade balance of World paddy export-import. It continuously remained negative up to year 2017-18. It reveals that there was a continuous demand for paddy in the World.

Table 4.17 Direction of trade-World paddy export and World paddy import
(₹'000 Crores)

Sr. No.	Year	World paddy Export	World paddy Import	Trade Balance
1	1960-61	0.27	0.36	-0.09
2	1970-71	0.89	0.99	-0.10
3	1980-81	3.94	4.22	-0.28
4	1990-91	7.25	8.15	-0.90
5	2000-01	29.23	32.74	-3.51
6	2010-11	92.12	94.81	-2.69
7	2017-18	140.33	145.75	-5.42

Source: www.ricestat.com; The State Food And Agriculture 1962

4.3.11 Direction of trade-India's paddy export and paddy import

Table 4.18 noted that in 1960-61, the India's paddy export was worth ₹ 0.004 thousand crores and India's paddy import was worth ₹ 0.039 thousand crores. The negative balance of trade was in the year 1960-61 and 1970-71. Then it was positive trade balance for remaining period. It means that India was deficit in paddy export during the period 1960-61 to 1970-71 but from the period 1980-81 to 2017-18 India was with a surplus in trade balance of paddy export-import.

Table 4.18 Direction of trade-India's paddy export and paddy import
(₹'000 Crores)

Sr. No.	Year	India's Paddy Export	India's Paddy Import	Trade Balance
1	1960-61	0.004	0.039	-0.035
2	1970-71	0.004	0.060	-0.056
3	1980-81	0.136	0.001	0.135
4	1990-91	0.452	0.038	0.414
5	2000-01	2.946	0.018	2.928
6	2010-11	10.496	0.0005	10.496
7	2017-18	47.968	0.012	47.956

Source : www.ricestat.com; Trends in India's Agriculture Trade, Foreign Agricultural Economic Report No.15

4.3.12 Export competitiveness of Indian paddy

The export competitiveness of paddy in India was estimated by using Nominal Protection Coefficient (NPC) and Export Performance Ratio (EPR) for the period 1970-71 to 2017-18.

The calculations of Nominal Protection Coefficient (NPC) and Export Performance Ratio (EPR) were shown in Table 4.19. It is revealed from the Table 4.19 that, the paddy had a comparative advantage because the values of NPC for overall study period have been found less than unity except some years such as 1973-74, 1977-78, 1978-79, 1997-98, 2001-02 and 2011-12, In this period the NPC values were recorded as greater than unity. On an average the Nominal Protection Coefficient (NPC) was 0.62, which was less than unity for paddy export and which indicates that the domestic prices received by the farmers in the country were lower than the international prices. The values of Export Performance Ratio for overall study period have been found more than unity except some years such as 1970-71 to 1973-74 and 1975-76 to 1977-78, in this period the EPR values were less than unity. On an average the Export Performance Ratio (EPR) was 11.74 means greater than unity for paddy export which indicates that the paddy has comparative advantage in export.

Table 4.19 Export Competitiveness of Indian Paddy

Sr. No.	Year	NPC	EPR
1	1970-71	0.39	0.73
2	1971-72	0.50	0.48
3	1972-73	0.80	0.47
4	1973-74	1.57	0.39
5	1974-75	0.09	1.62
6	1975-76	0.51	0.76
7	1976-77	0.16	0.97
8	1977-78	3.36	0.38
9	1978-79	1.01	2.85
10	1979-80	0.60	6.24
11	1980-81	0.91	8.31
12	1981-82	0.20	17.00
13	1982-83	0.11	12.98
14	1983-84	0.31	7.11
15	1984-85	0.31	5.53
16	1985-86	0.15	12.72
17	1986-87	0.38	10.06
18	1987-88	0.21	15.79

Table 4.19 Contd....

Sr. No.	Year	NPC	EPR
19	1988-89	0.31	11.15
20	1989-90	0.29	9.40
21	1990-91	0.38	8.70
22	1991-92	0.23	12.58
23	1992-93	0.24	12.70
24	1993-94	0.24	13.33
25	1994-95	0.41	10.12
26	1995-96	0.41	29.94
27	1996-97	0.54	18.64
28	1997-98	1.18	18.27
29	1998-99	0.42	25.67
30	1999-00	0.45	14.26
31	2000-01	0.60	14.51
32	2001-02	1.87	14.10
33	2002-03	0.66	22.44
34	2003-04	0.69	15.06
35	2004-05	0.68	18.38
36	2005-06	0.75	14.90
37	2006-07	0.99	14.09
38	2007-08	0.33	18.31
39	2008-09	0.29	10.66
40	2009-10	0.31	8.66
41	2010-11	0.80	6.98
42	2011-12	1.05	9.93
43	2012-13	0.71	15.66
44	2013-14	0.63	19.20
45	2014-15	0.55	18.97
46	2015-16	0.59	17.02
47	2016-17	0.85	14.93
48	2017-18	0.50	20.31
	Average	0.62	11.74

4.3.13 Export competitiveness of Indian paddy with major importing countries

Estimated values of Nominal Protection Coefficient (NPC) showing export competitiveness of Indian paddy with major importing countries during the period 1991-92 to 2017-18 is presented Table 4.20. It is observed from the Table 4.20 that, the paddy had a comparative advantage because the values of NPC for overall study period in major importing countries have been found less than unity. On an average the Nominal

Protection Coefficient (NPC) were 0.46, 0.16, 0.65, 0.55 and 0.51 for major importing countries such as Saudi Arabia, UAE, Kuwait, Yemen AR and USA respectively, means less than unity for paddy export which indicates that the domestic prices received by the farmers in the country were lower than the international prices.

Table 4.20 Competitiveness of Indian paddy with major importing countries

Sr. No.	Year	Nominal Protection Coefficient (NPC)				
		Saudi Arabia	UAE	Kuwait	Yemen AR	USA
1	1991-92	0.76	0.09	0.78	0.39	0.14
2	1992-93	0.42	0.07	0.16	0.40	0.14
3	1993-94	0.30	0.05	0.20	0.60	0.13
4	1994-95	0.35	0.09	0.12	0.20	0.13
5	1995-96	0.47	0.06	0.20	0.53	0.16
6	1996-97	0.41	0.09	0.28	0.34	0.23
7	1997-98	0.41	0.12	0.22	0.48	0.23
8	1998-99	0.35	0.10	0.30	1.07	0.23
9	1999-00	0.47	0.08	0.26	0.76	0.22
10	2000-01	0.43	0.09	0.30	0.61	0.20
11	2001-02	0.51	0.08	0.38	0.72	0.20
12	2002-03	0.65	0.07	0.47	0.67	0.18
13	2003-04	0.81	0.06	0.53	0.78	0.20
14	2004-05	0.54	0.16	0.38	0.66	0.21
15	2005-06	0.38	0.24	0.45	0.43	0.23
16	2006-07	0.44	0.16	0.40	0.70	0.24
17	2007-08	0.52	0.14	0.40	0.57	0.28
18	2008-09	0.25	0.09	0.24	0.47	0.35
19	2009-10	0.25	0.12	0.21	0.35	0.33
20	2010-11	0.32	0.14	0.40	0.54	0.39
21	2011-12	0.44	0.18	0.20	0.73	0.42
22	2012-13	0.51	0.28	0.37	0.52	0.42
23	2013-14	0.37	0.51	0.57	0.54	0.44
24	2014-15	0.42	0.28	0.31	0.46	0.40
25	2015-16	0.46	0.26	0.24	0.33	0.37
26	2016-17	0.54	0.32	0.36	0.52	0.36
27	2017-18	0.56	0.31	0.37	0.49	0.35
Grand Total		12.34	4.27	9.11	14.83	7.19
Average		0.46	0.16	0.65	0.55	0.51

From the forgoing discussion, it is noted that, the values of Nominal Protection Coefficient (NPC) in paddy were less than unity over a period of 27 years for all the important importing countries indicating highly competitiveness of Indian paddy for export in international market. The NPC was lowest *i.e.* below 0.50 for Saudi Arabia and UAE for overall period *i.e.* 1991-92 to 2017-18 indicating the highly export competitiveness of these two countries. The similar results were noted by Makama *et al.* (2016) and Yamini (2019). The hypothesis viz; Indian paddy are competitive in the international market has been proved.

