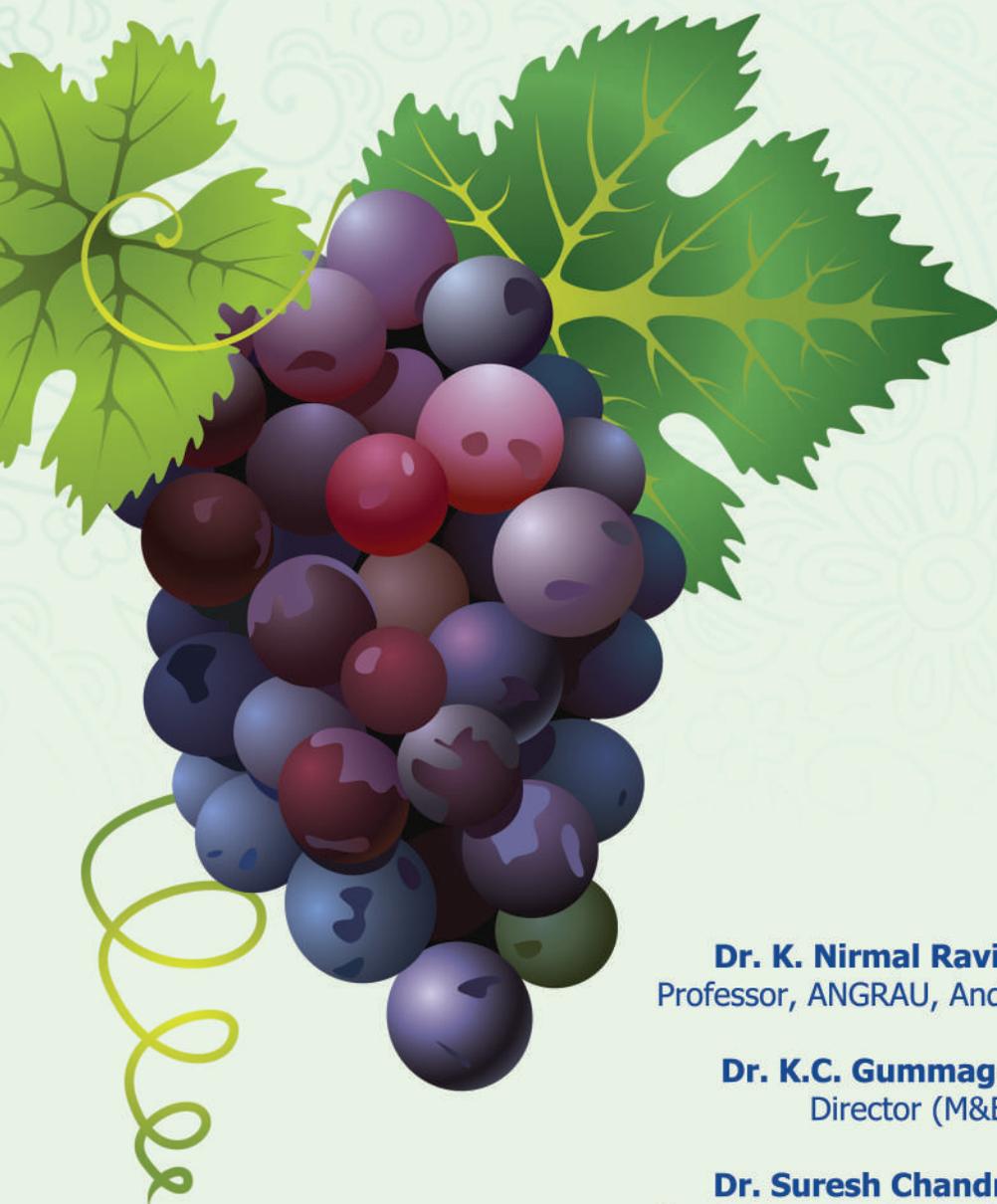


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Value Chain Management of Grapes during Covid-19 - A Glimpse on India's Responses



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Dr. P. Chandra Shekara
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Foreword

The ongoing pandemic crisis has devastated all sectors of the economy, including agriculture and horticulture. India being a leading producer and exporter of various horticultural commodities like fruits and vegetables has to face the brunt of the ongoing situation. It is a known fact that, the major impact of COVID-19 was on the exports of agricultural and horticultural commodities due to supply chain disruption and furthermore, mere absence of exports resulted in loss of foreign exchange earnings to India. Among the fruit crops, globally India ranks seventh in the production of grapes and with regard to exports, the table grapes accounted for more than 30 per cent of the total exports from India during 2019. In India, the state of Maharashtra ranks first in terms of production, accounting for more than 81 per cent of total country's output. Maharashtra is also a leading state in terms of grape exports which accounted for 92 per cent of total fresh grape exports during 2018-19. The disruption of grape value chain during pandemic resulted in decline in exports leading to reduction in earnings from foreign exchange on one hand and decline in the income of the farmers on the other hand.

In the light of above facts, an attempt has been made in this study to analyse the grape value chain in India in general and the disruption of value chain of grapes in particular for Maharashtra state amid corona pandemic. The study revealed the implications of Covid-19 pandemic situation like logistic bottle necks, price crash, declined exports, negative impact on cargo exports and also explained the constraints faced by the processing units in meeting the demand of the consumers for the processed grape products. Based on the outcome of the study, few strategies are suggested for building a resilient supply chain for grapes in India viz., digital horticulture, promotion of e-NAM, collective actions by the Government and cooperative organizations, Integration of FPOs and Agri-Tech Start- up and so on. The suggestions made based on outcome of this study will be helpful for policy makers to review the strategy for building up effective resilient supply chain practices for grapes in India.

I appreciate and congratulate Dr. K. Nirmal Ravi Kumar, Professor, ANGRAU, A.P, Dr. K.C. Gummagolmath, Director (M&E), MANAGE and Dr. Suresh Chandra Babu, Head, Capacity Strengthening, IFPRI, USA for taking up the study.


(P. Chandra Shekara)

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List of Acronyms

M. tonnes	Million Tonnes
M. tonnes	Metric Tonnes
ha	Hectares
m. ha	Million Hectares
t/ha	Tonnes/Hectare
Qtl	Quintals
APEDA	Agricultural and Processed Food Products Export Development Authority
APMC	Agricultural Produce Market Committee
ARI	Agharkar Research Institute
CAGRs	Compound Annual Growth Rates
CPP	Consumer's Purchase Price
DoH	Directorate of Horticulture
e-NAM	electronic National Agriculture Market
EU	European Union
FDI	Foreign Direct Investment
FPCs	Farmer Producer Companies
FPOs	Farmer Producer Organizations
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GMM	Gross Marketing Margin
GMP	Good Marketing Practices
GVA	Gross Value Added
ICAR	Indian Council of Agricultural Research
JNPT	Jawaharlal Nehru Port Trust
KVKs	Krishi Vigyan Kendras
MANAGE	National Institute of Agricultural Extension Management
MIDH	Mission for Integrated Development of Horticulture
MRDBS	Maharashtra Rajya Draksha Bagaitdar Sangh
MSAMB	Maharashtra State Agricultural Marketing Board
MSGGA	Maharashtra State Grape Growers Association
NCDC	National Cooperative Development Corporation
NHB	National Horticulture Board
NHM	National Horticulture Mission
NIAM	National Institute of Agricultural Marketing

NMM	Net Marketing Margin
NRCG	National Research Centre for Grapes
TE	Triennium Ending
TPM	Transitional Probability Matrix
PHC	Pre-Harvest Contractors
PPP	Public-Private Partnership
PSCR	Producer's Share in Consumer's Rupee
SIFAV	Sustainable Initiative Fruit and Vegetables
SPS	Sanitary and Phyto-Sanitary
VAMNICOM	Vaikunth Mehta National Institute of Cooperative Management
VCA	Value Chain Analysis

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Chapter-I

Introduction

The horticulture industry consists of the production of fruits, vegetables and flowers. In today's world, people are very conscious about their diet and eating habits. A busy lifestyle and stressful work culture have pushed up the consumption of fruits and vegetables. Consequently, this sector is flourishing and opening up new prospects of employment and research, thereby introducing a new dimension into the agriculture sector across the world. As a matter of fact, horticulture is currently considered as a separate industry. Further, the floriculture industry is picking up pace due to the increasing demand for fresh flowers and several associated products. This has generated new income prospects for farmers and others working in the allied sectors of this industry. The processing, transportation, distribution and packing sectors associated with the horticulture industry have also been greatly benefitted.

Global fruits production was estimated at 1111.37 m. tonnes in 2018 and this industry consists of the production and trade of bananas, semi-tropical fruits, citrus fruit, soft fruit, pomes and stone fruits. Global vegetable production, including the production of melons, was estimated at 1640.40 m. tonnes in 2018. China and India were amongst the highest producing countries of fruits and vegetables in the world (Table 1). That is, India is the second largest producer of fruits after China in the world with an annual production of 98.72 m. tonnes from an area of 7.21 m. ha. in 2018. It is also the second largest producer of vegetables next to China with an annual production of 128.24 m. tonnes from an area of 8.75 m. ha. (www.faostat.com). This is possible because of agro-climatic variations, enormous biodiversity, fertile soil and a large cultivable area. Indian agriculture has reached at the peak production level of various crops but the nutritional security is still a big question mark in front of planners and researchers. India accounts for nearly 9 per cent of world production of fruits and 8 per cent of the world's vegetables production. India enjoys significant position in the production of fruits and vegetables in the world and is often considered as the fruit and vegetable basket of the world. It holds a unique position in production figures among all countries (Table 2). It is the largest producer of okra, banana, mango, guava, lemon and lime and papaya. It is the second largest producer of vegetables and melons, potatoes, tomato, onion (dry), cabbages, cauliflower, brinjal and fruits excluding melons. The horticulture sector in India has witnessed a tremendous growth as a result of investment through National Horticulture Mission (NHM) and a number of other programmes. (Singh and Toppo, 2010). This robust growth of horticulture indicates a growing demand within the country too. There is scope for further growth as while India lies second in the list of major fruit producing countries featuring China, the US, Brazil, Spain, Mexico, Italy, Indonesia, the Philippines and Turkey, its productivity lags most of these countries. Fruits and vegetables play an important role in agriculture and industrial economy. These crops, which are among the perishable commodities, are important in gradients of human diet. The ongoing economic reforms in India are likely to result in structural changes in agriculture particularly in favour of fruit and vegetable crops, which has great potential to increase farm income as well as nutritional status of the citizens of the nation. On demand side, the increasing purchasing power and more working women have positive impact on changes in life style and food consumption habits of Indian population (Amara singhe *et al.*, 2007). It is estimated that to fulfill the increased demand for high

value horticultural crops in South Asia, the production of the above crops has to be increased by 142 per cent by 2020. So, the fruits and vegetables sub-sector under horticulture will be the future driving force in stimulating a healthy growth trend in Indian agriculture. Given the rising share of high value commodities in the total value of agricultural output and their growth potential, this segment is likely to drive agricultural growth in the years to come (ASSOCHAM, 2013).

Table 1: Leading Producers of Fresh Fruits and Vegetables in the world (2018)

Fruits				Vegetables			
Countries	Production (m. tonnes)	% share to total	Rank	Countries	Production (m. tonnes)	% share to total	Rank
China	243.59	21.92	1	China	551.56	33.62	1
India	98.72	8.88	2	India	128.24	7.82	2
Brazil	40.05	3.60	3	United States of America	31.74	1.93	3
United States of America	26.02	2.34	4	Turkey	24.14	1.47	4
Turkey	23.60	2.12	5	Nigeria	16.39	1.00	5
Mexico	22.77	2.05	6	VietNam	16.32	0.99	6
Indonesia	20.44	1.84	7	Mexico	16.17	0.99	7
Spain	19.33	1.74	8	Egypt	15.57	0.95	8
Iran (Islamic Republic of)	18.90	1.70	9	Iran (Islamic Republic of)	15.07	0.92	9
Italy	18.01	1.62	10	Russian Federation	13.71	0.84	10
Others	579.95	52.18		Others	811.49	49.47	
Total	1111.37	100.00		Total	1640.40	100.00	

Raw Data Source: <www.faostat.com>

Table 2: India's position in the world in the production of fruits and Vegetables (2017-18)

Product	India (m. tonnes)	World (m. tonnes)	India		Leading Producer
			Share (%)	Rank	
Vegetables & Melons	120	1075	11.2	Second	China
Okra	5.5	9	62	First	
Potatoes	44	377	11.6	Second	China
Tomato	18.4	177	10.4	Second	China
Onion (dry)	19.4	93.2	21	Second	China
Cabbages & other Brassicas	9	71.2	12.3	Second	China
Cauliflower&Broccoli	8.2	25.2	32.5	Second	China
Brinjal	12.6	51.3	24.5	Second	China
Fruits excluding Melons	91	866	10.5	Second	China
Banana	29.1	113.2	25.7	First	
Mango, Mangoes teen and Guava	18.8	46.5	40.4	First	
Lemon & Lime	3	17.3	17.2	First	
Papaya	5.6	12.6	44.4	First	

Raw Data Source: Horticultural Statistics at a Glance 2018, Ministry of Agriculture & Farmers' Welfare, Government of India

Need for the study: As the global effects on supply chains have resulted recently from the corona virus pandemic situation in China, its spill over effects on India can be discussed in two distinct ways. First, it is having an impact on the supply of resources and resource services for many farmers in taking up crops cultivation and if the disruption continues, it will affect the food production and exports from India in the future. Second, India is also a major import market for several inputs, pulses, edible oils, processed food products etc. Anywhere in the world, the countries that depend on India as a customer are feeling the adverse effects, as both production and consumption are restricted in India and as a result, the exporting countries too has to restrict or suspend their production. It is in this context, the study pertaining to disruption in supply chains of agricultural commodities in India amidst corona pandemic assume greater significance. India is among the first ten countries (7th position) in the world in the production of grapes. As Maharashtra ranks first in India in terms of grapes production, accounting for more than 81 per cent of total output, the same were considered for this in depth study to analyze the production, exports and value chains of grapes, disruptions in the value chains of grapes amidst corona pandemic and accordingly offering strategies for building a resilient supply chain for grapes.

Scheme of Chapterization: The present study has been organized into the following eight chapters:

- I. Introduction.
- II. Context and Review of Literature.
- III. A conceptual frame work for analyzing value chains under disease out breaks and external shocks.
- IV. Data Collection and Methodology.
- V. Production and export scenarios of fruits and vegetables in India.
- VI. Production, export and Value Chain Analysis (VCA) of grapes in India.
- VII. VCA of grapes-Case of Mahagrapes in Maharashtra.
- VIII. Disruptions in grapes value chains in the context of Covid-19 Pandemic.
- IX. Post Covid-19 Strategies for building a resilient supply chain for grapes. c

The introduction chapter presents brief background of the study. It highlights about the global fruits and vegetables production across the major countries and India's stand at the global level. It also deals with the need for the study and further elaborates the specific objectives and scheme of chapterization followed.

Second chapter provides an overview of the literature pertaining to production, exports and value chains in the context of horticulture sector in India.

In chapter three, the conceptual framework to understand the factors that contribute negatively to the value chain management under the COVID-19 emergency was discussed

Fourth chapter elaborates the detailed methodology adopted for the study. The detailed list of various sources of data from secondary sources and tools of analysis employed has given in this chapter.

Fifth chapter brings about a detailed discussion about background horticulture scenario at All-India level with reference to both production and export performances of fresh fruits and vegetables. The trade direction of fresh fruits exports from India during post-WTO regime was also dealt in this chapter.

Production scenario of grapes in the world and India's position at global level; growth dynamic of area, production and productivity; export and import performance of grapes, trade direction of grape exports from India during both post-WTO regime are discussed in the sixth chapter.

Seventh chapter brings about a detailed discussion about the major grape producing regions, grape varieties cultivated, processed products produced, VCA through identifying actors involved in transacting grapes and processed products, value chain mapping and degree of value addition across major players in value chains are studied with reference to independent grape growers vis-à-vis Maha grapes in Maharashtra.

In the eighth chapter, disruptions in grapes value chains in the context to Covid-19 pandemic are discussed in-detail.

Strategies for building a resilient supply chain for fresh fruits with special reference to grapes in Maharashtra during Post Covid-19 regime are discussed in the last chapter.

Chapter-II

Context and Review of Literature

Review of literature provides information to the researcher regarding the previous works done in their area of research and thereby helps the researcher in identifying the theoretical framework and methodological issues relevant to the study. It provides the researchers proper direction to carry out their research work and enables them to arrive at meaningful results. Therefore, the past studies were reviewed as per the objectives of this study. However, very few research studies have been carried out in the field of VCA and that too for grapes in Maharashtra and in this context, this study is certainly a contributing one.

i. Growth in area, production and productivity of agricultural crops: The analysis of growth is usually used in economic studies to find out the trend of a particular variable over a period of time and used for making policy decisions. Sikka and Vaidya (1984) observed that though there has been an increase of area, productivity and output of major crops, yet the increase in productivity and output has not been of the desired level. According to Venkiteswaran (1984), the increase in area under perennial crops was not only proportionate but also absolute and was mainly at the cost of area under food crops. The main reason for this chronic food deficit is that more than fifty per cent of the cultivated area is allocated to the production of commercial crops. The gradual expansion of area by the non-food grains sector was mainly at the cost of food grains sector. Singh (1988) analyzed that a wide variation amongst the important economic regions in the existing level of agricultural production and productivity as also in the use of inputs. It is worth emphasizing that the agriculturally backward regions possess vast potential for development. Large flow of credit was a pre-requisite for improving the use of modern inputs like fertilizers, HYV seeds, pesticides and productivity of various crops in different regions which could be achieved by encouraging regional specialization of crops. Singh and Singh (1989) reported that vegetables can also be grown under rainfed conditions. Many important vegetables like tomatoes need partial irrigation for maximum productivity during drought conditions. Singh (1993) stated that India is the second largest producer of vegetables in the world. The area and production of vegetables was about 4.0 million ha and 45.0 million tonnes, respectively and the productivity was 10 tonnes/hectare in the year 1987-88. Atterianand Chand (1997) examined production, consumption and processing scenarios of vegetables in India. It was noted that Bihar, Orissa, Uttar Pradesh and West Bengal were the main vegetable producing states, which occupied 59 per cent of the area and contributed about 56 per cent of production of vegetables in India. Dahiya and Singh (1997) observed that the prospects for development of horticultural crops such as fresh fruits, mushrooms, floriculture, etc. are very bright since the state has several innate agro-climatic advantages. But apple farming is being deviled by sharp fluctuations in production due to frequent attacks of several diseases and various other problems that could be attributed to weak efforts at educating the farmers. Kaul (1997) concluded that the area under horticultural crops in 1994-95 was 14.5 million ha with an annual production of 119.2 million tonnes. Fruits and vegetables together contributed 90.2 per cent of this production and 65.8 per cent of total area. The annual growth both in area and production of horticultural crops has gained momentum. The total increase in area and production registered in 1994-95 over 1991-92 was 18.1 and 24.1 per cent with an annual average growth rate of 4 and 8 per cent respectively. Fruits, vegetables and also coconuts have contributed

maximum to this growth. Today India is the largest producer of fruits in the world, having a share of over 10 per cent and second largest producer of vegetables with a global share of over 13 per cent. Moreover, India leads the world in varieties collections of mango, numbering over 1000 with several man-made hybrids being added to the list. Floriculture and mushroom have emerged as fast growing commodities both for domestic and overseas markets. Ganeshmurty *et al.* (2001) studied location specific strategies for increasing vegetable production in Bay Islands. Vegetables are cultivated only in 3834 ha of land with the total production of 20500 M. Tonnes. The average productivity of vegetables was very low (5.35 t/ha) as compared to the national average. Anonymous (2004) stated that Maharashtra tops in the tomato productivity that is 33.3 t/ha, followed by Karnataka with 28 t/ha as compared to all India average productivity of 17.4 tonnes/ha. This was primarily due to adoption of hybrid tomato technology in the set wo states on a large scale being promoted by private sector seed companies. Saheen and Shiyani (2004) studied that the temporal change in area under different crops revealed significant increase in area under apple, cherry and walnut overtime. Moderate to high significant growth was observed in area, production and productivity of all fruit crops for the period from 1974-2002 at state level. Higher instability in production in case of perennial fruit crops is generally the consequent of instability on productivity of the crop. The various factors like irregular rainfall, occasional drought spells, ultimately snowfall, invariable hailstorms and outbreak of pests and diseases could be probable reasons for the high instability in productivity of fruit crops. Goliat and Narayan (2007) reported that the horticulture growth has paramount importance in the way of providing nutritional security, reducing poverty level and generation of employment for the rural mass. It offers not only crop diversification for the farmers, but provides ample scope for sustaining large number of agro-based industries that provides employment in off-season. Kalamkar (2007) found that Maharashtra has the highest area and production in the country devoted to fruits and third largest area vegetables. During the last ten years, there has been significant increase in the area and production of horticultural crops in the state. Maharashtra has potential and plenty of scope to grow various horticulture crops. Different types of soil, diverse agro-climatic conditions, adequate technical manpower, well developed communication facilities, increasing trend in drip irrigation, greenhouse use of cold chain facilities and vibrant farmer organizations offer wide opportunities to grow different horticultural crops in the state. Roy (2007) studied that the state registered a rapid rate of growth of output during 1977-95. While the rate of growth of food grains has been very high, the cropping pattern in most of districts has changed in favor of high-value non-food crops. He also found that the small farmers lagged in the adoption of high-productivity variety technology due to inadequate flow of institutional credit besides uncertainty and unfavorable tenurial conditions. Sharma and Pant (2007) observed that the temporal growth in area and production of horticultural crops in Rajasthan. The area under fruits, vegetables and spices has positive growth. The growth in area under fruit crops was negative between 1990 and 1995 and has gained momentum after 2000-01. The landscape of vegetable crops in Rajasthan is bright and their area has shown an increasing trend in the last 15 years. Bera (2008) observed that the area under different crops showed faster rate of increase in area, under horticultural crops compared to cereals for the same period and the percentage change in area of fruits and vegetable during 1970-71-2005-06 indicated that in spite of a decline in net sown area by 1.9 per cent the total cropped area has grown by 32.42 per cent which helped the state to improve the percentage increase in area under vegetable and fruit crops witnessed the galloping acceleration by 136.3

and 117.3 respectively. In case of production also, the increase in vegetable and fruit was found to be greater than that of total cereals during the period 1991-92 to 2003-04. The annual compound growth rate of area, production and productivity of vegetables of major states of India shows that West Bengal is the only state which shows a positive growth rate in all aspect and in case of fruits except productivity (negative), growth is positive in area and production during 1991-92 to 2004-05. BIRTHAL *et al.* (2008) observed that despite deceleration in its contribution technology has remained an important source of growth in Indian agriculture. Also the diversification of agriculture towards horticultural crops has considerable potential to accelerate agricultural growth. Moreover the horticultural growth is an opportunity for small farmers to raise their income. CHAND *et al.* (2008) opined that diversification towards horticulture got real boost in the early 1990s which coincided with liberalization of economy. The growth rate in output of fruits and vegetables reached 6 per cent and condiments and spices reached almost 5 per cent. Those high growth rates in output of horticulture helped in raising growth rates of total crop sector from 2.03 per cent in 1980s to 3.02 per cent during 1990s despite deceleration in growth rates of cereals and pulses. The main factor underlying diversification in favor of fruits and vegetables has been higher returns relative to other crops. RAI *et al.* (2008) observed that horticultural crops have maintained steady growth in terms of acreage, productivity and production during each of the Period I -1980-90, Period II- 1990-2000, Period III-1980-2006. On the other hand, cereals have witnessed negative growth rate in acreage. These crops could maintain positive growth in production on account of some improvement in productivity and production over years. Vegetable and fruit crops have added higher nutritional value as well as increase income and employment opportunity per unit area. The higher biomass production per unit of area has an added advantage in producing organic product. SAHU and MAHAPATRA (2008) reported that in the green revolution period India's agricultural growth rate was due to supply driven factors but in the post reform period demand driven factors are the driving forces. Urbanization increase in per capita income and changing consumer tastes and preferences have largely shifted the consumption demand from food grain to high value commodities. SHARMA and KALITA (2008) found that the growth of area, production and productivity for all the fruit crops in the state were positive and statistically significant. The production and productivity of the crops were increasing due to combine effect of area and productivity. SINGH (2009) found that during the period 1970-2006, the increase in area under papaya and citrus was more than seven times followed by mango (approximately four times) where as in case of banana registered the highest compound growth rate of 6.53 per cent followed by papaya (5.97%), mango (4.12%), banana (2.79%), and lowest in guava (2.36%). The production of papaya increased approximately 12 times followed by banana (7 times), citrus (4.5 times), guava (2 times) and lowest increase was observed in mango which was approximately 1.8 times only. He also observed that papaya registered the highest compound growth rate of (5.72%), citrus (4.44%), guava (1.92%) and lowest 1.34 per cent in mango as far as production is concerned. There has been negative growth in productivity in mango, citrus and guava fruit crops where as the productivity of banana, papaya registered a positive compound growth rate of 2.94 and 1.8 per cent respectively. THIRUNARUKKARASU (2009) observed that land reforms measures were essential to initiate tribal development in order to promote more unproductive utilization of land resources. The land reforms laws should be uniquely designed to suit to each tribal area in our country. In his study he found, no significant change in land use pattern and cropping pattern was found during then 1990-2000. It is due to inadequate distribution of lands through land reforms,

the resultant change in socio- economic conditions of the tribal and the soil conditions in the Kalyan Hills. The study in an Agro-Economic Research Centre (2010) highlighted that the prospects commercial cultivation of vegetables in Assam is bright and the trend of vegetable production in the potential area is quite encouraging. The hybrid varieties benefited the growers with higher return per unit of area. Development of marketing and good storage facilities, careful handling, quick transportation along with development of agro-processing and agri-business supportive services at private and public sectors and considered essential to make vegetable crop cultivation remunerative (Anonymous 2010). Saraswati *et al.*, (2012) studied the growth in the area, production and productivity of different crops in Karnataka by using the compound growth function for a period of 26 years from 1982-83 to 2007-08. Growth rates showed a significant positive growth in area under pulses, vegetables and spices and fruits while cereals showed significant negative growth. The area under jowar, bajra, ragi and minor millets are experiencing a substantial annual decrement. 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. Ramachandra *et al.*, (2013) studied growth in the area, production and productivity under different crops in Karnataka by employing the compound growth function. Growth rates showed a significant positive growth in area under pulses, vegetables and spices and fruits and nuts while cereals showed significant negative growth. The area under jowar, bajra, ragi and minor millets were experiencing a substantial annual decrement. 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 rate. The production of oilseeds and commercial crops registered insignificant positive growth. The productivity of different crops registered significant growth in the case of cereals, pulses and fruits. Productivity of oilseeds recorded moderately significant positive growth. The productivity of commercial crops registered insignificant positive growth and for vegetables, the growth in productivity was insignificant and negative. Nethravathi and Yeledhalli (2016) opined that Karnataka has a typical composition having a large share of its area under highly diversified agricultural crops, higher growth in agriculture assumes great importance and is a matter of concern for policy planners and research scholars in recent times. The results revealed that in Davanagere the highest CAGR was observed in productivity of tomato (9.12%). In Shivamogga district highest CAGR observed in production of sunflower to an extent 29.57%. In Tumkuru area under green chillies was growing at rate of 34.46 per cent per annum. Area and production of cereals was observed negative growth but productivity had a positive growth. However, the growth in area, production and productivity of pulses have been increased significantly. Bhosale *et al.*, (2016) in their study concluded that the area under grapes in Maharashtra has increased by 82.68 per cent and it has increased at the annual growth rate of 6.68 per cent. The area under grapes has increased in Western Maharashtra and Marathwada regions. Area under grapes has increased in Nashik district and declined in Sangli and Solapur districts. The highest annual increase in acreages under grapes was noticed in Osmanabad district

and drastically declined in Sangli district which is major grape growing district. The production of grapes in Maharashtra has increased by 40.29 per cent over the base year and it has increased at the rate of 6.38 per cent. The increase in production of grapes in Marathwada was more than twice and in Western Maharashtra region marginal decline has noticed. Avinash and Patil (2018) in their study concluded that in Karnataka, the growth in area, production and productivity of pulses is positive in all the periods except productivity (-0.82%) in period-I (1980 to 1990). It is important to highlight that though the growth rates of productivity was found negative, but the production found positive in period-I. The country as a whole showed positive growth in area, production and productivity in all the periods but it is worth noting that the production and productivity found positive and significant in all the periods.