4.4 Structural Changes in Paddy Export From India

4.4.1 Major export destinations of Indian paddy

Indian paddy mainly exported to Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada and Belgium. The major destinations of Indian paddy in terms of both quantity and value and their shares is illustrated in Tables 4.21 and 4.22, respectively. It is revealed from the Table 4.21 that the Saudi Arabia accounted for the highest share (37.05 %) in paddy export from India in terms of quantity followed by UAE (34.67 %), Kuwait (7.70 %), Yamen Arab Republic (6.67 %), UK (6.44 %), USA (5.72 %), Canada (1.27 %) and Belgium (0.48 %) in the year 2016-17. Whereas Table 4.22 depicted in terms of export value. Saudi Arabia accounted the highest share (37.74%) followed by UAE (30.96 %), Kuwait (8.67 %), USA (7.19 %), Yamen AR (6.29 %), UK (5.62 %), Canada (1.78 %) and Belgium (1.75 %) in the year 2016-17. Paddy is not produced in Saudi Arabia and the country imports substantial quantity of paddy from India to meet its more consumer demand and the UAE imports paddy due to extreme heat and limited fresh water supplies that limit crop output. There has been a major destinations of export of Indian paddy over a period of ten years (2007-08 to 2016-17).

4.4.2 Trade directions of paddy exports from India

The changing pattern of Indian paddy export were estimated by computing the transitional probability matrices for the annual export data in terms of quantity and value presented in Tables 4.23 and 4.24, respectively. The row elements in the transitional probability matrix provide the information on the extent of loss in quantity and value of imports to competing countries. The columns element indicates the probability of gains in quantity and value of trade from other competing countries and the

diagonal element indicates probability of retention of the previous year's trade quantity and value by the respective country.

The major importers countries from India *viz.*, Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada and Belgium were considered for analysis. It is evident from the Table 4.23 that, UAE was the most stable market among the major importers of Indian paddy as reflected by the probability of retention at 0.6793, which means that UAE had retained its original export quantity share of 67.93 per cent during the period 2007-08 to 2016-17. Saudi Arabia had probability of retention 0.5734, and it retained its original export quantity share of 57.34 per cent. Similarly, Yamen Arab Republic retained its original export quantity share of 39.39 per cent. This implies that Saudi Arabia and Yamen AR were also the stable importer of Indian paddy. Kuwait and UK have shown lower probability of retention *viz.*, 0.1355 and 0.0865 respectively, on the contrary, USA, Canada and Belgium have shown 'zero' probability of retention which means that they were unstable importers of Indian paddy.

The major gainer among the importers of Indian total paddy in quantity over the study period was Saudi Arabia which had a transfer probability of 1.0000 from Canada, 0.2779 from Kuwait, 0.4745 from UK, 0.1672 from UAE, 0.9897 from USA and 0.2699 from Belgium.

The Transitional Probability Matrix presented in Table 4.24 provides a broad indication of changes in the direction of export value of paddy from India .The major Indian paddy importing countries were Saudi Arabia, Kuwait, UK, Yamen Arab Republic, U.S.A, Canada and Belgium in terms of value.

Table 4.24 indicated that U.S.A. was the most stable market in terms of value among the major importers of Indian paddy, as exhibited by highest probability of retention at 0.7634, which means that U.S.A. had retained its original export value share of 76.34 per cent during the period 2007-08 to 2016-17. UAE had the probability of retention 0.5647, and it retained its original export value share of 56.47 per cent. Similarly, Saudi Arabia retained its original export value share of 43.88 per cent. This implies that UAE and Saudi Arabia was the stable importer of Indian paddy in value term.

Table 4.21 India's total paddy export to major importing countries

(Qty: MT)

Year	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	U.S.A.	Canada	Belgium	Total
2007-08	382642.50 (44.29)	74026.9 (8.57)	44459.87 (5.15)	252641.99 (29.24)	51997.24 (6.01)	41965.16 (4.86)	8899.45 (1.03)	7344.335 (0.85)	863977.43 (100.00)
2008-09	262562.61 (41.18)	55867.05 (8.76)	31928.45 (5.00)	238729.17 (37.44)	15923.84 (2.50)	20022.05 (3.14)	8899.45 (1.40)	7344.34 (1.15)	637649.3 (100.00)
2009-10	327640.85 (41.74)	70025.92 (8.92)	18963.55 (2.42)	313970.28 (39.10)	32000.81 (4.08)	15439.69 (1.97)	5402.63 (0.69)	1495.05 (0.19)	784938.8 (100.00)
2010-11	311962.36 (36.94)	98876.17 (11.78)	38809.34 (4.60)	318196.95 (37.68)	35146.76 (4.16)	24019.21 (2.84)	8321.04 (0.99)	9207.06 (1.09)	844538.9 (100.00)
2011-12	411962.83 (33.20)	109385.2 (8.81)	80573.44 (6.51)	468147.03 (37.73)	82219.44 (6.63)	55891.63 (4.50)	16056.48 (1.30)	16430.22 (1.32)	1240666.28 (100.00)
2012-13	412204.69 (37.40)	101732.05 (9.23)	107939.20 (9.80)	248375.66 (22.54)	113903.70 (10.34)	56371.15 (5.12)	15052.42 (1.37)	46303.31 (4.20)	1101882.18 (100.00)
2013-14	482852.43 (45.51)	101354.37 (9.55)	71377.88 (6.73)	186979.14 (17.62)	105752.98 (9.97)	64404.42 (6.07)	15955.99 (1.50)	32198.23 (3.03)	1060875.43 (100.00)
2014-15	574498.42 (46.73)	99875.99 (8.12)	75941.77 (6.18)	259876.56 (21.14)	126585.49 (10.30)	58464.10 (4.76)	14779.48 (1.20)	19479.96 (1.58)	1229502.66 (100.00)
2015-16	550356.92 (38.73)	106611.91 (7.50)	101907.46 (7.17)	423212.95 (29.78)	113420.71 (7.98)	81081.95 (5.71)	20406.1 (1.44)	23895.66 (1.68)	1420893.66 (100.00)
2016-17	467503.11 (37.05)	97224.45 (7.70)	81208.435 (6.44)	437437.87 (34.67)	84119.91 (6.67)	72125.53 (5.72)	16060.44 (1.27)	6021.105 (0.48)	1261700.84 (100.00)

(Figures within the parentheses indicate per cent share of each importing country)

Source : www.APEDA.com

Table 4.22 India's paddy export to major countries during 2007-08 to 2016-17

(Value ₹. Lakh)

Year	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	U.S.A.	Canada	Belgium	Total
2007-08	122567.89 (45.99)	23646.92 (8.87)	16191.23 (6.07)	75897.35 (28.48)	11607.63 (4.35)	10744.88 (4.03)	3226.70 (1.21)	2600.94 (0.97)	266483.52 (100.00)
2008-09	155277.97 (39.86)	36737.47 (9.43)	21782.69 (5.59)	145144.98 (37.26)	8795.24 (2.25)	13728.42 (3.52)	6048.67 (1.55)	1991.01 (0.51)	389506.43 (100.00)
2009-10	167329.08 (40.46)	51607.38 (12.47)	10050.92 (2.43)	156833.07 (37.92)	15115.72 (3.65)	8593.58 (2.07)	3222.29 (0.77)	783.63 (0.17)	413535.66 (100.00)
2010-11	156906.23 (38.42)	54593.07 (13.36)	17626.70 (4.31)	142243.24 (34.83)	14860.00 (3.63)	12628.38 (3.09)	5044.42 (1.23)	4,489.55 (1.09)	408391.57 (100.00)
2011-12	183037.19 (32.74)	71136.71 (12.72)	34693.54 (6.21)	196591.37 (35.16)	28927.38 (5.17)	28805.09 (5.15)	9332.66 (1.67)	6593.74 (1.18)	559117.67 (100.00)
2012-13	204701.51 (39.22)	59174.47 (11.34)	45360.50 (8.69)	103567.20 (19.84)	51505.94 (9.87)	32352.29 (6.20)	8858.75 (1.70)	16429.85 (3.15)	521950.49 (100.00)
2013-14	362077.60 (49.84)	81037.38 (11.16)	43588.52 (6.00)	94751.59 (13.04)	67281.15 (9.26)	50287.71 (6.92)	12304.69 (1.69)	15107.59 (2.08)	726436.21 (100.00)
2014-15	395508.67 (48.99)	82850.62 (10.26)	48129.46 (5.96)	134849.68 (16.70)	74600.67 (9.24)	47072.79 (5.83)	12401.72 (1.54)	11914.19 (1.48)	807327.80 (100.00)
2015-16	300026.68 (40.41)	74768.86 (10.09)	50108.45 (6.70)	192924.28 (25.79)	50741.22 (6.78)	53969.45 (7.21)	13568.08 (1.81)	12095.81 (1.62)	748202.82 (100.00)
2016-17	246134.94 (37.78)	56522.05 (8.67)	36683.62 (5.69)	201935.95 (30.45)	40993.55 (6.29)	46889.82 (7.29)	11617.87 (1.79)	11436.46 (1.94)	652214.23 (100.00)

(Figures within the parentheses indicate per cent share of each importing country)

Source : www.APEDA.com

Kuwait, UK, Yamen Republic, and other countries have shown lower probability of retention, *viz.* 0.2010, 0.1586 and 0.2899, respectively on the contrary, Canada and Belgium have shown ‘zero’ probability of retention, indicating that Canada and Belgium were unstable importers of Indian paddy.