ii. Export performance and Direction of Exports

Bandopadhyaya (1982) analyzed the growth rate of India's share in world tea exports, using the simple linear trend equations. The reports revealed that Indian share in total world export of tea consistently declined during the period 1964-78. One of the causes attributed for the shrink in exports was the spurt in the demand for tea in the domestic market due to the population boom. Other associated attributes were low productivity, high cost of production and scarcity of suitable land and capital. Pal (1992) in his analysis on the agricultural exports from India during pre-liberalization period (1970 to 1989) observed that the compound growth rates of export earnings from all agricultural products comprising food and animal products, beverages and tobacco, crude materials and animal and vegetable oils was estimated at 6.67 per cent per annum. The growth of export earnings from fish and fish products was higher with an average annual rate of 12.26 per cent. While the export earnings from forest products was stagnant during the last two decades, the export earnings from agricultural products increased because of the rise in the unit value. Veena (1992) estimated the growth in export of Indian coffee for the pre-liberalization period (1965-1990) using exponential function. The results indicated that export of plantation type coffee exhibited a compound growth of 3.6 per cent annum while Arabica grew at a growth rate of 3.0 per cent. However, Robusta exports registered a marked increase of 10.7 per cent. Jalajakshi (1994) analyzed the growth of exports of shrimps (employing exponential model) from India for the pre-liberalization period (1966-91). Frozen shrimp recorded a positive growth rate due to high demand in the importing countries. Negative growth was observed for dried and canned shrimps which was attributed to the declining demand in the importing countries and increased cost of production in India. Negi *et al.*, (1994) observed that country's horticultural exports increased at a compound growth rate of 14.8 per cent per annum during pre-liberalization period between 1976-77 and 1990-91. The growth rate in export of potatoes was found to be positive (30.8%) while that of dry onion was negative (-3.9%) in value terms. However, it was 23.1 per cent and 9.7 per cent, respectively in terms of quantity. Mamatha (1995) evaluated the growth rates in production and export of selected spices (pepper, chillies turmeric and ginger) for the pre-liberalization period from 1970-71 to 1991-92 and reported that positive growth rates in both production and export of the selected spices were observed mainly due to the increased domestic production as well as increased demand for produce. Sale *et al.*, (1997) reported that over the years, export of fruits and vegetables decreased from 95.8 per cent (1982-83) to 37.85 per cent (1991-92) in the total agricultural exports. They stressed that the present level of exports of vegetables were far below the potential that India possesses and suggested the need for devising appropriate policy measures for enhancing production

of export quality products to derive the benefits of relatively higher prices in the international markets. Erthridge *et al.*, (1983) studied the changes in the structure of Texas high plains cotton ginning industry using Markov chain procedures. All projections showed declining number of active ginning firms with large decline in number of small firms and increasing number of large firms. Fialor (1985) analyzed the market share of Ghanaian cocoa exports for the period of 1951-81 using the Markov model. He decomposed the total change in export into the overall market share effect, the direction of trade effect, and the individual market effect. It was observed that there was an overall contraction in Ghana's cocoa exports during this period to the tune of about 38,000 tonnes. Even though there was an expansion in exports due to increase in the overall market share effect as a consequence of increased world demand to the extent about 2,26,000 tonnes and another 15,000 tonnes due to the direction of trade effect; yet the loss through the individual market share effect was large (2,78,000 tonnes) and this had resulted in the contraction of Ghana's export. Srivastava and Ahmed (1986) analyzed the direction of exports from India for the period 1960-61 to 1983-84. The countries such as USA, former USSR, Japan and erstwhile West-Germany had greater share in India's export and import trade. India's exports to the above mentioned five major countries declined over the period of study. The UK no more remained as the principal destination of Indian trade as it was in the pre-independence period. In 1983-84, USA emerged as one of the major trading partners of India. Veena (1992) analyzed the direction of Indian coffee exports in terms of importing country shares over the period 1965-90 using Markov Chain analysis. The projections indicated a declining trend in Indian coffee exports to the USA, Yugoslavia, Netherlands and other importing countries. The increased market shares of the erstwhile USSR in the 1970s and 1980s were subsequently threatened by economic and political upheavals in the region. Jeromi and Ramanathan (1993) noticed significant changes in the direction of pepper exports from India for the period 1975-90. It was observed that nearly 44 per cent of India's pepper exports were directed to former USSR, which constituted about eighty two per cent of the total pepper imports of that country. On the other hand, India not only failed to increase its exports to USA in tune with increased consumption in that country but also could not sustain the quantity exported during the earlier years. Instability was low in case of exports to former USSR, Italy and Canada and higher for Poland, USA and Czechoslovakia. Laxminarayana (1993) studied the direction of Indian silk exports by following first-order Markov process. The major importing countries considered for the analysis were USA, West Germany, UK, France, Italy and Japan. The exports to USA were stable and would remain highly loyal to Indian silk. The probability of exports to the UK, West Germany and Japan switching over to USA was unity, implying that entire quantity of exports to these countries would drift to USA over a period of time. Jalajakshi (1994) in her study showed the changing pattern of Indian shrimp exports between two periods, Period-1 covering the years 1970-80 and Period-II covering the years 1980-90. The study indicated that during Period-I, India could not retain its previous market share in the EEC countries. Nearly, 90 per cent of Indian share was diverted to Japan and seven per cent was diverted to UK. However, in Period-II, India could retain 11 per cent of its previous market share in the EEC countries due to the gradual acceptance of tropical shrimps in these countries. Veena *et al.*, (1994) examined the changing directions of Indian coffee exports in terms of importing country shares over the period 1965 to 1990 using Markov chain analysis. It was observed that India could not retain its previous market share to USA, Netherlands, former Yugoslavia and other importers. However, the actual quantity exported to all these countries has increased which was due to increased quantity of Indian coffee exports. India retained its market share to former West Germany, erstwhile USSR and Italy.

The increased market share of USSR in the 1970s and 1980s was then threatened by the economic and political upheaval in the region. Diana (1997) used non-stationary Markov chain analysis to explore the linkages between sector specific policy and sector employment in Oregon, USA. Application of the technique to Oregon's forestry sector and national forest policy demonstrated that macroeconomic forces had statistically important effects on employment while national forest policy measures as timber sold or timbers cut did not. This result raised question about forest policy impact analysis and assumptions inherent in national forest policy implementation. Ajjan *et al.*, (1998) analyzed the direction of trade of senna and periwinkle in India using Markov Chain analysis. The probability of Germany and USA retaining their import shares of senna in the years to come were estimated to be 0.8258 and 0.8188, which clearly indicated that these two countries would retain their import share in the same position as 1977. For periwinkle, France had a high retention of the export share (probability of 0.8826) while Germany and others had as low as 0.2644 and 0.0543, respectively. This clearly indicated that the chances of maintaining export share to France was 88.26 per cent and in the other two cases the chances of maintaining the export share was practically low or nil for the year 1996. Gupta (1998) reported that India's share in world export has increased over a decade from 1970 to 1994 on rice (0.6% to 6.6%), feeding stuffs for animals (1.6% to 3.1%) and cereals (0.1% to 0.9%). Similarly, the share of fruits and vegetables increased from 1.2 per cent in 1974 to 1.7 per cent in 1994. Further, it was observed that former USSR, UAE, United Kingdom, USA, Italy, Singapore, Indonesia, Republic of Korea, Belgium, Saudi Arabia, Holland and Nepal were the important destinations for Indian agricultural products. Thus, if India thinks of augmenting export earnings, it can safely give greater emphasis of agricultural exports and development of new markets should be the primary goal. Mandanna *et al.*, (1998) analyzed structural change in India's tobacco exports for the period 1980-81 to 1994-95 using Markov chain analysis. The study revealed that the USSR, the largest market for Indian un manufactured tobacco, had a high degree of loyalty for Indian tobacco during the period 1980-81 to 1985-86, but it diminished substantially during the period 1985-86 to 1994-95. The markets of Western Europe, Asia and the Middle East had taken the place of the USSR. Among the manufactured products, only cigarettes had a dominant presence in the export basket. The diversification of export market is clearly evident, necessitating efforts in the direction of brand building for Indian tobacco. The tobacco board of India can initiate this exercise. Measures should also be initiated to improve the export competitiveness of Indian tobacco in the world market. Srinivasamurthy and Subramanyam (1999) analyzed the direction of onion trade by using Markov chain model during the year 1980-81 to 1995-96. The major gainer among importers of Indian onion over a period of time was Malaysia which was having a transfer probability of 0.6459 from Saudi Arabia and 0.3488 from UAE; Sri Lanka, in addition to having high probability of retention of its own share, was also likely to gain from Saudi Arabia with a moderate probability and a gain of 0.3488. On the other hand, Saudi Arabia which was having zero probability of retention of own share of exports of fresh onion was likely to gain to some extent from Bangladesh and other countries. Shivaraya (2000) studied the changes in trade directions of exports of selected vegetables using Markov chain analysis. The results of the study revealed that UAE and Malaysia were the loyal markets for the Indian onion. In case of potato, Sri Lanka and Nepal were found to be the most loyal markets whereas; Bangladesh and Nepal were the most stable importers of Indian fresh tomatoes. Angles *et al.* (2001) used Markov chain model for assessing the direction of trade and destination of Indian turmeric. The results of Markov Chain analysis showed that previous export share retention for Indian turmeric was high in UK (42.99%) and countries pooled

under others category (58.77%.) The countries such as USA, Iran, Japan and UAE were not stable importers of Indian turmeric. The plans for export may be oriented towards those two and also plans should be formulated for stabilizing the export to other countries. Desai (2001) used Markov Chain model to analyze the trade direction of export of Indian fresh mango and mango products. Japan was one of the most stable countries, among major importers of Indian fresh mango as reflected by its high probability of retention (1.00). In the case of mango pulp, other countries had the highest probability of retention (42.90%) followed by Saudi Arabia (24.00%) while, Netherlands, UK, Kuwait and UAE were unable to retain their share as reflected by their probability of retention of zero. The transitional probability estimated for mango slices in brine showed that UK was the most stable country among major importers of Indian mango slices in brine which was reflected by its high probability of retention (0.782). Mahesh (2000) analyzed the structural changes in Indian tea exports by employing the first order Markov model. The transitional probability matrix indicated that the countries like United Kingdom, USSR, Iran, UAE, Saudi Arabia and other importing countries retained their previous shares of Indian tea while rest of the countries like Germany, Poland and USA could not retain their previous shares of Indian tea. Jayesh (2001) used Markov chain analysis to study the direction of trade and changing pattern of pepper and cardamom exports from India. The results of Markov chain analysis indicated that exports of Indian pepper were likely to be concentrated in USA and Russia. Similarly, cardamom export was likely to be concentrated in Japan and Saudi Arabia. A high dependence on one or two export markets would increase the trade risk in the long run. Hence, it was suggested to evolve appropriate export promotion strategies to diversify the geographical concentration. Especially in case of cardamom exports, steps should be taken to enhance Indian exports to other countries of Middle East along with Saudi Arabia, since this region was the major consumer of cardamom in the world. Sananse *et al.* (2004) studied basmati rice export from export potential point of view and found that rice has greater competitiveness. Mahadevaiah *et al.* (2005) analyzed the dynamics of changes in the export of cotton from India by estimating the probability of retention and switching pattern by employing a first order Markov chain model. Purohit *et al.* (2008) used two state Markov chain model to find the probabilities of occurrence of dry and wet weeks and also carried out weekly analysis of rainfall at Bangalore. Indian spices exports have been able to record strident gains in both volume and value. Spices exports have registered substantial growth during the last five years, registering a compound annual average growth rate of 21 per cent in value and 12 per cent in volume (Spices board, 2013). Kusuma and Basavaraja (2014) attempted Markov chain analysis to assess the transition probabilities for the major grape markets. The major export markets for Indian grapes are Bangladesh (35.42%), Netherlands (21.5%), U.K. (13.85%), U.A.E. (10.87%) and Germany (3.01%). The major Indian grape export markets were categorized as stable markets (Bangladesh, U.A.E, Netherlands) and unstable markets (Germany, U.K.) based on the magnitude of transition probabilities. Ansari and Khan, (2015) also employed compound annual growth rate and Balassa's revealed comparative advantage index to find export performance of agricultural commodities. The results revealed that India has comparative advantage in export of some agricultural commodities such as meat and edible meat, oilseed, coffee, wheat, rice and tea. Deepika *et al.* (2015) observed that the countries which were stable destination for Indian spices export were Canada for black pepper, UK for chillies, Bangladesh for turmeric, UAE for cumin and Malaysia for coriander. The transitional probability matrix obtained indicated that most of the traditional importers have shown low retention probability which may be due to tough competition arising in spices trade and trade related barriers

in the developed nations. Suresh and Mathur (2016) analyzed the growth performance of agricultural exports in India by using trend growth, percentage share, compound annual growth rate (CAGR) and Revealed Comparative Advantage (RCA) index. The author found that there was an improvement in the growth rate of export of agricultural commodities. The comparative advantage improved for some plantation crops but declined for rice and wheat. Shilpashree *et al.* (2017) analyzed the pattern of export, import and balance of trade of sheep and goat meat in India. From the results, India is largest exporters of sheep & goat meat to the world. The country has exported 16.05 thousand MT of sheep & goat meat to the world for the worth of Rs. 425.63 crores during the year 2012-13. Domestic demand for the sheep and goat meat has also been increasing consistently, which may further preclude it to expand its export. The study was also undertaken to find out the direction of trade of sheep and goat meat using Markov Chain Analysis. The results also revealed that India's previous export to the United Arab Emirates market was retained to the level of 17 per cent during the current period. India could not retain its previous import to Australia, Singapore and United Arab Emirates during the study period. The entire share of Australia was directed to Singapore whereas the entire share of Singapore was directed to other countries. India's previous sheep and Goat meat import to the Thailand market was retained to the level of 100 per cent during the current period. India's previous Sheep and Goat meat import to the other countries was retained to the level of only 18 per cent during the current period.

iii. Value Chains in Fruits & Vegetables:

Singh and Kahlon (1969) identified three important channels in marketing of grapes in Punjab. They were, channel-I: sale to the pre-harvest contractor who in turn supplied the produce to retailers through commission agents in the primary market, channel-II: the producer supplying to the wholesaler through commission agent in the primary market and the former selling to the retailer in the same market and channel- III: the producer selling to the retailer through commission. Gulati *et al.* (1994) observed that the canalization of onion through National Agricultural Cooperative Marketing Federation of India (NAFED) has led to loss of share in export market because of intervention of NAFED. Whenever there is escalation of price in the domestic market, the infrastructure for storage, transport, internal as well as international was largely inadequate. The interest on export finance was high (13%) and it should be brought down to nine per cent per annum. Institutions such as farmer's exporter co-operatives like Mahagrapes and Mahamango were considered most useful in the export promotion of fruits and vegetables. This is essential to ensure good quality product as well as remunerative returns to the farmers. Burma and Boselie (2000) analyzed the development of a sustainable agri supply chain which requires commitment of the various stakeholders like growers, traders and supermarkets. The stakeholders considered in the vegetables supply chain are the general management of the super market organization, the management of the distribution centre, the buyers in the super market organization, the vegetable suppliers, the vegetable growers and the input suppliers of the vegetable growers. The various stakeholders perceive weaknesses and threats in the misuse of pesticide, the delusion of good quality vegetables, the irregular supply of vegetables, the obscurity of cost of production and handling, the strong price fluctuations for vegetables and the strong competition in the market for inputs. Hau and Oppen (2002) conducted a study to know the efficiency of vegetable market in Northern Thailand and it indicated that wholesale markets present outside the cities have strong influence on price determination for retailers. The average

price for cabbage was 12.65 Baht/Kg, for carrot it was 19.42 Baht/Kg, for onion 22.31 Baht/kg and for tomato it was 18.07 Baht/Kg in retail shops in the city. Whereas it was 11.06 Baht/Kg, 17.63 Baht/Kg, 20.33 Baht/Kg and 16.34 Baht/Kg for cabbage, carrot, onion and tomato respectively for the outskirts retail shops. Chole *et al.*, (2003) carried out a study to examine price spread in marketing of brinjal in Maharashtra state. The brinjal growers used three channels. Channel- II was most favored channel in the study area as maximum (nearly 50%) quantity was marketed through this channel. The producer's share in consumer's rupee was maximum in channel - I (68.28%) followed by channel II (57.94%) and channel III (53.14%). Wilson and Goddard (2004) reported that the wine industry of New Zealand has rapidly developed and matured in the last decade to produce an international product that is highly desired by key global markets, and has become a major contributor to the economy. However, limited activities and the waste arising from them. Value stream mapping is a diagnostic technique that originated in lean manufacturing for the purpose of eliminating wasteful activities and reducing production lead time. Case study evidence indicates that order volatility and forecast inaccuracy make it difficult for manufacturers to estimate material requirements and to plan production, thus reducing efficiency and encouraging over- production to ensure availability, factors that increase both physical and operational wastes. Altenburg and Tilman (2006) observed that production by order of a lead firm that 'governs' its value chain by defining and enforcing standards without aspiring to gain ownership control of its suppliers is becoming a dominant form of industrial organization. This trend has far-reaching consequences for developing countries, among others, affecting the degree of inclusion of poor producers, their income earning opportunities, the allocation of risks, and consumer prices. His study serves a triple purpose. First, it tries to disentangle the multiple factors that determine the concrete form of value chain governance; second, it proposes a framework for the analysis of the developmental impacts of these different forms of value chain governance; and, third, it derives policy conclusions from this analysis. Narrod and Roy (2007) observed that India was a small horticultural exporter mainly because of lack of off- farm competitiveness. Smallholder dominated agriculture restricts the number of farmers able to adopt sophisticated farm practices and undertake the investments (like cold storage) to meet stringent international food safety standards. However, organizations like Mahagrapes had helped in increasing export competitiveness of small Indian farmers. Mahagrapes has established chain of cold storage at cooperative societies. It had provided EUREPGAP certificate to these societies which had reduced the cost of individual certification. Mahagrapes provides materials and technical help along with infrastructural support to facilitate the implementation of the standards. Mahagrapes also provided the farmers with packaging material which comply with international norms. Olhangar *et al.* (2006) examined combined Fisher's approach with the concept of a customer order decoupling point. They distinguished between a product supply decoupling point and a demand mediation decoupling point. A decoupling point divides the value chain into two distinct parts; one upstream with certain characteristics and one downstream with distinctly different characteristics. They specifically explored how the Fisher model can be used to characterize the role and features of upstream versus downstream value chain operations relative to the product supply decoupling point and the demand mediation decoupling point. Schmitz (2006) explored the power of the global value chain approach in explaining the growth of production capabilities and the distribution of gains. He suggests that the upgrading opportunities of local enterprises are structured by the relationships in global value chains. This is shown clearly

for the case of the garment and footwear industry, where advances have been rapid in product and process upgrading but more limited in functional upgrading. With regard to the distribution of gains, the global value chain approach also provides clear hypotheses but the empirical evidence remains weak. Roy and Thorat (2008) observed that in spite of being the second largest horticultural producer in the world, India is a failed exporter mainly because of the inability to meet the food safety standards. Hence, successes in horticultural exports are rare. They studied one unique success story, Mahagrapes, a marketing partner to farmer cooperatives and attributed its success to a combination of collective action and public private partnerships. Their results indicate that Mahagrapes farmers earn significantly higher income vis-à-vis their outside marketing option and smallholders face no bias in selection. Together with the farmer's ability to consistently meet standards, this implies that the model can be scaled up. Working Group Report, Planning Commission, GOI, 2007 opined that Mahagrapes is the organization which helps in linking small and marginal farmers to export market. It was formed in January 1991 with the objective of elimination of middlemen in marketing process, encouragement and development of agricultural export. It acts as a marketing partner to the group of producers cooperatives in the Maharashtra state of India. Mahagrapes negotiates better prices for its members and also provides technical assistance, inputs and information to the farmers to enable them in meeting stringent quality requirement of export markets. Talgeri in his article published in Outlook Business magazine dated October 18, 2008 gave some excerpts from interview of Sopan Kanchan, Executive Partner of Mahagrapes. He emphasized that by themselves, these 2,500 grape growers of Maharashtra could barely send their produce across the state, but now together they are exporting it to Europe. The success of Mahagrapes has been two-fold. One, it has enabled the grape growers to get a fair price on their produce across small and medium individual land holdings. This has been possible due to the benefits of consolidating the produce across myriad vineyards of the region for testing, packaging, freight and shipment. Second, by helping farmers comply with the standards for export of 2.2 m. tonnes of grapes, it has inculcated a culture of quality control. In effect, Mahagrapes allows grape growers in Sholapur, Pune, Nashik and Sangli to access grading techniques, technology and best practices. And with the value chain it has developed in the past decade, the Maharashtra grape growers' produce has charted a route to the shelves of retail chains like Tesco in London. It follows the model of a co-operative society, but behaves like a company in the world market. Sethi and Zutshi (2008) reported that there is a lot of opportunity for strengthening value chain of grapes in Indian economy. As wine is an emerging sector in the Indian food industry. While the consumption of wine is growing at 30 per cent in the last few years in India. The total market size of the beer and wine industry was Rs. 10,000 crores (US \$ 2.3 billion) in 2006-07 and is expected to grow up to Rs. 23,955 crores by 2015. Sikka *et al.* (2008) observed that 30- 40 per cent of fruits and vegetables were being wasted due to post-harvest losses due to lack of basic as well as specialized infrastructure such as cold storages, reefer vans, cool chains, ripening chambers, etc. in Punjab. There is also a missing link between production, research system and international consumerism. They found that precision farming technology can bring quick improvement in value chain in different agro-climatic regions. Further, refinement in supply chain, adoption of new technologies and their transfer will bring perceptible improvement. Sowmya *et al.* (2008) found that marketing cost of grapes in both the markets is different from person to person. Farmer spent more than Rs. 40920 to market one – acre of grape (440 baskets). Pre-harvest contractor had to spend Rs. 3.85 to market one baskets of

grape, and finally retailer spent Rs. 515 to market 10 basket of grape. When the grower does direct marketing of this produce, which is referred to as zero level channel benefited by getting higher price than through pre-harvest contractor/commission agent. Fearne (2009) reported that the stakeholders involved are significant players in the context of the Australian wine industry and the product family is broadly representative of the many branded Australian wines that have been in the vanguard of Australia's success in overseas wine markets generally and the UK market in particular. Thus, many of the findings of this case study are likely to be of broader relevance to the Australian wine industry as a whole and particularly those reliant on supermarket channels. Gooch *et al.* (2009) describes the techniques that stakeholders along the value chain use to manage quality. As can be seen, Ontario's grape industry almost invariably uses only subjective measures to manage quality. This includes the picking decisions that invariably translate into differences in quality across suppliers and individual deliveries to retail, regardless of other factors which further impact quality – such as cool chain management. Also detailed are quality issues commonly found to occur at each level of the value chain, and how they might be addressed, and descriptions that interviewed respondents used to compare Ontario's industry to leading importers. Presutti and Mawhinney (2009) proposed a contemporary value chain model that reflects the elements that Porter's model did not. Those elements include leadership, corporate culture and the discipline of supply chain management. The supply chain, an important component of the value chain but not synonymous with it, includes all the primary activities of the Porter model. Consolidating those activities into the supply chain component of the contemporary model provides an opportunity to include other elements that are fundamental to value chain success. Kesar and Ferjank (2010) in his study on key aspects of managing successful wine tourism development in times of global economic crisis- a case of Croatia revealed that Wine tourism as an option for sustainable rural development that may serve to generate additional economic benefits for small rural communities. The case study method was used to investigate the present state and the prospects for wine tourism development in the continental part of Croatia that receives no benefits from mass tourism. The findings have shown that region features excellent conditions for growing grapes and wine production, but lacks tourism infrastructure and collaboration between the stakeholders as well as the expertise on tourism development - all of which reduce the opportunities for more intensive development. Marco Li Calzi (2010) reported that the grape industry has potential for increasing national wealth and there by achieving social and economic benefits in India. The potential benefits of grape cultivation can be derived only by establishing the grape processing industries, since this will improve the profit-ability and sustainability of grape production research on wine grape cultivation and wine making is still at in-fancy stage. There is an immediate need to intensify the research in all aspects of wine grape cultivation and wine making. Rieple and Rajbir Singh (2010) analyzed the different activities within the value chain of organic cotton production in India to understand where, and how, value is added at each stage. Transforming a cotton crop into a textile and then into a final item of clothing involves many stages of processing, using many skills and technologies. They examined the activities and the prices achieved at each stage of this chain, from the farming of the cotton crop to its eventual sale in clothes' retailers. Asante *et al.* (2011) observed that small-scale farmers can have easy access to market information, credit and input for their production, processing, and marketing activities by joining farmer-based organizations. However, their study found out that

despite such observed benefits, some farmers were not members of farmer-based organizations. They used probit model to assess the factors influencing the decisions to join farmer-based organizations in Ghana. The results revealed that farm size, farming as a major occupation, access to credit to loan and access to machinery services influenced farmers' decisions to join farmer-based organizations in the Eastern Region of Ghana. Kumar *et al.*, (2011) in their study of the smallholder dairy farmers access to modern milk marketing chain has shown that in spite of the growing presence of modern milk supply chains, the traditional milk supply chain is still dominant in the Indian milk market. Its presence is even more pronounced in less developed States like Bihar. However, the traditional milk supply chain is being replaced, albeit slowly, with commercialization of dairying. The structure of the milk marketing in Punjab has depicted this conclusion. The study has concluded that the modern milk supply chain seems to have an inclusive structure and the resource- poor dairy farmers are not excluded from the modern milk supply chain. The study found that the scalability of the modern milk supply chain will depend on the development of milk collection and transportation facilities and incentive pricing for quality produce. Herlehy (2012) in his article "Linking Smallholder Farmers to Markets: The Power of Farmer-Based Organizations" emphasized that when farmers come together through cooperatives or member-owned businesses, they can pool their resources and maximize the value of whatever work they do. Cooperatives link farmers to markets, input suppliers, new technologies and sound farm management techniques. Farmer-based organizations help farmers negotiate better prices for their goods and services through the power of aggregation. Nikam (2013) analyzed the supply chain of grapes in Maharashtra and the findings revealed that Mahagrapes members had slightly more income (Rs. 13.32 lakh) than independent farmers (Rs. 12.38) though mean was not statistically significant. More number of Mahagrapes members belonged to small and marginal farmers (15.5%) than independent farmers. Productivity of grapes at Mahagrapes members field was slightly more (11.78 ton/acre) than independent farmers. (11.31ton/acre). Mahagrapes members were more socially active (mean score 7.3) than independent farmers (mean score 6) and difference of mean was significant. Santosh (2016) concluded that low price and domination of middlemen were the prime constraints identified in grape supply chain management in Vijaypur district of Karnataka. To overcome this, the Grape Growers Association can arrange procurement of grapes by announcing the price in advance as done in the case of sugarcane in the same locality. To accomplish this objective the Grape Growers Association should establish cold storage units and market for sale of fresh grapes as in practice in Maharashtra district like Mahagrapes. Maximo (2020) opined that amidst COVID-19 pandemic, markets witnessed an increase in both staple food and ready-to-eat food that can be stored and also strong increase on e-commerce. In Italy, demand for flour increased by 80 per cent, canned meat by 60 per cent, canned beans by 55 per cent, and tomato sauce by 22 per cent. These trends lead to difficulties to sell produce, loss of perishable produce and loss of income. Also, it witnessed an increase in e-commerce up to five times fold. Closure of farmers' markets, preventing smallholder farmers to direct sell to consumers, leading to loss of income, loss of perishable produce and accumulation of non-perishable produce. Smallholder farmers that supply school meal schemes are affected by schools closure.

Chapter-III

A Conceptual Framework for Analyzing Value Chains Under External Shocks

In this section we develop a simple framework for identifying the effects of shocks of the value chains of fresh products such as fruits and vegetables. Studying the value chains and the distortions along the various linkages in the value chain is a key first step to device appropriate interventions. Figure 1 presents the value chain mapping for fresh fruits and vegetables and the possible areas of disruptions denoted by a dot in the linkage arrows. In addition, the figure also includes the processing of the fruits and vegetables which are still emerging as a subsector in developing countries, particularly in India. This is denoted by an additional dotted arrow. As depicted in the figure, almost all linkages are affected by the COVID-19 emergency. The complete lockdown affects the use of labor in all stages of the value chain ranging from the farming activities related to planting, inter-cultivation and harvesting, to transportation of the produces in various stages of the value chains. The local markets are also affected in some cases where there are restrictions to bring the produces to a common marketplace. The slowdown in the movement of the produces increases the wastages in the absence of adequate cold storage facilities for the perishable commodities.