The major gainer among the importers of Indian paddy over the study period was Yamen Republic which had a transfer probability of 1.0000 from Belgium, 0.0051 from U.S.A. 0.1463 from Kuwait and 0.7077 from Canada.

Thus, the trade direction of Indian paddy export in terms of quantity and value were changing over a period of time. These results are in line with findings of Anup Adhikari *et al.* (2016) and Yamini (2019). The hypothesis *viz.*; the dynamics in the direction of paddy export is changing has been proved.

Table 4.23 Transitional probability matrix for total paddy export in quantity from India during 2007-08 to 2016-17

	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium
Saudi Arabia	0.5734	0.1220	0.0000	0.3046	0.0000	0.0000	0.0000	0.0000
Kuwait	0.2779	0.1355	0.1482	0.0000	0.3067	0.0000	0.0463	0.0855
UK	0.4745	0.0000	0.0865	0.0000	0.0000	0.3552	0.0837	0.0000
UAE	0.1672	0.0724	0.0414	0.6793	0.0000	0.0308	0.0089	0.0000
Yamen AR	0.0000	0.0000	0.3464	0.0000	0.3939	0.1832	0.0000	0.0766
USA	0.9897	0.0000	0.0000	0.0000	0.0000	0.0000	0.0103	0.0000
Canada	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Belgium	0.2699	0.0000	0.0000	0.0000	0.7301	0.0000	0.0000	0.0000

Table 4.24 Transitional probability matrix for paddy export in value from India during 2007-08 to 2016-17

	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium
Saudi Arabia	0.4389	0.1202	0.0864	0.3340	0.0000	0.0000	0.0206	0.0000
Kuwait	0.5021	0.2010	0.0000	0.0000	0.1463	0.0835	0.0117	0.0553
UK	0.8309	0.0000	0.1587	0.0000	0.0000	0.0000	0.0105	0.0000
UAE	0.2794	0.1555	0.0000	0.5647	0.0000	0.0000	0.0005	0.0000
Yamen AR	0.4183	0.0000	0.0726	0.0000	0.2899	0.1256	0.0000	0.0935
USA	0.0113	0.0000	0.0833	0.0000	0.0051	0.7634	0.1047	0.0323
Canada	0.2923	0.0000	0.0000	0.0000	0.7077	0.0000	0.0000	0.0000
Belgium	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000

4.4.3 Major export destinations of Indian basmati paddy

In earlier part of this section, the structural changes in export and import of Indian total paddy has been discussed. However, for more detailed analysis the structural changes in export and import of Indian rice of Basmati and non-basmati rice is explained as below.

Indian basmati paddy mainly exported to Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada and Belgium. The major destinations of Indian basmati paddy in terms of both quantity and value and their shares illustrated in Table 4.25 and 4.26 respectively. It is revealed from the Table 4.25 that the Saudi Arabia accounted for the highest share (40.75 %) in basmati paddy export quantity from India followed by UAE (22.07 %), UK (9.28 %), Yamen Arab Republic (8.62 %), Kuwait (8.58 %), USA (6.52 %), Canada (2.12 %) and Belgium (2.06 %). Whereas, Table 4.26 depicted that, Saudi Arabia also accounted the highest share (41.39 %) in basmati paddy export in terms of value from India followed by UAE (21.85 %), Kuwait (8.88 %), Yamen AR (8.04 %), UK (7.97 %), USA (7.44 %), Canada (2.39 %) and Belgium (2.05 %) in the year 2017-18. There has been major destinations of export of Indian paddy over a period of ten years (2008-09 to 2017-18).

Table 4.25 India's Basmati paddy export to major importing countries from 2008-09 to 2017-18
Qty : MT

Year	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium	Total
2008-09	524401.67 (41.94)	111547.25 (8.92)	62563.10 (5.00)	456146.51 (36.48)	31475.68 (2.52)	39625.13 (3.17)	17835.20 (1.43)	6898.73 (0.55)	1250493.27 (100.00)
2009-10	640404.41 (41.79)	139473.57 (9.10)	36966.43 (2.41)	616125.13 (40.21)	61809.92 (4.03)	25922.13 (1.69)	9244.81 (0.60)	2511.00 (0.16)	1532457.40 (100.00)
2010-11	622704.96 (37.16)	197590.40 (11.79)	77384.45 (4.62)	634769.33 (37.88)	70042.10 (4.18)	47489.73 (2.83)	16531.47 (0.99)	9207.06 (0.55)	1675719.50 (100.00)
2011-12	721245.48 (35.58)	199869.77 (9.86)	141666.21 (6.99)	728823.29 (35.95)	92112.14 (4.54)	91816.94 (4.53)	28458.45 (1.40)	23279.84 (1.15)	2027272.12 (100.00)
2012-13	681238.69 (42.09)	163317.07 (10.09)	192433.35 (11.89)	234679.47 (14.50)	172348.74 (10.65)	91546.37 (5.66)	28145.15 (1.74)	54959.36 (3.40)	1618668.20 (100.00)
2013-14	826289.81 (52.19)	175444.79 (11.08)	118888.17 (7.51)	149041.96 (9.41)	146839.58 (9.27)	103377.64 (6.53)	28826.11 (1.82)	34498.88 (2.18)	1583206.94 (100.00)
2014-15	966931.17 (51.78)	166468.29 (8.91)	136347.31 (7.30)	278596.43 (14.92)	174368.66 (9.34)	89223.17 (4.78)	25666.84 (1.37)	29900.00 (1.60)	1867501.87 (100.00)
2015-16	948847.51 (41.87)	180731.80 (7.98)	187701.72 (8.28)	612154.81 (27.01)	142161.42 (6.27)	120687.24 (5.33)	36216.07 (1.60)	37516.00 (1.66)	2266016.57 (100.00)
2016-17	809342.72 (39.59)	162675.52 (7.96)	150537.21 (7.36)	614656.98 (30.07)	130652.82 (6.39)	108990.92 (5.33)	31651.40 (1.55)	35694.91 (1.75)	2044202.48 (100.00)
2017-18	792480.09 (40.75)	166873.90 (8.58)	180507.92 (9.28)	429325.73 (22.07)	167687.62 (8.62)	126791.19 (6.52)	41232.62 (2.12)	40061.40 (2.06)	1944960.47 (100.00)

(Figures within the parentheses indicate per cent share of each importing country)

Source: www.ricestat.com

Table 4.26 Export of Basmati paddy from India to major importing countries in Value ₹ Lakh

Year	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium	Total
2008-09	310280.84 (40.51)	73393.68 (9.58)	43103.89 (5.63)	278620.50 (36.37)	17515.88 (2.29)	27259.70 (3.56)	12007.75 (1.57)	3836.29 (0.50)	766018.53 (100.00)
2009-10	329547.41 (40.49)	103014.17 (12.66)	19589.45 (2.41)	309465.31 (38.02)	29548.25 (3.63)	15349.93 (1.89)	6136.60 (0.75)	1294.17 (0.16)	813945.29 (100.00)
2010-11	313294.44 (38.64)	109164.06 (13.46)	35176.84 (4.34)	283975.54 (35.02)	29678.49 (3.66)	25032.49 (3.09)	10054.08 (1.24)	4489.55 (0.55)	810865.49 (100.00)
2011-12	338088.10 (33.80)	136292.08 (13.63)	62945.73 (6.29)	343279.33 (34.32)	40291.21 (4.03)	50388.20 (5.04)	17402.42 (1.74)	11612.14 (1.16)	1000299.21 (100.00)
2012-13	365908.13 (41.79)	105967.74 (12.10)	84998.43 (9.71)	131119.84 (14.98)	87819.40 (10.03)	56169.10 (6.42)	17080.52 (1.95)	26473.00 (3.02)	875536.16 (100.00)
2013-14	671706.04 (53.07)	151305.57 (11.95)	78584.89 (6.21)	118922.48 (9.40)	110779.47 (8.75)	87044.95 (6.88)	23154.93 (1.83)	24177.24 (1.91)	1265675.57 (100.00)
2014-15	726078.26 (51.56)	153322.63 (10.89)	89981.41 (6.39)	192996.56 (13.71)	120100.30 (8.53)	80540.10 (5.72)	22966.48 (1.63)	22214.35 (1.58)	1408200.09 (100.00)
2015-16	549385.15 (42.33)	137670.34 (10.61)	93283.66 (7.19)	311070.29 (23.97)	73128.18 (5.64)	86167.51 (6.64)	25104.43 (1.93)	21911.18 (1.69)	1297720.74 (100.00)
2016-17	449452.95 (40.17)	100241.95 (8.96)	68080.94 (6.08)	314171.59 (28.08)	69244.80 (6.19)	75285.27 (6.73)	21156.50 (1.89)	21214.35 (1.90)	1118848.35 (100.00)
2017-18	534317.17 (41.39)	114627.09 (8.88)	102835.66 (7.97)	282053.47 (21.85)	103843.45 (8.04)	96013.19 (7.44)	30854.75 (2.39)	26404.73 (2.05)	1290949.51 (100.00)

(Figures within the parentheses indicate per cent share of each importing country)

Source : www.ricestat.com

4.4.4 Trade directions of basmati paddy exports from India

The changing pattern of Indian basmati paddy in export were estimated by computing the transitional probability matrices for the annual export data in terms of quantity and value, presented in Table 4.27 and 4.28 respectively.

The major importer countries from India *viz.*, Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada and Belgium were considered for analysis. It is evident from the Table 4.27 that, UAE was the most stable market among the major importers of Indian basmati paddy as reflected by the probability of retention at 0.7937, which means that UAE had retained its original export quantity share of 79.37 per cent during the period 2008-09 to 2017-18. Saudi Arabia had probability of retention 0.7401, and it retained its original export quantity share of 74.01 per cent. Similarly, Kuwait retained its original export quantity share of 53.66 per cent and Yamen Arab Republic retained its original export quantity share of 51.50 per cent. This implies that Saudi Arabia, Kuwait and Yamen AR were also the stable import countries of Indian basmati paddy. UK has shown lower probability of retention *viz.*, 0.1205, on the contrary, USA,

Canada and Belgium have shown ‘zero’ probability of retention which means that they were unstable importer of Indian basmati paddy.

Table 4.27 Transitional probability matrix for basmati paddy export in quantity from India during 2008-09 to 2017-18

	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium
Saudi Arabia	0.7401	0.0448	0.0382	0.1428	0.0333	0.0000	0.0000	0.0008
Kuwait	0.4634	0.5366	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
UK	0.4600	0.0000	0.1205	0.0000	0.0000	0.2249	0.0556	0.1390
UAE	0.0000	0.0668	0.0493	0.7937	0.0000	0.0614	0.0212	0.0075
Yamen AR	0.0000	0.0000	0.1307	0.0000	0.5150	0.2784	0.0759	0.0000
USA	0.0867	0.0000	0.4173	0.0000	0.4208	0.0000	0.0075	0.0677
Canada	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Belgium	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4.28 Transitional probability matrix for basmati paddy export in value from India during 2008-09 to 2017-18

	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium
Saudi Arabia	0.7298	0.0838	0.0203	0.1173	0.0488	0.0000	0.0000	0.0000
Kuwait	0.1658	0.4753	0.2732	0.0000	0.0062	0.0070	0.0688	0.0038
UK	0.6487	0.0000	0.0370	0.0000	0.0000	0.2824	0.0295	0.0025
UAE	0.0798	0.0813	0.0000	0.7962	0.0000	0.0335	0.0092	0.0000
Yamen AR	0.6503	0.0000	0.0000	0.0000	0.3497	0.0000	0.0000	0.0000
USA	0.0000	0.0000	0.2644	0.0000	0.1102	0.5530	0.0000	0.0724
Canada	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2945	0.7055
Belgium	0.1983	0.0000	0.0000	0.0000	0.8017	0.0000	0.0000	0.0000

The major gainer among the importers of Indian basmati paddy over the study period was Saudi Arabia which had a transfer probability of 1.0000 from Canada, 1.0000 from Belgium 0.4634 from Kuwait, 0.4600 from UK and 0.0867 from USA.

The Transitional Probability Matrix presented in Table 4.28 provides broad indications of changes in the direction of export value of basmati paddy from India. The major Indian paddy importing countries were Saudi Arabia, Kuwait, UK, Yamen Arab Republic, U.S.A, Canada and Belgium. Table 4.28 indicated that UAE, was the most stable market in terms of value among the major importers of Indian basmati paddy, as exhibited by highest probability of retention at 0.7962, which means that UAE had retained its original export value share of 79.62 per cent during the period 2008-09 to 2017-18. Saudi Arabia had the probability of retention 0.7298, and it retained its original export value share of 72.98 per cent. Similarly, USA retained its original export value share of 55.30 per cent. This implies that Saudi Arabia and USA were also the stable import value of Indian basmati paddy.

Kuwait, UK, Yamen Republic and Canada have shown lower probability of retention, viz. 0.4753, 0.0370, 0.3497 and 0.2945 respectively, on the contrary, Belgium had shown 'zero' probability of retention, indicating that Belgium was an unstable importer of Indian basmati paddy.

The major gainer among the importers of Indian basmati paddy over the study period was Yamen Republic which had a transfer probability of 0.8017 from Belgium, 0.1102 from USA, 0.0488 Saudi Arabia and 0.0062 from Kuwait.

4.4.5 Major export destinations of Indian non-basmati paddy

Indian non-basmati paddy mainly was exported to Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada and Belgium. The major destinations of Indian non-basmati paddy in terms of both quantity and value and their shares are illustrated in Tables 4.29 and 4.30 respectively. It is revealed from the Table 4.29 that the UAE accounted for the highest share (47.03 %) in non-basmati paddy export quantity from India followed by Saudi Arabia (22.22 %), Yaman Arab Republic (14.57 %), USA (6.95 %), Kuwait (6.34 %), UK (1.57 %), Canada (0.77 %) and Belgium (0.54 %). Whereas, Table 4.30 depicted that, UAE also accounted the highest share (43.52 %) in non-basmati paddy export value from India followed by Saudi Arabia (21.40 %), Yamen

AR (15.17 %), Kuwait (6.50 %), UK (2.22 %), Canada (0.94 %), Belgium (0.53 %) and USA (0.10 %) in the year 2017-18. There has been a major destinations of export of Indian paddy over a period of ten years (2008-09 to 2017-18).

4.4.6 Trade directions of non-basmati paddy exports from India

The changing pattern of Indian non-basmati paddy in export were estimated by computing the transitional probability matrices for the annual export data in terms of quantity and value presented in Tables 4.31 and 4.32 respectively.

The major importer countries from India *viz.*, Saudi Arabia, Kuwait, UK, UAE, Yemen Arab Republic, USA, Canada and Belgium were considered for analysis. It is evident from the Table 4.31 that, Belgium was the most stable market among the major importers of Indian non-basmati paddy as reflected by the probability of retention at 0.4409, which means that Belgium had retained its original export quantity share of 44.09 per cent during the period 2008-09 to 2017-18. UAE had probability of retention 0.3371, and it retained its original export quantity share of 33.71 per cent. Similarly, Saudi Arabia retained its original export quantity share 22.08 per cent and UK retained its original export quantity share of 19.26 per cent. This implies that Saudi Arabia and UK were also the stable import quantity of Indian non-basmati paddy. Canada has shown lower probability of retention *viz.*, 0.0854, on the contrary, Kuwait, USA and Yaman Arab Republic have shown 'zero' probability of retention which means that they were unstable importer of Indian non-basmati paddy.