In Figure 2 we identify the supply side and demand side factors that will affect the value chain management of the fresh fruits and vegetables. On the supply side for example, issues related to labor supply for all farm operations, area planted and maintained, quantity harvested, reduction in the input supply, transport restrictions and the market restrictions affect production, marketing and trade of fresh fruits and vegetables. On the demand side, the COVID-19 lockdown reduces the demand for fresh produces due to restricted movement of the consumers and, also due to low income earning capacity of the majority of the population during this pandemic period. Due to the closing of the institutions, the regular supply of the fruits and vegetables to the mandis also has drastically come down. Collectively both the supply and demand factors contribute the high-level disruptions of the activities along the value chain for the fresh fruits and vegetables. We use this conceptual framework in developing the case study of grape value chain in Maharashtra, India to analyze the impact of COVID- 19.

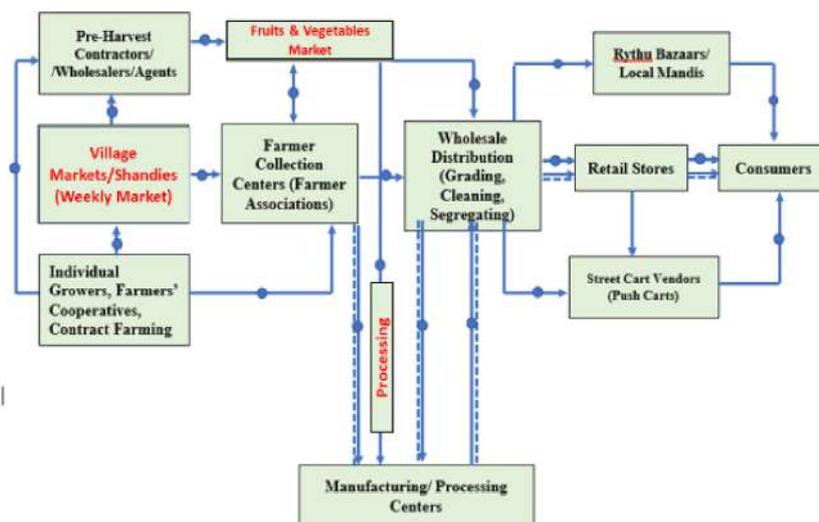


Fig. 1: Value chain mapping for fruits and vegetables in India

SUPPLY SIDE

- Less production likely, but not yet noticeable
- Significant area (under grapes) not harvested
- Low capacity use of processing units
- Supply chains to be disrupted as of April and May
- Reduction in labour force could disrupt production and processing of grapes
- Reduced access to critical inputs for production and processing (due to logistical constraints and labour shortages)
- Transport restrictions and quarantine measures likely to impede farmers' access to input and output markets, curbing productive capacities and denying a point of sale for produce; potential to raise post-harvest losses
- Blockages of transport routes, disruption of fresh fruits supply chains
- Increased levels of food loss and waste during transit

DEMAND SIDE

- Panic buying of fresh foods and processed products
- Food demand is generally price inelastic and effect on overall consumption likely limited, although dietary patterns may alter
- Temporary closing of schools, colleges, shopping malls, movie theatres, restaurants, and reduction of sales at local mandis led to larger decline in fresh foods consumption (implications from spread of virus)
- Food demand is more income elastic, and loss of income-earning opportunities could cause consumption to contract
- Fear of contagion exacerbated the effect on food consumption, through reduced visits to food markets
- Shift in purchasing modalities from open market to increased e-commerce deliveries
- Threat to imports of critical inputs and products (edible oils, pulses etc)

Fig. 2: Food Supply Chain under strain - Imbalance between Demand side and Supply side forces

Chapter-IV

Data Collection and Methodology

Based on the review of literature, it was noticed that though several studies dealt with growth dynamics of area, production, productivity, trade performance and VCA of agricultural commodities, none of them tried to study the same with special reference to grapes and its processed products from India in general and with special reference to Maharashtra state. In view of the India's position in the global production of grapes and share of Maharashtra in the total production of grapes at All-India level, the disruptions in the value chains of grapes amidst COVID-19 pandemic and suitable strategies to address the same assume greater significance.

As mentioned earlier, the present study is designed to analyze the growth dynamics of area, production and productivity of fruits and vegetables, export performance and trade direction of fresh fruits at All-India level and with reference to grapes in Maharashtra. The study also focussed on analysing the degree of value addition of market players involved in transacting grapes and its products and the benefits realized by the growers transacting grapes through Mahagraper vis-à-vis Independent grape growers in Maharashtra. In the context of COVID-19 pandemic, the study also highlighted the disruptions in supply chains of grapes and offered suitable suggestions to ensure building a resilient supply chain for fresh fruits with special reference to grapes in Maharashtra.

As Maharashtra is the leading State contributing around 76 and 78 per cents of total grapes area and production respectively at All-India level, the same was selected purposively to analyze the value chains of grapes and its products, possible disruptions in its supply chain during the COVID-19 pandemic and offering suitable strategies for building resilient supply chain for grapes. This study is based on secondary data. The information pertaining to area, production and productivity of horticulture crops at All- India level are collected from Horticulture Statistics at a Glance, Ministry of Agriculture and Farmers' Welfare, Government of India and www.fao.org. The data regarding exports, imports and trade direction of fresh fruits and grapes are collected from www.apeda.com and www.fao.org. The information pertaining to value chains of independent grape growers and Mahagraper, major players and degree of value addition across grapes value chains, possible disruptions in grape supply chains and strategies for building resilient grape supply chain in the context of COVID-19 pandemic are obtained from the officials of Directorate of Horticulture (DoH) through telephonic interactions.

Statistical Techniques Employed: The following techniques are employed to arrive at the realistic conclusions from the study:

- Compound Annual Growth Rates (CAGRs): CAGR analysis is employed through fitting the exponential function to the variables of interest viz., area, production, productivity, exports and imports of the horticulture crops at All- India level and with special reference to grapes in Maharashtra. The CAGRs are calculated by fitting the following exponential function:

$$Y_t = Y_0 (1 + r)^t \quad (1)$$

Taking log on both sides, we will get $\ln Y_t = \ln Y_0 + t \ln(1 + r)$

$$\ln Y_t = a + bt \quad (2)$$

where,

$$a = \ln Y_0$$

$$b = \ln(1 + r)$$

Y_t = area/production/productivity/exports/imports Y_0 = Constant

t = time period in years and b = regression coefficient

$$\% \text{ CAGR} = (\text{Antilog } b - 1) \times 100 \quad (3)$$

- **Markov Chain Analysis:** The changes in the direction of exports of fresh fruits and grapes from India to different countries was analyzed by employing a first order finite Markov chain model which captured the net effect in changes in their exports over a period of time. There is a growing awareness of the usefulness of this technique for analysis and forecasting in many areas including exports, particularly when the process is constant but has a gradual change (Eswarprasad *et al.*, 1997).

In this report, the structural change in the exports of the above commodities in terms of market retention and market switching was examined by using the Markov chain approach. The estimation of the Transitional

Probability Matrix (TPM, (P)) was central to this analysis. The element P_{ij} of the matrix indicated the probability that the exports would switch from the i^{th} country to j^{th} country over a period of time. The diagonal elements P^{ii} indicated the probability that the export share of a country would be retained in the successive time periods, which in other words, measured the loyalty of an importing country to a particular exporting country. In the context of the current application, ten major importing countries (including all other countries grouped under 'others') are considered for fresh fruits and grapes exports from India. The average exports to a particular country was considered to be a random variable which depended only on its past exports to that country and which was denoted algebraically by the following equation:

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

where, E_{jt} = Exports from India to the i^{th} country during the year 't' E_{it-1} = Exports to the i^{th} country during the year 't - 1'

P_{ij} = Probability that exports will shift from the i^{th} country to j^{th} country e_{jt} = Error-term which is statistically independent of e_{jt-1} , and

r = Number of importing countries

The transitional probabilities P_{ij} , which can be arranged in a $(c \times r)$ matrix had the following properties:

$$0 \leq P_{ij} \leq 1$$

$$\sum_{i=1}^r P_{ij} = 1 \text{ for all } i$$

The expected export-share of India during a particular period, 't' was obtained by multiplying the quantity of exports to the selected countries (ten in the present study) during the previous period (t-1) with the estimated TPM (P). There are several approaches to estimate the transitional probabilities of the Markov chain model such as un weighted restricted least squares, weighted restricted least squares, Bayesian maximum likelihood, unrestricted least squares, etc. In the present study, Minimum Absolute Deviations (MAD) estimation procedure was employed to estimate the transitional probability, which minimizes the sum of absolute deviations. The conventional Linear.

Programming (LP) technique was used, as this satisfies the properties of transitional probabilities of non-negativity restrictions and row sum constraints in estimation (Mandana *et al.*, 1998 and Hugar, 2002). The LP formulation on analysis was stated as per expression given below:

$$\text{Min } O P^* + Ie \text{ subject to, } XP^* + V = Y GP^* = 1$$

where, P^* is a vector of the probabilities P_{ij} ; O is a null vector; I is an appropriately dimensional vector of areas; e is the vector of absolute errors ($|U|$); Y is the vector of exports to each country; X is a block diagonal matrix of lagged values of Y ; V is the vector of errors; and G is a grouping matrix to add the row elements of P arranged in P^* to unity.

P^* vectors were arranged to obtain the transitional probability matrix which indicated the overall structure of the transitions that had taken place in the system. Essentially, the transitional probability matrix captures the dynamics of the changes in raw cotton exports from India. The individual probabilities P_{ij} indicate the probability of the shift from the country i to country 'j'.

- VCA of grapes in Maharashtra:
 - o Computation of Marketing Margins: There are two types of marketing margins viz., Gross Marketing Margin (GMM) and Net Marketing Margin (NMM).

GMM of a market player in a value chain is obtained as given

below:

$$GMM_i = SP_i - PP_i$$

where, GMM_i = GMM of i^{th} player; SP_i = Selling Price of i^{th} player and PP_i = Purchase Price of i^{th} player.

NMM of a market player in a value chain is obtained as given

below:

$$NMM_i = SP_i - (PP_i + MC_i)$$

where, NMM_i = NMM of i^{th} player; MC_i = Marketing Costs incurred by the i^{th} player in the value chain (Hussain *et al.*, 2013).

So, NMM_i indicates the exclusive profit margin realized by the market player in the value chain

- o **Producer's Share in Consumer's Rupee (PSCR):** It is obtained from the following formula:

$$PSCR = (FNSP * 100) / CPP$$

where, FNSP = Farmer's Net Selling Price (after deducting the transaction costs of the farmer),
CPP = Consumer Purchase Price for the same quantity of produce handled.

- o **Degree of value addition by each market player:** The NMM realized by a market player is divided by his purchase price of the same quantity of commodity handled in the value chain and this will give the figure of value addition (Imtiyaz and Soni, 2013). Now the degree/extent of value addition is obtained by multiplying the figure of value addition calculated above with hundred and can be conveniently expressed in percentage.

Degree of value addition by each market player = $(NMM_i/PP_i)*100$

Chapter-V

Production and Export Scenarios of Fruits and Vegetables in India

India after independence experienced considerable growth in agricultural production and earnings from agricultural exports. With the growth of Indian economy, the share of Agriculture in Gross Domestic Product (GDP) has declined over the years and even today productivity of some agricultural products is lower compared to countries like USA and China. The growth in Indian agricultural sector has gained momentum with the advent of Green Revolution technology since mid-sixties. From a food grain production around 55 m. tonnes at the time of Independence, the country is now marching ahead to produce around 280 m. tonnes in 2017-18. Unlike developed nations, agriculture still remains the backbone of the country. This sector occupies centre stage in Indian economy embodying three thrust areas viz., to promote inclusive growth, to enhance rural income, and to sustain food security. It accounts for nearly 14 per cent of GDP and exports and supports half of the country's population as its principal source of income. This sector has contributed to foreign trade even in its traditional form. Indian agricultural products have been facing stiff competition from Asian countries for quite some times. Due to globalization and liberalized regime, this competition is likely to increase further and new initiatives in agriculture development shall have to meet the emerging challenges. The performance of agriculture after integration with the world markets is greatly linked .to the success of efficient value chain and boosting the exports.

Horticulture sector in India has become one of the major drivers of growth in the agriculture sector. This sector encompasses a wide range of crops namely fruit crops, vegetables crops, potato and tuber crops, ornamental crops, medicinal and aromatic crops, spices and plantation crops. New introductions like mushroom, bamboo and bee keeping (for improving the crop productivity) further expanded the scope of horticulture. With the growth of technology, modernization, and changes in food habits of the people, the sector has undergone a major shift in the recent past and got a tremendous potential to push overall agriculture growth in the country (Bahadur, 2010). Also, the sector can directly address poverty and food and nutritional security issues in both urban and rural areas of the developing world (Abou-Hadid, 2005). At present, the sector has, perhaps, become the most profitable venture of all farming activities, as it provides ample employment opportunities and scope to raise the income of the farming community in the country (Choudhary, Singha, & Vishnu, 2013). It also has tremendous potential to push the overall agriculture growth to more than the targeted 4 per cent. It is the fastest growing sector within agriculture. While the first few Five Year Plans (FYPs) in the country assigned priority to achieving self- sufficiency in food grains production, over the years, horticulture has emerged as an indispensable part of agriculture, offering a wide range of choices to the farmers for crop diversification. It also provides ample opportunities for sustaining large number of agro-industries which generate substantial employment opportunities. The horticulture sector account for about 13.08 per cent of gross cropped area (192.79 m. ha.) in the country and contribute around 30 per cent to Indian Agricultural GDP (2015- 16). Its share is about 37 per cent of the total exports of agricultural commodities. Horticulture sector received focused attention from 7th FYP onwards, as a

result, there has been not only sustained increase in production of horticulture crops but hi-tech horticulture also been recognized as a commercial proposition. Horticulture sector is providing opportunity for crop diversification resulting in the increased income from the land and also the nutritional security. The benefit of area expansion is horticulture in clusters supported by post-harvest management infrastructure has percolated down to even small and marginal farmers, a number of whom contribute to the export of horticulture produce. Thus, this sector has gained prominence over the last few years contributing a growing share in Gross Value Added (GVA) of the Agriculture and allied sectors.

Besides, contributing to higher productivity and production, it influences the income of growers and contributions to the development of a horticultural economy. It opens up an efficient market system and marketing horticulture is a reliable source of income. Simultaneously, horticultural marketing ensures the availability of produce at a reasonable price to consumers. India is one among the many important fruits and vegetables producing countries of the world. It ranks second next to China in the production of horticultural crops. It is the world largest producer of mangoes and occupies second place among the banana and onion producing countries of the world. Horticulture is now regarded as the largest sub-sector of agriculture producing high quality traditional and exotic fruits and vegetables. Employment opportunities offered by this sector are plenty to the farm population engaged in production, transportation, processing and marketing operations in addition to the entrepreneurs seeking self-employment. Keeping in view of its importance much emphasis has been given to promote value chain management in this sector besides augmenting the production of horticultural crops. So, the farmers are to be provided enough incentive in terms of remunerative prices, efficient marketing system and with least wastage in the transaction process along the supply chain.

In order to provide impetus to this sector, the Government of India has taken several initiatives and the Mission for Integrated Development of Horticulture (MIDH) is the prominent one and is being implemented now by adopting an end to end approach for increasing production of horticulture crops (fruits, vegetables, root and tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and bamboo) and reducing post-harvest losses. This scheme is a Centrally Sponsored Scheme and is a part of the umbrella scheme 'Green Revolution Krishonnati Yojana' in agriculture Sector for the holistic growth of the horticulture sector. Under this scheme, the Government of India contributes 60 per cent of total outlay for developmental programmes in all the States except states in North East and Himalayas and remaining 40 per cent share is contributed by the respective State Governments. In the case of North Eastern States and Himalayan States, Government of India contributes 90 per cent. The interventions under MIDH have a blend of technological adaptation supported with fiscal incentives for attracting farmers as well as entrepreneurs involved in the horticulture sector. This MIDH subsumes six ongoing schemes of the Department of Agriculture and Cooperation on horticulture development viz: three Centrally Sponsored Schemes of NHM, Horticulture Mission for North East & Himalayan States (HMNEH), National Bamboo Mission (NBM), and three Central Sector Schemes viz. National Horticulture Board (NHB), Coconut Development Board (CDB) and the Central Institute for Horticulture (CIH), Nagaland. With the successful

implementation of schemes in Horticulture sector, the horticulture production has crossed food grains production for the past few years even when the country faced back-to-back droughts in 2014 and 2015. As on today, the country has registered as the second largest producer of fruits and vegetables in the world, next to China. Of the fruits, the country is the largest producer of mango, banana, coconut, cashew, papaya, and pomegranate, and also, the largest exporter of spices. At present, the country ranks the first in productivity of grapes, banana, cassava, peas, papaya etc. In terms of area coverage, the area under the horticulture crops in the country has increased significantly from 16.59 m. ha. in 2001-02 to 25.43 m. ha. in 2017-18, at a CAGR of 2.73 per cent (Table 3). As of the overall production, during the same period, it rose from 145.79 m. tonnes to 311.71 m. tonnes at a growth rate of 5.22 per cent, significant at one per cent level. This signifies that the productivity of horticulture crops has increased significantly at a CAGR of 2.42 per cent during the above reference period. This also illustrates that the horticulture sector in India has received considerable attention in recent years, as it has been recognized as a potentially important source of growth, employment generation and foreign exchange earnings. The priority areas like Research and Development (R&D), post-harvest management, processing, promotion of value chain concept etc., has received special attention towards the promotion of horticultural exports from the country through establishment of focal Agricultural Export Zones (AEZs). With these developmental priorities in the sector, the horticulture has moved from rural confines to commercial production and this scenario also encouraged the private sector investments both in production and marketing systems management. The recent technological infusions like micro-irrigation, precision farming, green house cultivation, and improved post-harvest management impacting the horticulture development in the country. Though India's horticulture output has been growing steadily for the last few years, it is much less than that of China. That apart, the processing of horticulture produce is low in India as compared to China. A recent study by YES Bank revealed that India has only two per cent of the horticulture production in temperature-controlled conditions, while in China the corresponding figure is 15 per cent. In Europe and North America, it is 85 per cent. Cold storage facilities are available for just around 10 per cent of horticulture production in the country and 30-40 per cent of the annual production is wasted before consumption. China could process around 30 per cent of the total fruits and vegetables production, while in India it is far less (only 1-2%). Keeping these understandings in mind, the present study is aimed to analyze the value chain management of horticulture produce in India, as it ensures appropriate production practices, quality output, careful harvesting, and proper packaging, storage, and transport and these finally contribute to good produce quality. Post-harvest management enhances value through the application of cost-efficient and environmentally sound post-harvest techniques, to reduce losses and increase efficiency.

Domestic Scenario of Horticulture in India with special reference to Fruits cultivation:

India's diverse climate ensures availability of all varieties of fresh fruits and vegetables. It ranks second in fruits and vegetables production in the world, after China. India produces nearly 15 and 11 per cent of the world's fruits and vegetables, respectively. As per National Horticulture Database, India produced 97.36 m. tonnes of fruits from 6.51 m. ha. and 184.39 m. tonnes of vegetables from 10.26 m. ha. during 2017-18. Maharashtra occupies around 12

per cent of total fruits area and Uttar Pradesh around 14 per cent of area under vegetables cultivation during 2017-18. Andhra Pradesh contributes around 16 per cent and Uttar Pradesh contributes around 15 per cent in Indian fruits and vegetables productions respectively. India is the largest producer of mango, banana, papaya and guava. Amongst vegetables, India is the largest producer of ginger and okra and ranks second in production of potato, onion, cauliflower, brinjal, cabbage, etc. Total area under horticultural crops has increased from 16.59 m. ha of 2001-02 to 25.43 m. ha in the year 2017-18 at a CAGR of 2.73 per cent, significant at one per cent level (Table 3). Similarly, total horticultural production increased to 311.71 m. tonnes from 145.79 m. tonnes during the same reference period, and this showed significant growth rate of 5.22 per cent. But in the year 2002-03, total horticultural area decreased from 16.59 m. ha of the year 2001-02 to 16.27 m. ha.. Total area under horticultural crops, which was 19.21 m. ha. in 2003-04 decreased to 18.45 m. ha. in the year 2004-05, while overall production showed slight downfall only once in the year 2002-03 ie., from 145.79 m. tonnes of the year 2001-02 to 144.38 m. tonnes (2002-03). Fruits, vegetables and plantation crops are the major component of horticultural production. Besides these, spices, flowers, aromatic and medicinal plants are also important. Data shows that vegetables ranks first in terms of both area and production among all horticultural crops from the year 2001-02 to 2017-18; while the fruits are positioned on the second. Plantation crops ranks third in production terms, while spices ranked third in terms of area as on 2017-18. Thus, during the last one and a half decade, the production of total horticulture crops became doubled, which shows great potential in terms of income and foreign exchange earnings. It is further heartening that the trends in CAGR (%) of area, production and productivity of total horticulture crops in India (Table 4) during selected sub-periods since 1991-92 revealed positive and significant growth rates.

Area of fruits was 4.01 m. ha. (2001-02) which increased to 6.51 m. ha. in the year 2017-18 at a CAGR of 3.08 per cent significant at one per cent level. Vegetables showed a prominent growth and the area under vegetables increased to 10.26 m. ha. in 2017-18 from 6.16 m. ha. in 2001-02 at an annual growth rate of 3.61 per cent (significant at 1% level). Area of flowers, aromatic and medicinal plants rose heavily by nearly ten times during the study period from 0.11 m. ha. (2001-02) to 1.04 m. ha. in 2017-18 (at a CAGR of 16.21%). Area under plantation crops and spices showed modest increase from 2.98 m. ha. in 2001-02 to 3.74 m. ha. in 2017-18 (at a CAGR of 1.44%, significant at 1% level) and from 3.22 m. ha. in 2001-02 to 3.88 m. ha. in 2017-18 (at a CAGR of 0.65%, but non-significant) respectively.

There is a tremendous growth in the production statistics of horticulture crops in India from 2001-02. Production of fruits has increased from 43.00 m. tonnes to 97.36 m. tonnes in 2017-18, which is a double increase (at a significant CAGR of 5.41%). Similarly, production of vegetables has followed the same trend. Production of vegetables has increased from 88.62 m. tonnes to 184.39 m. tonnes in the study period from 2001-02 to 2017-18. The CAGR of vegetables production is significant at 5.18 per cent. Flowers, aromatic and medicinal plants production rose 6.75 times, as it was only 0.54 m. tonnes in 2001-02 and become 3.65 m. tonnes in 2017-18 at an annual CAGR of 13.67 per cent significant at one per cent level. Production of plantation crops increased from 9.70 m. tonnes to 18.08 m. tonnes (ie., by nearly two times) in the study period at a CAGR of 4.08 per cent. Spices showed a growth CAGR of 4.87 per cent in production between

the years 2001-02 to 2017-18 in spite of marginal increase in area. These trends imply that the Green revolution of the 1960s and 1970s ended chronic food deficits and while cereals still command the attention of policy makers, fruit production has surged impressively, making India the second largest global producer behind China. Annual growth in horticulture has seen fruit production grow faster than vegetables though the latter constitute the largest segment of this sector of agriculture. This stellar performance of fruits has attracted attention of the researchers to analyze the production and export performance of fresh fruits from India in general and with special reference to value chain of grapes in Maharashtra state, as it the leading commodity in the basket of fresh fruits exported from Maharashtra.

Major horticulture produce grown in India: The top two leading horticulture producing states in India are Uttar Pradesh with 39.25 m. tonnes accounting for 13 per cent of total horticulture production followed by West Bengal with 32.42 m. tonnes accounting for 10 per cent of total horticulture production (Figure 2.1). As may be seen in the Figure 2.2, the total production of fruits is highest in case of Andhra Pradesh (15.22 m. tonnes, accounting for 16% of total fruits production) followed by Maharashtra with 11.73 m. tonnes accounting for 12 per cent of total fruits production. For this period, the total vegetable production was highest in case of Uttar Pradesh with 283.16 m. tonnes accounting for 15.4 per cent of total vegetables production followed by followed by West Bengal with 276.95 m. tonnes accounting for 15 per cent of total vegetables production (Figure 3). Apart from nutritional benefits, the production of vegetables improves the economy of a country as these are very good source of income and employment. The contribution of vegetables remains highest (59–61%) in horticulture crop productions over the last five years (Figure 4). During 2017-18, the area under vegetables was 10.26 m. ha. with a production of 184.39 m. tonnes in India. Good potentialities exist for cultivation of flowering plants. Increasing trends in area and production of flowers has been observed since 2003-04 onwards. In addition to the beautification of the local landscape, great scope exists for export of flowers; and floriculture is important for bee-keeping industry which too provides an alternate source of income to the Indian farmers. The major fruits grown in India (Table 5) are mango (34.71% of total area under fruits), citrus (15.42%) and banana (13.59%). Other grown fruits are apple, guava, pomegranate, jackfruit, papaya, grapes, walnut, pineapple, sapota and others. Amongst fruits, the banana ranks first in production (31.64%) followed by mango (22.41%) and citrus (12.89%).

Table 3: All India Area, Production and Productivity Growth Rates under Horticulture Crops (1991-92 to 2017-18)

(Area: m.ha, Production: m.tonnes, Productivity: Tonnes/ha)

Year	Fruits			Vegetables			Flowers, Aromatic & Medicinal			Plantation Crops			Spices			Total		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
2001-02	4.01	43.00	10.72	6.16	88.62	14.40	0.11	0.54	5.05	2.98	9.70	3.25	3.22	3.77	1.17	16.59	145.79	8.79
2002-03	3.79	45.20	11.93	6.09	84.82	13.92	0.07	0.74	10.50	2.98	9.70	3.25	3.22	3.77	1.17	16.27	144.38	8.87
2003-04	4.66	45.94	9.86	6.08	88.33	14.52	0.10	0.58	5.74	3.10	13.16	4.24	5.16	5.11	0.99	19.21	153.30	7.98
2004-05	5.16	50.99	9.89	6.74	101.25	15.01	0.25	0.82	3.29	3.15	9.84	3.13	3.15	4.00	1.27	18.45	166.94	9.05
2005-06	5.32	55.36	10.40	7.21	111.40	15.44	0.39	0.86	2.19	3.28	11.26	3.43	2.37	3.71	1.57	18.71	182.82	9.77
2006-07	5.55	59.56	10.72	7.58	114.99	15.17	0.47	1.06	2.26	3.21	12.01	3.74	2.45	3.95	1.61	19.39	191.81	9.89
2007-08	5.86	65.59	11.20	7.85	128.45	16.37	0.56	1.26	2.25	3.19	11.30	3.54	2.62	4.36	1.66	20.21	211.24	10.45
2008-09	6.10	68.47	11.22	7.98	129.08	16.17	0.60	1.42	2.37	3.22	11.34	3.52	2.63	4.15	1.58	20.66	214.72	10.39
2009-10	6.33	71.52	11.30	7.99	133.74	16.75	0.69	1.59	2.30	3.27	11.93	3.65	2.46	4.02	1.63	20.88	223.09	10.69
2010-11	6.38	74.88	11.73	8.50	146.55	17.25	0.70	1.64	2.33	3.31	12.01	3.63	2.94	5.35	1.82	21.83	240.53	11.02
2011-12	6.71	76.42	11.40	8.99	156.33	17.39	0.76	2.22	2.92	3.58	16.36	4.57	3.21	5.95	1.85	23.24	257.28	11.07
2012-13	6.98	81.29	11.64	9.21	162.19	17.62	0.79	2.65	3.35	3.64	16.99	4.66	3.08	5.74	1.87	23.69	268.85	11.35
2013-14	7.22	88.98	12.33	9.40	162.90	17.34	0.75	3.19	4.27	3.68	16.30	4.44	3.16	5.91	1.87	24.20	277.35	11.46
2014-15	6.11	86.60	14.17	9.54	169.48	17.76	0.91	3.14	3.46	3.53	15.58	4.41	3.32	6.11	1.84	23.41	280.99	12.00
2015-16	6.30	90.18	14.31	10.11	169.06	16.73	0.91	3.21	3.52	3.68	16.66	4.53	3.47	6.99	2.01	24.47	286.19	11.69
2016-17	6.37	92.92	14.58	10.24	178.17	17.40	0.97	3.36	3.47	3.60	17.97	4.99	3.67	8.12	2.21	24.85	300.64	12.10
2017-18	6.51	97.36	14.96	10.26	184.39	17.97	1.04	3.65	3.49	3.74	18.08	4.83	3.88	8.12	2.09	25.43	311.71	12.25
CAGR (%)	3.08**	5.41**	2.26**	3.61**	5.18**	1.51**	16.21**	13.67**	-2.19NS	1.44**	4.08**	2.61**	0.65NS	4.87**	4.18**	2.73**	5.22**	2.42**