The major gainer among the importers of Indian non-basmati paddy over the study period was UAE which had a transfer probability of 1.0000 from Kuwait, 1.0000 from USA, 0.7607 from Yaman Arab Republic and 0.3665 from Saudi Arab.

The Transitional Probability Matrix presented in Table 4.32 provides a broad indication of changes in the direction of export value of non-basmati paddy from India .The major Indian paddy importing countries were Saudi Arabia, Kuwait, UK, Yamen Arab Republic, U.S.A, Canada and Belgium. Table 4.32 indicated that Kuwait was the most stable market among the major importers of Indian non-basmati paddy, as exhibited by highest probability of retention at 0.4290, which means that Kuwait had retained its original export value share of 42.90 per cent during the period 2008-09 to 2017-18. UAE had the probability of retention 0.2933, and it retained its original export

value share of 29.33per cent. Similarly, Saudi Arabia retained its original export value share of 23.79 per cent. This implies that Saudi Arabia had also the stable import value of Indian non-basmati paddy.

Canada has shown lower probability of retention, viz. 0.0620 while UK, Yaman Arab Republic, USA and Belgium have shown ‘zero’ probability of retention, indicating that they were unstable importer of Indian non-basmati paddy.

The major gainer among the importers of Indian non- basmati paddy over the study period was Saudi Arabia which had a transfer probability of 1.0000 from Belgium, 0.4150from UAE and 0.0863 from Yaman Arab Republic.

Table 4.29 Export of Non-Basmati paddy from India to major importing countries during 2008-09 to2017-18

Qty : MT

Year	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium	Total
2008-09	723.55 (2.92)	186.84 (0.75)	1293.79 (5.22)	21311.83 (85.92)	372 (1.50)	418.97 (1.69)	206.93 (0.83)	291.4 (1.17)	24805.31 (100.00)
2009-10	14877.29 (39.76)	578.26 (1.55)	960.67 (2.57)	11815.43 (31.58)	2191.70 (5.86)	4957.24 (13.25)	1560.45 (4.17)	479.1 (1.28)	37420.14 (100.00)
2010-11	1219.76 (29.38)	161.93 (3.90)	234.22 (5.64)	1624.56 (39.13)	251.42 (6.06)	548.68 (13.22)	110.61 (2.66)	0 (0.00)	4151.18 (100.00)
2011-12	102680.18 (22.61)	18900.68 (4.16)	19480.66 (4.29)	207470.76 (45.69)	72326.74 (15.93)	19966.31 (4.40)	3654.51 (0.80)	9580.59 (2.11)	454060.43 (100.00)
2012-13	143170.69 (24.47)	40147.03 (6.86)	23445.04 (4.01)	262071.85 (44.79)	55458.66 (9.48)	21195.93 (3.62)	1959.69 (0.33)	37647.26 (6.43)	585096.15 (100.00)
2013-14	139415.05 (25.89)	27263.95 (5.06)	23867.59 (4.43)	224916.32 (41.76)	64666.38 (12.01)	25431.19 (4.72)	3085.86 (0.57)	29897.57 (5.55)	538543.91 (100.00)
2014-15	182065.66 (30.78)	33283.69 (5.63)	15536.23 (2.63)	241156.68 (40.77)	78802.32 (13.32)	27706.82 (4.68)	3892.12 (0.66)	9059.92 (1.53)	591503.44 (100.00)
2015-16	151866.33 (26.38)	32492.02 (5.64)	16113.20 (2.80)	234271.09 (40.69)	84680.00 (14.71)	41476.65 (7.20)	4596.13 (0.80)	10275.32 (1.78)	575770.74 (100.00)
2016-17	125663.49 (24.37)	31773.38 (6.16)	11879.66 (2.30)	260218.76 (50.47)	37587.00 (7.29)	35260.14 (6.84)	4694.47 (0.91)	8472.30 (1.64)	515549.20 (100.00)
2017-18	129329.04 (22.22)	36928.35 (6.34)	9123.32 (1.57)	273769.97 (47.03)	84783.00 (14.57)	40476.33 (6.95)	4497.38 (0.78)	3163.00 (0.54)	582070.39 (100.00)

(Figures within the parentheses indicate per cent share of each importing country)

Source : www.ricestat.com

Table 4.30 Export of non-basmati paddy from India to major importing countries
Value: ₹. lack

Year	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium	Total
2008-09	275.09 (2.12)	81.26 (0.63)	461.48 (3.55)	11669.45 (89.80)	74.6 (0.57)	197.13 (0.02)	89.59 (0.69)	145.72 (1.12)	12994.32 (100.00)
2009-10	5110.74 (38.94)	200.59 (1.53)	512.39 (3.90)	4200.82 (32.00)	683.18 (5.20)	1837.23 (0.14)	307.98 (2.35)	273.09 (2.08)	13126.02 (100.00)
2010-11	518.02 (36.27)	22.07 (1.55)	76.55 (5.36)	510.93 (35.78)	41.51 (2.91)	224.26 (0.16)	34.76 (2.43)	0 (0.00)	1428.1 (100.00)
2011-12	27986.28 (23.73)	5981.34 (5.07)	6441.35 (5.46)	49903.41 (42.31)	17563.54 (14.89)	7221.97 (0.06)	1262.89 (1.07)	1575.34 (1.34)	117936.12 (100.00)
2012-13	43494.89 (25.83)	12381.19 (7.35)	5722.56 (3.40)	76014.56 (45.15)	15192.48 (9.02)	8535.48 (0.05)	636.97 (0.38)	6386.69 (3.79)	168364.82 (100.00)
2013-14	52449.15 (28.02)	10769.18 (5.75)	8592.15 (4.59)	70580.70 (37.70)	23782.83 (12.70)	13530.46 (0.07)	1454.45 (0.78)	6037.93 (3.23)	187196.85 (100.00)
2014-15	64939.11 (31.35)	12378.61 (5.98)	6277.50 (3.03)	76702.80 (37.02)	29101.03 (14.05)	14318.93 (0.07)	1836.95 (0.89)	1614.03 (0.78)	207168.96 (100.00)
2015-16	50668.20 (25.50)	11867.38 (5.97)	6933.24 (3.49)	74778.26 (37.64)	28354.29 (14.27)	21771.38 (0.11)	2031.72 (1.02)	2280.43 (1.15)	198684.90 (100.00)
2016-17	42816.92 (23.07)	12802.15 (6.90)	5286.29 (2.85)	89700.30 (48.34)	12742.30 (6.87)	18494.36 (0.10)	2079.23 (1.12)	1658.56 (0.89)	185580.11 (100.00)
2017-18	47270.46 (21.40)	14357.55 (6.50)	4903.07 (2.22)	96152.22 (43.52)	33514.23 (15.17)	21456.43 (0.10)	2087.24 (0.94)	1173.85 (0.53)	220915.05 (100.00)

(Figures within the parentheses indicate per cent share of each importing country)

Source : www.ricestat.com

Table 4.31 Transitional probability matrix for non-basmati paddy export in Quantity from India during 2008-09 to 2017-18

	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium
Saudi Arabia	0.2208	0.0536	0.0336	0.3665	0.3255	0.0000	0.0000	0.0000
Kuwait	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
UK	0.0000	0.0020	0.1926	0.0000	0.4999	0.0000	0.0000	0.3054
UAE	0.4550	0.0287	0.0046	0.3371	0.0248	0.1350	0.0146	0.0000
Yamen AR	0.0000	0.2393	0.0000	0.7607	0.0000	0.0000	0.0000	0.0000
USA	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
Canada	0.0000	0.0000	0.7649	0.0000	0.0000	0.1496	0.0854	0.0000
Belgium	0.0164	0.0288	0.3694	0.0000	0.1446	0.0000	0.0000	0.4409

Table 4.32 Transitional probability matrix for non-basmati paddy export in value from India during 2008-09 to 2017-18

	Saudi Arabia	Kuwait	UK	UAE	Yamen AR	USA	Canada	Belgium
Saudi Arabia	0.2379	0.0000	0.0431	0.2806	0.3551	0.0825	0.0000	0.0007
Kuwait	0.0000	0.4290	0.0000	0.3873	0.1837	0.0000	0.0000	0.0000
UK	0.0000	0.1104	0.0000	0.8896	0.0000	0.0000	0.0000	0.0000
UAE	0.4150	0.0054	0.0352	0.2933	0.0482	0.1540	0.0257	0.0231
Yamen AR	0.0863	0.0999	0.0000	0.8138	0.0000	0.0000	0.0000	0.0000
USA	0.0000	0.2120	0.0000	0.7880	0.0000	0.0000	0.0000	0.0000
Canada	0.0000	0.0000	0.9380	0.0000	0.0000	0.0000	0.0620	0.0000
Belgium	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.5. Determinants of export of paddy from India

The factors influencing the export of Indian paddy were analysed. The data pertaining to different aspects that influence the export of paddy were collected for 48 years from 1970-71 to 2017-18. The multiple regression model was employed for the analysis. The model is fitted and R^2 value was used to fit the model to analyze the parameters under study.

Table 4.33. Determinant of Paddy Export From India

Sr. No.	Variables	Coefficients	S.E.
1	Intercept	-175251.0000	1441427
2	Domestic Production of Paddy (Tonnes)(X_1)	-0.0254**	0.012161
3	Wholesale Price of Paddy (₹/qtl)(X_2)	-1206.5300***	176.66
4	International Price of Paddy (₹/qtl)(X_3)	4818.9000***	719.78
5	World Production Paddy (Tonnes) (X_4)	0.0029	0.0075
6	Exchange Rate(X_5)	-41660.5600*	22791.33
7	NPC(X_6)	-2906.1700	285467
8	EPR(X_7)	59635.2000*	29864.24
9	R^2	0.95	-

Note: ***, ** and * indicates 1, 5 and 10 per cent level of significance

It is revealed from the Table 4.33 that, the factors determining paddy export from India were studied by using multiple regression model where quantity exported (Y) was regressed against domestic production (X_1), wholesale price (X_2), international price (X_3), world production (X_4), exchange rate (X_5), Nominal Protection Coefficient (NPC) (X_6) and Export Performance Ratio (EPR) (X_7). The data used for regression analysis were for 48 years. (1970-71 to 2017-18).

Table 4.33 shows that the Domestic Production (X_1), Wholesale price (X_2), Exchange rate (X_5) and NPC (X_6) were negatively significant. Whereas, the international price (X_3), world Production of paddy (X_4) and EPR (X_7) were positively significant. The regression coefficient of domestic production of paddy (X_1) is 0.03 whereas negatively significant at 5 per cent level of significant. It indicates that if the domestic production of paddy increased by one tonne then export of paddy was declined by 0.03 tonne. If wholesale price (X_2) increased at 1 ₹/qtl then export of paddy decline at 1206.53 tonnes with 1 per cent level of significant. Demand for paddy export from India was found to be increased with increase in international prices of paddy (X_3), with 1 ₹/qtl increase in international prices of paddy the export of paddy would be increased by 4818.90 tonne. World production of paddy (X_4) was positive but non-significant which indicates that the increase in the world production of the paddy export would be 0.003 tonne. If exchange rate (X_5) increased at 1 ₹/qtl then export of paddy decline at 41660.56 with 10 per cent level of significant. Nominal Protection Coefficient (X_6) was negative but non-significant. This indicates that if the domestic price of paddy was less than international price, then it increased export of paddy from India. Export Performance Ratio (X_7) was positively significant with 10 per cent level of significance This indicates that, the share of paddy in India's total export was more than share of paddy in the World total export. Similar observations were reported by Adhikar (2016) and Yamini (2019).

5. SUMMARY AND CONCLUSIONS

International trade plays an important role in economic development and growth of a country. Exports are vital to Indian economy as it is the major source of foreign exchange earnings and provides employment to millions of people in the country. Paddy is one of the major cereal crop in the World and most important food crop of India. It plays an important role in providing food security to the country. Paddy is grown and consumed extensively in India. The present study was undertaken in order to know the Indian scenario of paddy trade along with its area, production and productivity, pattern of export performance of paddy in India and policies to enhance the export of paddy from India in order to gain valuable foreign exchange with the following objectives.

5.1 Objectives

1. To estimate the growth rates of area, production and productivity of paddy in India.
2. To estimate the trends in domestic and international prices of paddy.
3. To examine the competitiveness of Indian paddy.
4. To analyze the direction of trade of paddy export from India.
5. To study the determinants of export of paddy in India.
6. To suggest the policy measures for export of paddy

5.2 Methodology

The study was conducted at all India level using secondary data collected from different sources for the period of 48 years beginning with 1970-71 to 2017-18. The data were divided into three sub periods *i.e.* pre-WTO period (1970-71 to 1994-95), post-WTO period (1995-96 to 2017-18) and overall period (1970-71 to 2017-18). For the meaningful interpretation of data, appropriate percentages and averages were worked out. The annual compound growth rates and variability of area, production and productivity and export of paddy in India were estimated during different time period. The trends in domestic and international prices of paddy were analysed by polynomial (cubic) function. Nominal protection coefficient and Export Performance Ratio were employed to measure export of competitiveness of Indian paddy during the study period 1970-71 to 2017-18. The direction trade of exports of Indian paddy were analysed using the first order Markov

chain analysis and the factors determining paddy export from India were studied by using multiple regression model.

5.3 Summary

The results of study are summarized as follows,

The growth rates of area, production and productivity of paddy at National level were increased at the rate of 0.33, 2.22 and 1.88 per cent per annum, respectively, with positive and highly significant at one per cent level it means that production increased due to area expansion and productivity improvement for the overall period. The same trend was observed in Pre-WTO period at National level where the growth rate of area, production and productivity was positive and highly significant which increased at the rate of 0.54, 3.05 and 2.50 per cent per annum, respectively. However, in Post-WTO period the production and productivity of paddy was highly significant and increased at the rate of 1.53 and 1.55 per cent per annum, respectively. Whereas, the area under paddy was declined by 0.02 per cent per annum. It indicates that, the production of paddy in Post-WTO period was mainly increased by productivity improvement.

In major states of India, the growth rates of area, production and productivity were positive and significant in Uttar Pradesh, West Bengal, Karnataka, Maharashtra, Punjab and Assam at overall period indicating that, the production of paddy was influenced by both area expansion and productivity improvement in these states. The growth rate in area were negatively significant while, the production and productivity was positively significant in Andhra Pradesh and Tamil Nadu for overall period, indicating that the production of paddy was increased only due to productivity improvement in these two states. However, in Madhya Pradesh and Kerala, the growth rates of area and production of paddy was negatively significant and the growth rate of productivity was positively significant at overall period. The rate of growth decline in area was higher than the positive growth rate of productivity of paddy in Madhya Pradesh and Kerala, that's why the production of paddy was declined in these states, even though, there was a improvement in productivity.

In Post-WTO period the production of paddy was increased only due to productivity improvement in West Bengal, Uttar Pradesh, Maharashtra and Assam. Whereas, the production of paddy increased by both area expansion and productivity

improvement in Punjab states. However, the production of paddy was declined only due to decreased in area in Andhra Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu and Kerala. It is due to the diversification in cropping pattern and different competing crops for paddy in above mentioned states.

In Pre-WTO period, the production of paddy was significantly increased at the rate of 5.28, 3.31, 3.18, 2.22, 10.34 and 2.75 per cent per annum due to both productivity improvement and area expansion in Uttar Pradesh, West Bengal, Andhra Pradesh, Maharashtra, Punjab and Madhya Pradesh, respectively. Whereas, production of paddy was significantly increased due to only yield improvement in Tamil Nadu and Assam.

As regards the World wide paddy production it increased to 729.10 m.tons in 2017-18 from 316.40 m.tons in 1970-71. The per cent change recorded over the base period was 130.47 per cent. The paddy production at national and state level were increased to 111.01m.tons in 2017-18 from 42.22 m.tons in 1970-71 and 2.66 m.tons in 2017-18 from 1.66 m.tons in 1970-71 then per cent change recorded over base period were 130.12 and 60.24 per cent respectively.

The area under paddy was most consistent and stable with 5.47 per cent C.V. followed by productivity (25.61 % C.V.) and production (29.61 % C.V.) in India at overall period. In post-WTO period the area, production and productivity of paddy with 2.52, 11.68 and 11.2 per cent C.V. was more stable and consistent than in pre-WTO period with 4.62, 23.72 and 19.51 per cent C.V. of area, production and productivity of paddy in India.