Note: ** - Significant at 1% level, NS - Non-Significant

Raw Data Source: Horticultural Statistics at a Glance 2018, Ministry of Agriculture & Farmers' Welfare, Government of India

Table 4: Trends in CAGR (%) of Area, Production and Productivity of Horticulture Crops in India

Item	1991-92 to 1995-96	1996-97 to 2001-02	2001-02 to 2005-06	2006-07 to 2010-11	2011-12 to 2017-18
Area	1.37**	1.74**	2.41**	2.36**	1.35**
Production	5.37**	3.48**	4.63**	4.63**	3.01**
Productivity	4.17**	1.74**	2.18**	2.13**	1.62**

Note: ** - Significant at 1% level

Raw Data Source: Horticultural Statistics at a Glance 2018, Ministry of Agriculture & Farmers' Welfare, Government of India

Table 5: Area and Production of major fruits in India (2017-18)

Fruits	Area ('000 ha)	% Share to Total	Rank	Production ('000 M.T.)	% Share to Total	Rank
Apple	301	4.63	4	2327	2.39	8
Banana	884	13.59	3	30808	31.64	1
Citrus	1003	15.42	2	12546	12.89	3
Grapes	139	2.14	9	2920	3.00	6
Guava	265	4.07	5	4054	4.16	5
Jackfruit	185	2.84	7	1830	1.88	9
Mango	2258	34.71	1	21822	22.41	2
Papaya	138	2.12	8	5989	6.15	4
Pineapple	103	1.58	11	1706	1.75	10
Pomegranate	234	3.60	6	2845	2.92	7
Sapota	97	1.49	12	1176	1.21	11
Walnut	109	1.68	10	300	0.31	12
Others	790	12.14	-	9035	9.28	-
Total	6506	100.00		97358	100.00	

Raw Data Source: www.indiastat.com

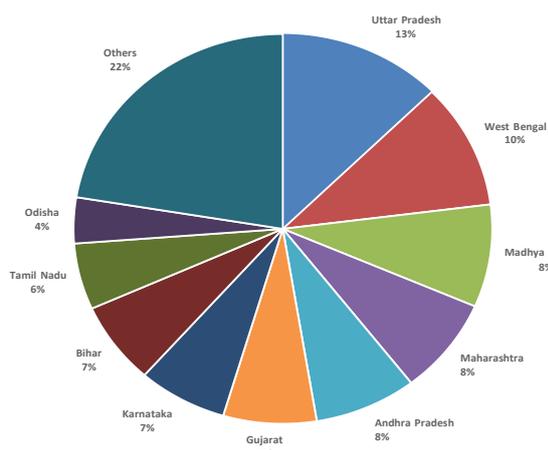


Fig. 2.1: Major Horticulture Producing States in India (2017-18)

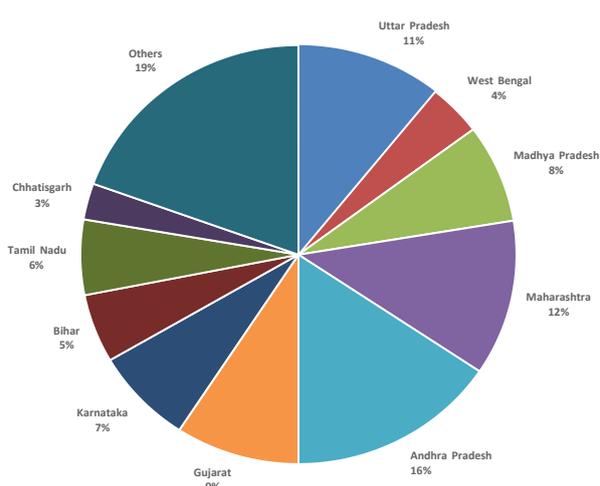


Fig. 2.2: Major Fruit Producing States in India (2017-18)

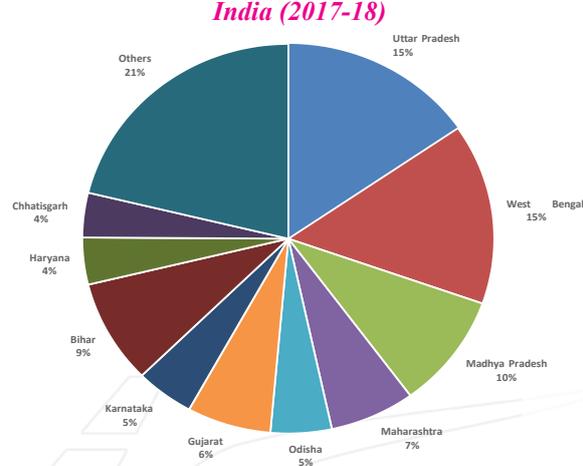


Fig. 3: Major Vegetables Producing States in India (2017-18)

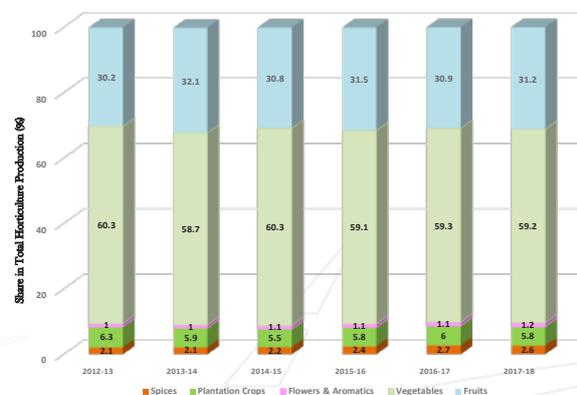


Fig. 4: Trends in Production Share of various Horticulture crops in India

Table 6 shows the year-to-year per cent variation in the area, production and productivity of fruits, vegetables and total horticulture during 2001-02 to 2017-18. It was found that per cent increase in total horticulture area was highest in the year 2003-04, which is about 18.06 per cent compared to the previous year, while production variation was highest in 2007-08 by about 10.13 per cent compared to its previous year. Highest productivity increase was in the year 2004-05, which was 13.41 per cent compared to its previous year. The area under total horticulture showed greatest decline in the year 2004-05 by -3.97 per cent, productivity in 2003-04 by 10.03 per cent compared to their respective previous years. However, production of total horticulture recorded positive variations year by year except a marginal decline during 0.96 per cent during 2002-03.

Coinciding with area increase under total horticulture, the area under fruits also showed highest positive variation in 2003-04 by 23.04 per cent compared to its previous year. While production and productivity variations are highest in 2004-05 (10.98%) and 2014-15 (14.92%) respectively. The area and production of vegetables showed highest positive variations by 10.88 and 14.62 per cents respectively during 2004-05, while productivity recorded maximum rise during 2007-08 by 7.91 per cent compared to its previous year. It is interesting that the year-to-year per cent variations in area, production and productivity of fruits are comparatively higher than vegetables for majority of the years during the reference period.

Table 7 share of output value of horticulture crops in agriculture. The share of fruits and vegetables is very high, and it increased from 24.5 per cent in 2008-09 to 25.9 per cent in 2015-16. The shares of condiments, spices and floriculture in terms of value of output in agriculture also found increasing during the above reference period. Accordingly, the share of share of output value of total horticulture crops in agriculture was increased from 31.1 per cent to 33.3 per cent during the above reference period. However, the proportion of output of total fruits and vegetables in total horticulture was found declining over a period of time (Table 8). That is, in 2008-09, total fruits and vegetables production contributed 92.2 per cent share in total horticulture and the same was declined to 90.4 per cent in 2017-18. The production shares of flowers, aromatics, plantations and spices in total horticulture showed increasing trend during the above reference period. Though the shares of total fruits and vegetables production in total horticulture production is found declining, the horticulture sector in terms of contributing value of output in agriculture is found increasing and is contributing around 30 per cent during the reference period (2008-09 to 2015-16) and especially by fruits and vegetables which are the considered the backbone of horticulture. So, there is a vast scope for this sector. Further, the horticulture sector is progressing at a faster pace compared to total food grains in terms of area, production and productivity (Table 9). India witnessed the shift in area from food grain towards horticulture crops over last five years (from 2012-13 to 2017-18). The production of Horticulture crops has outpaced the production of food grains since 2012-13 (Figure 5).

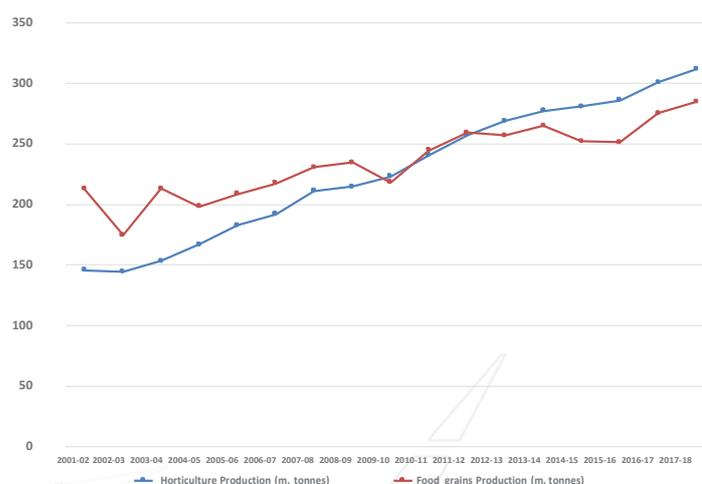


Fig. 5: Trends in Horticulture vis-à-vis Food grains Production in India

Table 6: Annual Area, Production and Productivity Variations (%) under Fruits, Vegetables and Total Horticultural Crops in India (2001-02 to 2017-18)

(Area: m.ha, Production: m.tonnes, Productivity: Tonnes/ha)

Year	Fruits				Vegetables				Total Horticulture							
	A	%	P	%	Y	%	A	%	P	%	Y	%	P	%	Y	%
2001-02	4.01		43.00		10.72		6.16		88.62		14.40		16.59		145.79	
2002-03	3.79	-5.54	45.20	5.12	11.93	11.29	6.09	-1.04	84.82	-4.30	13.92	-3.33	16.27	-1.94	144.38	-0.96
2003-04	4.66	23.05	45.94	1.63	9.86	-17.35	6.08	-0.16	88.33	4.15	14.52	4.31	19.21	18.06	153.30	6.18
2004-05	5.16	10.60	50.99	10.98	9.89	0.30	6.74	10.88	101.25	14.62	15.01	3.37	18.45	-3.97	166.94	8.90
2005-06	5.32	3.28	55.36	8.57	10.40	5.16	7.21	6.95	111.40	10.03	15.44	2.86	18.71	1.42	182.82	9.51
2006-07	5.55	4.32	59.56	7.60	10.72	3.08	7.58	5.10	114.99	3.23	15.17	-1.75	19.39	3.65	191.81	4.92
2007-08	5.86	5.46	65.59	10.11	11.20	4.48	7.85	3.52	128.45	11.70	16.37	7.91	20.21	4.22	211.24	10.13
2008-09	6.10	4.17	68.47	4.39	11.22	0.18	7.98	1.69	129.08	0.49	16.17	-1.22	20.66	2.25	214.72	1.65
2009-10	6.33	3.74	71.52	4.45	11.30	0.71	7.99	0.05	133.74	3.61	16.75	3.59	20.88	1.04	223.09	3.90
2010-11	6.38	0.85	74.88	4.70	11.73	3.81	8.50	6.39	146.55	9.58	17.25	2.99	21.83	4.55	240.53	7.82
2011-12	6.71	5.04	76.42	2.06	11.40	-2.81	8.99	5.82	156.33	6.67	17.39	0.81	23.24	6.50	257.28	6.96
2012-13	6.98	4.13	81.29	6.36	11.64	2.11	9.21	2.40	162.19	3.75	17.62	1.32	23.69	1.94	268.85	4.50
2013-14	7.22	3.35	88.98	9.46	12.33	5.93	9.40	2.07	162.90	0.44	17.34	-1.59	24.20	2.13	277.35	3.16
2014-15	6.11	-15.33	86.60	-2.67	14.17	14.92	9.54	1.55	169.48	4.04	17.76	2.42	23.41	-3.26	280.99	1.31
2015-16	6.30	3.13	90.18	4.14	14.31	0.99	10.11	5.91	169.06	-0.24	16.73	-5.80	24.47	4.54	286.19	1.85
2016-17	6.37	1.14	92.92	3.03	14.58	1.89	10.24	1.31	178.17	5.39	17.40	4.00	24.85	1.55	300.64	5.05
2017-18	6.51	2.09	97.36	4.78	14.96	2.61	10.26	0.21	184.39	3.49	17.97	3.28	25.43	2.33	311.71	3.68

Note: % - Per cent variation over previous year

Raw Data Source: Horticultural Statistics at a Glance 2018, Ministry of Agriculture & Farmers' Welfare, Government of India

Table 7: Percentage Share Value of Output of Horticulture in Agriculture at All-India level (at constant prices)

Item	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Total Fruits and Vegetables	24.5	24.5	22.4	22.3	23.3	23.3	24.8	25.9
Total Condiments & Spices	2.9	3.2	3.2	3.2	3.1	3.3	3.6	3.5
Total Floriculture	1.3	1.4	1.4	1.5	1.4	1.4	1.4	1.6
Total Plantation Crops	2.3	2.5	2.4	2.2	2.2	2.1	2.2	2.3
Total Horticulture	31.1	31.7	29.5	29.2	30.0	30.1	32.0	33.3

Source: Horticultural Statistics at a Glance – Various Issues, Ministry of Agriculture & Farmers’ Welfare, Government of India

Table 8: Trends in Percentage Share of Production of various Horticulture Crops in Total Horticulture at All-India level (2009-10 to 2017-18)

Crops	% Share in Total Horticulture Production								
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Fruits	32.2	31.1	29.7	30.2	32.1	30.8	31.5	30.9	31.2
Vegetables	60	61	60.8	60.3	58.7	60.3	59.1	59.3	59.2
Flowers & Aromatics	0.7	0.7	0.9	1.0	1.2	1.1	1.1	1.1	1.2
Plantation Crops	5.3	5.0	6.4	6.3	5.9	5.5	5.8	6	5.8
Spices	1.8	2.2	2.3	2.1	2.1	2.2	2.4	2.7	2.6
Total Horticulture	100	100	100	100	100	100	100	100	100