During the pre-WTO period the area under paddy was observed more stable in states *viz.*, Uttar Pradesh, West Bengal, Andhra Pradesh, Madhya Pradesh, Assam, Kerala and Maharashtra whereas area under paddy in Karnataka, Tamil Nadu and Punjab was fluctuated. In post-WTO period the area under paddy was observed more consistent in states *viz.*, West Bengal, Karnataka, Tamil Nadu, Assam, Maharashtra and Punjab but in case of Uttar Pradesh, Andhra Pradesh, Madhya Pradesh and Kerala, there were inconsistency in area of paddy, At overall period the area under paddy was observed more consistency in states *viz.*, Uttar Pradesh, West Bengal, Andhra Pradesh, Karnataka,

Assam, and Maharashtra whereas Madhya Pradesh, Tamil Nadu, Kerala and Punjab have shown fluctuated area under paddy cultivation respectively.

In first stage, the trends in domestic prices were declined @ 6.60 ₹/qtl but in international prices it increased @ 31.40₹/qtl. In second stage, trends in domestic prices increased @ 0.42₹/qtl but in international prices it declined @ 0.82₹/qtl. and in terminal stage domestic prices of paddy significantly increased @ 0.02₹/qtl and international prices also increased @ 0.04₹/qtl. The trend equation was significant in domestic and international prices, as revealed by F value (483.58) and (34.66) respectively, and fluctuation in domestic prices and international prices of paddy due to time factor to extent of 97 per cent and 70 per cent respectively, as indicated by R^2 .

The growth rates of domestic and international prices of paddy were estimated significant growth at 5.92 and 8.71 per cent per annum during pre-WTO period respectively. However during post-WTO period, the growth rate domestic and international prices were estimated at 6.71 and 6.84 per cent per annum respectively. As such growth rate for domestic price *i.e.* 8.21 is higher than international price *i.e.* 7.02 during overall period.

The instability index of domestic (45.95) and international (61.77) prices of paddy was higher in pre-WTO period and in both post-WTO (33.77 and 42.03 %) and overall (37.99 and 53.23 %) period respectively. It means that, domestic prices of paddy were more consistent than international prices of paddy in both pre-WTO and post- WTO period.

India's export share in World total export was increased from 1.03 in 1960-61 to 1.30 per cent in 2017-18. India's Agricultural export share in World Agricultural export was 1.66 in 1960-61 which has increased to 3.74 per cent in 2017-18. India's paddy export share in the World agricultural export was very negligible. It ranged from 0.02 to 0.47 per cent during the study period.

India's Agricultural export share in India's total export was decreasing continuously. In 1960-61 it was 43.69 per cent and it has drastically decreased to 18.82 per cent in 2017-18.

India's paddy export shares in the India's agricultural export trade 1.43 per cent in 1960-61 and increased up to 12.60 per cent in 2017-18. The same case was

registered with India's paddy export share in India's paddy production. The share of paddy export in total paddy production during 1960-61 was 0.62 per cent while it increased to 11.93 per cent in 2017-18. Whereas, the India's paddy export share in paddy production has continuously increased during post-WTO period *i.e.* after 1990-91.

Direction of trade for World total export and World total import has a continuously negative balance of trade up to 2010-11 then it was changed as positive trade balance in the year 2017-18 but direction trade of India's total export and India's total import the negative balance of trade in India did not change over the last 57 years, in spite of all government policies regarding export promotions.

Direction trade of India's agricultural export denotes negative trade balance. It means that India was deficit during 1960-61. India's agriculture export trade balance were positive from 1970-71 to 2017-18. It means that India with a surplus from 1970-71 to 2017-18, in agricultural export.

Direction trade of World paddy export-import indicates continuously negative trade balance up to year 2017-18. It indicates that there was a continuous demand for paddy in the World but in case of India's paddy export-import direction trade show negative balance of trade was in the year 1960-61 and 1970-71. Then it was positive trade balance for remaining period. It means that India was deficit in paddy export during the period 1960-61 to 1970-71 but from the period 1980-81 to 2017-18 India with a surplus in trade balance of paddy export-import.

On an average during entire study period the Nominal Protection Coefficient (NPC) was 0.62 means less than unity for paddy export which indicates that the domestic prices received by the farmers in the country were lower than the international prices. On an average the Export Performance Ratio (EPR) was 11.74 means greater than unity for paddy export which indicates that the product has comparative advantage in export. On an average the Nominal Protection Coefficient (NPC) were 0.46, 0.16, 0.65, 0.55 and 0.51 for major importing countries such as Saudi Arabia, UAE, Kuwait, Yemen AR and USA respectively, means less than unity for paddy export which indicates that the domestic prices received by the farmers in the country were lower than the international prices.

The trade direction has been explored by Markov chain analysis using export quantity and value data for paddy export from 2007-08 to 2016-17. It is observed that UAE was the most stable market among the major importers of Indian paddy in terms of quantity as reflected by the high probability of retention at 67.93 per cent. Similarly, Saudi Arabia, Yamen Arab Republic, Kuwait, and Uk have retained their original export quantity share of 57.34, 39.39, 13.55 and 8.65 per cent respectively, on the contrary, USA, Canada and Belgium they were unstable importer of Indian paddy.

In terms of value of paddy export U.S.A. was the most stable market among the major importers of Indian paddy, it retained its original export value share of 76.34 per cent. Similarly, UAE and Saudi Arabia, have retained its original export value share of 56.47 and 43.88 per cent respectively, means stable importer Indian paddy in value term.

The trade direction has been explored by Markov chain analysis using export quantity and value data for basmati paddy and non-basmati paddy export from 2008-09 to 2017-18. It was observed that UAE was the most stable market among the major importers of Indian basmati paddy, it retained its original export quantity share of 79.37 per cent. Similarly, Saudi Arabia, Kuwait and Yamen Arab Republic have retained its original export quantity share of 74.01, 53.66 and 51.50 per cent respectively, means stable import quantity of Indian basmati paddy. UK has shown lower probability of retention *viz.*, 12.05, on the contrary, USA, Canada and Belgium were unstable importers of Indian basmati paddy.

In terms of value of basmati paddy export, it is observed that the UAE was the most stable market among the major importers of Indian basmati paddy, it retained its original export value share of 79.62 per cent. Similarly, Saudi Arabia, USA have retained its original export value share of 72.98 and 55.30 per cent respectively, means they have stable import value of Indian basmati paddy. Kuwait, UK, Yamen Republic and Canada have shown lower probability of retention, *viz.* 0.4753, 0.0.0370, 0.3497 and 0.2945, respectively, on the contrary, Belgium was an unstable importer of Indian basmati paddy.

Belgium was the most stable market among the major importers of Indian non-basmati paddy, it retained its original export quantity share of 44.09 per cent. UAE, Saudi Arabia and UK have probability of retention 33.71, 22.08 and 19.26 per cent

respectively, means they have stable import quantity of Indian non-basmati paddy. Canada has shown lower probability of retention *viz.*, 0.0854, on the contrary, Kuwait, USA and Yaman Arab Republic they were unstable importer of Indian non-basmati paddy.

In terms of value of non-basmati paddy export, Kuwait was the most stable market among the major importers of Indian non-basmati paddy, it retained its original export value share of 42.90 per cent. UAE and Saudi Arabia were retained its original export value share of 29.33 and 23.79 per cent respectively, means UAE and Saudi Arabia was also the stable import value of Indian non-basmati paddy. Canada had shown lower probability of retention, *viz.* 0.0620 on the contrary, UK, Yaman Arab Republic, USA and Belgium they were unstable importer of Indian non-basmati paddy.

The factors determining paddy export from India were studied by using multiple regression model during (1970-71 to 2017-18), where quantity export regressed against domestic production of paddy (X_1) is 0.03 with negatively significant at 5 per cent level of significant. It indicates that if the domestic production of paddy increased by one tonne then export was decline at 0.03 tonne, wholesale price (X_2) increased at 1 ₹/qtl then export of paddy decline at 1206.53 tonnes with 1 per cent level of significant, international prices of paddy (X_3), with 1 ₹/qtl increase in international prices of paddy the export of paddy would be increased by 4818.90 tonne, World production of paddy (X_4) was positive but non-significant it indicates that the increase in the World production of paddy the paddy export will increased at 0.003 tonne, exchange rate (X_5) increased at 1 ₹/qtl then export of paddy decline at 41660.56 with 10 per cent level of significant, Nominal Protection Coefficient (X_6) was negative but non-significant. This indicates that if the domestic price of paddy was less than international price, then it increased export of paddy from India and Export Performance Ratio (X_7) was positively significant with 10 per cent level of significant. This indicates that, the share of paddy in India's total export was more than share of paddy in the World total export.

India had a great advantage to specialize in production of paddy and to export the surplus production to earn valuable foreign exchange. India needs to capitalize this advantageous position by ensuring its position in the international market as a stable and dependable source of paddy quality. There was also need to increase the export of

paddy in our country, by reducing cost of production considerably through enhancing productivity per unit of resources used, which would enhance the comparative advantage in paddy export from India.

5.4 Conclusions

The following conclusions emerged from the present study-

1. India stands 1st in area, but 2nd in production and 5th in Productivity of paddy in the World.
2. In India the area of paddy declined during the study period except in 1990-91 whereas, production and productivity continuously increased.
3. In Maharastra the area, production and productivity of paddy were fluctuating during the entire study period.
4. The growth rates of area, production and productivity of paddy at National level were observed to be positive and highly significant at one per cent level for the overall period. It indicates that the production of paddy at national level was increased by both area expansion and productivity improvement.
5. Across the entire study period, in major states of India, the growth rates of area, production and productivity were positive and significant in Uttar Pradesh, West Bengal, Karnataka, Maharashtra, Punjab and Assam. It indicated that, the production of paddy was influenced by both area expansion and productivity improvement in these states.
6. The area of paddy was most consistent and stable with 5.47 per cent C.V. in India, followed by productivity (25.61 % C.V.) and production (29.61 % C.V.) whereas, the production of paddy was not consistent in all selected states as shown by coefficient of variation and yield of paddy was not stable in all selected states except two states, viz., Maharashtra and Punjab, with 18.73 and 18.49 per cent respectively, measured by coefficient of variation.
7. The trends in domestic prices of paddy were fluctuated due to time factor. The polynomial curve of domestic prices of paddy behaved almost constant in the initial study years. But, after 1990-91 it started increasing at increasing rate till the end of the year 2017-18.

8. The trends in international prices of paddy indicated wide fluctuatings due to time factor. The analysis of trend in international prices of paddy movement indicated more fluctuations during the entire period (1970-71 to 2017-18).
9. The growth rate estimated for domestic prices (*i.e.* 8.21 per cent per annum) was higher than international prices (*i.e.* 7.02 per cent per annum) at overall period.
10. The growth of domestic and international prices of paddy in post-WTO period did not fluctuate more due to less restrictions and growing demand of Indian paddy. In general, domestic prices of paddy were more consistent than international prices of paddy in both pre and post- WTO period.
11. India's total export share in World's total export has increased from 1960-61 to 2017-18. But, still the share could not be retained to a considerable level.
12. India's agricultural export share in World agricultural export did not show a promising picture which is less than 3 per cent.
13. India's paddy export share in World agricultural export has marginally increased. It lies between 0.02 to 0.47 per cent.
14. India's agricultural export share in India's total export has declined.
15. India's paddy export share in India's agricultural export trade (1.43 per cent in the year 1960-61) increased to 12.60 per cent in the year 2017-18.
16. India's paddy export share in total paddy production during 1960-61 was 0.62 per cent while it increased to 11.93 per cent in the year 2017-18.
17. The balance of trade of World total export –import shows negative trade balance during study period except in the year 2017-18, where in it shows positive balance trade.
18. The balance trade of India's total export-import shows negative balance trade during overall study period.
19. Direction of trade in India's agricultural export-import shows positive balance trade during study period except in the year 1960-61, where in shown negative balance trade.
20. Trade balance of World paddy export-import was negative during overall study period.

21. Trade balance of India's paddy export-import was negative balance trade during the initial period, *i.e.* 1960-61 to 1970-71, while it was positive from the year 1990-91 to 2017-18.
22. The NPC is less than one in almost all the years. This indicates that paddy enjoys competitive advantage in the international market.
23. The EPR is greater than one in almost all the years. This indicates that paddy enjoys comparative advantage in the international market.
24. The UAE was the most stable market among the major importers of Indian paddy as it retained its original export quantity share of 67.93 per cent during the period 2007-08 to 2016-17. Similarly, Saudi Arabia and Yamen Arab Republic have retained their original export quantity share of 57.34 and 39.39 per cent, respectively. This implies that Saudi Arabia and Yamen AR were also the stable importers of Indian paddy.
25. The USA was the most stable market among the major importers of Indian paddy, it retained its original export value share of 76.34 per cent during the period 2007-08 to 2016-17. Similarly, UAE and Saudi Arabia have retained their original export value shares of 56 .47 and 43.88 per cent, respectively.
26. The UAE was the most stable market among the major importers of Indian basmati paddy, it retained its original export quantity share of 79.37 per cent during the period 2008-09 to 2017-18. Similarly, Saudi Arabia, Kuwait and Yamen Arab Republic retained their original export quantity share of 74.01, 53.66 and 51.50 per cent, respectively.
27. The UAE was the most stable market among the major importers of Indian basmati paddy, as it retained its original export value share of 79.62 per cent during the period 2008-09 to 2017-18. Similarly, Saudi Arabia and USA have retained their original export value shares of 72.98 and 55.30 per cent, respectively.
28. The Belgium was the most stable market among the major importers of Indian non-basmati paddy, as it retained its original export quantity share of 44.09 per cent during the period 2008-09 to 2017-18. Similarly, UAE, Saudi Arabia and UK have retained their original export quantity shares of 33.71, 22.08 and 19.26 per

cent, respectively. This implies that Saudi Arabia and UK were also the stable importers of Indian non-basmati paddy.

29. The Kuwait was the most stable market among the major importers of Indian non-basmati paddy, it retained its original export value share of 42.90 per cent during the period 2008-09 to 2017-18. Similarly, UAE and Saudi Arabia have retained their original export value shares of 29.33 and 23.79 per cent, respectively. This implies that Saudi Arabia was also the stable import value of Indian non-basmati paddy.
30. Seven independent variables *viz.*, Domestic production of paddy (X_1), Wholesale Price of Paddy (X_2), International Price of Paddy (X_3), World Production of Paddy (X_4), Exchange rate (X_5), NPC ratio (X_6) and EPR (X_7) jointly explained the 95 per cent of total variation in export of paddy from India. The coefficient of international prices of paddy and the World production of paddy were statistically significant and have positive impact on export of paddy.

5.3 Policy implications

1. Export is a result of production over domestic consumption and stock. Higher the production, higher would be the surplus and ultimately export. Therefore, the policy focus to increase production through breeding program, infrastructure investment, cost of reduction technology, identifying contiguous zone for cultivation of export quality rice should be adopted. The production of scented fine quality rice varieties, like basmati, should be encouraged in the country, because these varieties of rice have more demand in international markets.
2. There is a need of separate long term export policies for basmati and non-basmati rice. The export of basmati rice is due to higher demand in international market, where as export of non-basmati rice is due to higher domestic production.
3. The analysis of instability in export earnings revealed that changes in price variance is contributing to the tune of 20 per cent to the variability in export earnings whereas the effect of changes in quantity variance is nil. Therefore measures should be taken to minimize the price variance by entering in to bilateral/multilateral trade agreements with the importing countries so as to minimize the instability in the export earnings.

4. The productivity stagnated at 2584.63 kg per hectare as compared to world average yield of 4535.33 kg per hectare. The stagnation was not because of any lack of technological inputs, but because of slow technological transformation and progress. Dissemination of information on latest technology holds key to increasing productivity and production. Rigorous extension mechanism should deliver this input. Efforts should be stepped up to seek the aid of frontier sciences like biotechnology and genetic engineering to increase productivity.
5. The paddy prices in the domestic and international market are integrated. This implies that domestic market is responsive to changes in the international market prices and producers would benefit from increases in the international market prices. However, this benefit has not been fully exploited by the farmers because the Indian paddy exports are regulated by the government by export quota system. This requires the initiation of new paddy policy to remove the present export quota system, therefore, that farmer can be benefited from price increase in the international market. This will encourage paddy production especially quality paddy, which will also meet the requirement of rice mills.

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in

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2020

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