Source: Horticultural Statistics at a Glance-Variou Issues, Ministry of Agriculture & Farmers’ Welfare, Government of India

Table 9: CAGR (%) of All-India Area, Production and Productivity of Horticulture crops vis-à-vis Food grains

Years	Total Horticulture			Total Food Grains		
	Area (m. ha)	Production (m. tonnes)	Productivity (t/ha)	Area (m. ha)	Production (m. tonnes)	Productivity (t/ha)
2001-02	16.59	145.79	8.79	122.78	212.85	17.34
2002-03	16.27	144.38	8.87	113.86	174.77	15.35
2003-04	19.21	153.30	7.98	123.45	213.19	17.27
2004-05	18.45	166.94	9.05	120.08	198.36	16.52
2005-06	18.71	182.82	9.77	121.60	208.6	17.15
2006-07	19.39	191.81	9.89	123.71	217.28	17.56
2007-08	20.21	211.24	10.45	124.07	230.78	18.60
2008-09	20.66	214.72	10.39	122.83	234.47	19.09
2009-10	20.88	223.09	10.69	121.33	218.11	17.98
2010-11	21.83	240.53	11.02	126.67	244.49	19.30
2011-12	23.24	257.28	11.07	124.75	259.29	20.78

2012-13	23.69	268.85	11.35	120.78	257.13	21.29
2013-14	24.20	277.35	11.46	125.05	265.05	21.20
2014-15	23.41	280.99	12.00	124.30	252.03	20.28
2015-16	24.47	286.19	11.69	123.22	251.54	20.41
2016-17	24.85	300.64	12.10	129.23	275.11	21.29
2017-18	25.43	311.71	12.25	127.56	284.83	22.33
CAGR (%)	2.73**	5.22**	2.42**	0.35**	2.34**	1.98**

Note: ** - Significant at 1% level

Raw Data Source: Horticultural Statistics at a Glance – Various Issues, Ministry of Agriculture & Farmers’ Welfare, Government of India;

Agricultural Statistics at a Glance – Various Issues, Ministry of Agriculture & Farmers’ Welfare, Government of India

Exports scenario of fruits and vegetables from India: India’s diverse climate ensures availability of all varieties of fresh fruits and vegetables. As mentioned earlier, India ranks second in fruits and vegetables production in the world, after China. India produces nearly 9 and 8 per cents of the world’s fruits and vegetables respectively in 2018. As per Ministry of Agriculture & Farmers’ Welfare, Government of India, India produced 97.36 m. tonnes of fruits from 6.51 m. ha. and 184.39 m. tonnes of vegetables from 10.26 m. ha. during 2017-18. This vast production base offers tremendous opportunities for export of both fresh and processed fruits and vegetables from India. Accordingly, the CAGRs of exports of both fresh and processed fruits and vegetables gained significant momentum during the selected reference period (Table 10). Further, it was observed that the export of fruits in both the categories viz. fresh and processed reported significant annual growth of 5.75 and 4.77 per cents respectively by quantity and 16.85 and 11.02 per cents respectively during the last decade (2009-10 to 2018-19). Similarly, export of vegetables in both the categories viz. fresh and processed reported significant annual growth of 8.63 and 12.63 per cents respectively by value. In terms of quantity, the export of fresh vegetables recorded positive significant growth rate (4.71%), unlike processed vegetables that showed significant declining growth rate by 3.91 per cent during the same reference period. These trends show that there is a good scope for export of fresh as well as processed fruits and vegetables from India. It also indicates that still fresh fruits are moving at a faster rate as compared to processed fruits. In case of vegetables, though the export of processed vegetables in terms of quantity registered significant decline, but by value, both the categories ie., fresh and processed vegetables reported significant positive growth rates. This might be due to rise in prices of vegetables and also due to rise in value of US dollar during the reference period. So, these findings indicate that export of fruits has performed well, but in case of vegetables especially processed vegetables, more efforts are needed in a more comprehensive manner along with appropriate Government policy measures to improve their quantum of exports in the future. Though India’s share in the global market is still nearly one per cent only, there is increasing acceptance of horticulture produce from the country. This has occurred due to concurrent developments in the areas of state-of-the-art cold chain infrastructure and quality assurance measures. Apart from large investment pumped in by the private sector, public sector has also taken initiatives and with The Agricultural and Processed Food Products Export Development Authority’s (APEDA) assistance several Centres

for perishable cargoes and integrated post-harvest handling facilities have been set up in the country. Capacity building initiatives at the farmers, processors and exporters' levels has also contributed towards this effort. The major destinations for Indian fruits and vegetables are Bangladesh, UAE, Netherland, Nepal, Malaysia, UK, Sri Lanka, Oman and Qatar.

The data portrayed through Table 10 shows that during the year 2018-19, India exported 4.47 m. tonnes of fruits and vegetables worth of Rs. 17147 crore in various forms viz., fresh fruits (0.74 m. tonnes worth of Rs. 5304 crore), fresh vegetables (2.92 m. tonnes worth of Rs. 5312 crore), processed fruits and juices (0.59 m. tonnes worth of Rs. 4477 crore) and processed vegetables (0.23 m. tonnes worth of Rs. 2055 crore). Looking at per cent shares of fresh fruits and vegetables exports (quantity) in their respective productions, the shares are found negligible for both the categories. However, the proportionate share is higher for fresh vegetables compared to fresh fruits. Even for processed fruits and vegetables products, the shares of exports in their respective productions are again less than one per cent.

India export agricultural products to various countries worth Rs. 2.51 lakh crore during the year 2017-18. Amongst all agricultural products, marine products ranked first with export of Rs. 47646 crore contributing 18.94 per cent in total agricultural exports of India. It was followed by basmati rice (10.68%), buffalo meat (10.35%), non-basmati rice (9.32%) and so on (Table 11). Fresh vegetables and fresh fruits exports occupied 10th and 12th positions in the export market of agri-products from India.

Product-wise exports of major fruits in India: India is also a major exporter of fruits to the world. The vast production base offers India tremendous opportunities for export. During 2015-16, India exported fruits and vegetables worth Rs. 8,391.41 crores which comprised of fresh fruits worth Rs. 3,524.50 crores. Mangoes, grapes, pomegranates, banana, walnut, citrus, grape, and sapota accounts for larger portion of fruits exported from the country. Fruit have a great demand in the international market. Therefore, they are one of the potential earners of foreign exchange. The total fruits (fresh & processed) export in terms of value was Rs. 7221 crore during the year 2015-16. The product-wise exports' shares of major fruits during the year 2015-16 (Table 12) shows that mango ranked first with Rs 1961.93 crore accounting for 27.17 per cent in the total export of fruits from India followed by grapes (21.35%). These two fruits i.e. mango and grape together contribute about half of the total fruits export. These two are followed by pomegranate and banana with meagre contributions of 5.76 and 4.93 per cents respectively.

Table 10: Growth (%) in Exports of Fruits and Vegetables from India (Quantity: m. tonnes, Value: Rs. Crore)

Years	Fresh Fruits		Fresh Vegetables		Processed Fruits & Juices		Processed Vegetables		Share of Fresh Fruits	Share of Vegetables	Share of Processed	Share of Processed
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Exports (in terms of quantity) in Total Fruits Production	Fruits Exports (in terms of quantity) in Total Vegetables Production	Fruits & Juices Exports (in terms of quantity) in Total Fruits Production	Vegetables Exports (in terms of quantity) in Total Vegetables Production
2009-2010	0.476	1524.21	2.032	3014.32	0.410	1904.18	0.299	743.01	0.67	1.57	0.57	0.22
2010-2011	0.447	1355.19	1.660	2620.48	0.370	1859.96	0.258	747.92	0.60	1.24	0.49	0.18
2011-2012	0.488	1937.22	2.040	3023.31	0.425	2277.04	0.323	1043.72	0.64	1.39	0.56	0.21
2012-2013	0.535	2686.57	2.344	3407.19	0.417	2577.32	0.307	1102.56	0.66	1.50	0.51	0.19
2013-2014	0.525	3645.45	2.292	5384.47	0.462	3331.88	0.275	1288.77	0.59	1.41	0.52	0.17
2014-2015	0.484	3148.07	2.019	4611.64	0.471	3624.41	0.315	1725.34	0.54	1.24	0.54	0.19
2015-2016	0.573	3918.41	1.872	4762.62	0.450	3759.38	0.269	1695.82	0.64	1.12	0.50	0.16
2016-2017	0.799	4966.63	3.632	5718.69	0.533	3904.98	0.194	1773.56	0.86	2.15	0.57	0.11
2017-2018	0.657	4746.31	2.296	4997.49	0.571	4164.78	0.212	1823.25	0.67	1.25	0.59	0.12
2018-2019	0.737	5304.05	2.915	5311.73	0.590	4476.52	0.229	2054.9	0.76	1.56	0.61	0.12
CAGR (%)	5.75**	16.85**	4.71*	8.63**	4.77**	11.02**	-3.91*	12.63**				

Note: ** - Significant at 1% level; * - Significant at 5% level Raw Data Source: www.apeda.com

Table 11: Export of major agricultural products from India (2017-18)

Rank	Product	Value (Rs. Crore)	% Share in Total National Export
1	Marine Products	47646.41	18.94
2	Basmati Rice	26870.67	10.68
3	Buffalo Meat	26035.19	10.35
4	Rice (Other than Basmati)	23437.23	9.32
5	Spices	20084.91	7.98
6	Cotton Raw Including Waste	12200.05	4.85
7	Coffee	6245.36	2.48
8	Cashew	5945.28	2.36
9	Tea	5396.65	2.15
10	Fresh Vegetables	5297.72	2.11
11	Sugar	5225.60	2.08
12	Fresh Fruits	4913.28	1.95

Raw Data Source: Horticultural Statistics at a Glance 2018, Ministry of Agriculture & Farmers' Welfare, Government of India

Table 12: Product-wise export of major fruits from India (2015-16)

Rank	Fruit Crop	Product	Value in Rs. Crore		% share
1	Mango	Fresh/Dried	317.10	1961.93	27.17
		Pulp	796.17		
		Squash	61.02		
		Jams/Jellies/Marmalades	742.82		
		Sliced Dried	44.82		
2	Grape	Fresh	1337.78	1541.95	21.35
		Dried (Raisins)	204.17		
3	Pomegranate	Fresh	-	416.00	5.76
4	Banana	Fresh	-	356.13	4.93
5	Walnut	Fresh	-	117.92	1.63
6	Citrus	Lemons & Limes Fresh/Dried	74.07	86.81	1.20
		Other Citrus Fruit Fresh/Dried	12.74		
7	Melon	Water Melons, Fresh	54.46	80.55	1.12
		Other Melons Fresh	26.09		
8	Papaya	Fresh/Dried	-	56.78	0.79
9	Guava	Guavas Fresh/Dried	7.12	33.32	0.46
		Jams/Jellies/Marmalades	26.20		
10	Sapota	Fresh	-	9.67	0.13
	Others	-	-	2559.94	35.45
Total (Fresh + Processed)				7221.00	100.00

Raw Data Source: www.apeda.com

Horticultural Statistics at a Glance 2018, Ministry of Agriculture & Farmers' Welfare, Government of India

Trade Direction of the fresh fruits from India: The dynamics of changes in the export trade of fresh fruits from India were studied through the estimation of a Markov probability matrix. The probability of retaining the previous period market share (gain or loss) is interpreted by studying the diagonal and off diagonal elements of TPM. The major importing countries taken for the analysis of trade in fresh fruits exports during the period (2009-10 to 2018-19) were UAE, Bangladesh, Nepal, Saudi Arabia, Pakistan, Kuwait, Iran, Oman, Qatar and along with the remaining importing countries grouped under 'others'. That is, there are nine major countries importing fresh fruits in large quantity and rest of countries are pooled under 'others' category. The diagonal elements in the TPM (Table 13) for fresh fruits exports provide the information on the probability of retention of the trade, while row elements indicate the probability of loss in trade on account of competing countries. The column elements indicate the probability of gain in trade from the competing countries. TPM revealed that Bangladesh was found to be the most stable importer of fresh fruits, as it retained its original share of around 45 per cent which was the highest among the importing countries. It lost its remaining share of 55 per cent to UAE, Nepal and Saudi Arabia. That is, Bangladesh was the largest buyer of fresh fruits from India followed by other traditional buyers like UAE, Nepal and Saudi Arabia. UAE was also found to be stable with 29.59 per cent retention of its shares, while losing major share of 70.41 per cent to Bangladesh, Nepal, Saudi Arabia and other countries. Nepal was also found to be stable with 4.18 per cent of retention of its shares, while losing major share of 95.82 per cent to Bangladesh, UAE, Saudi Arabia and other countries. Other countries were also found to be stable with 58.48 per cent of retention of their shares, while losing a share of 41.52 per cent to UAE, Nepal and Bangladesh. Superior quality of produce has made Indian fresh fruits more acceptable across the countries in the international market. The higher exports to Bangladesh, UAE, Nepal and Saudi Arabia and retentions by major countries could be due to high export competitiveness of fresh fruits from India across these countries.

It is also revealed from Table 13 that 'other' countries, Bangladesh and UAE were the stable markets for fresh fruits among the importing countries, as reflected by high retention probabilities of 58.48, 45.18 and 29.59 per cents respectively. This implies the imports of fresh fruits by Bangladesh and UAE from India will show an increasing trend in the future years. Next to these countries, Nepal, Saudi Arabia and Iran are also the major importers of fresh fruits from India, as their retention probabilities are 4.18, 1.76 and 1.16 per cents respectively.

Table 13: TPM of fresh fruits exports from India (2009-10 to 2018-19)

Countries	UAE	Bangladesh	Nepal	Saudi Arabia	Pakistan	Kuwait	Iran	Oman	Qatar	Others
UAE	0.29599	0.41381	0.02505	0.01658	0.00006	0.00219	0.00059	0.00049	0.00070	0.24455
Bangladesh	0.30854	0.45185	0.02578	0.01354	0.00030	0.00214	0.00242	0.00046	0.00061	0.19437
Nepal	0.30512	0.45462	0.04179	0.01529	0.00343	0.00135	0.00046	0.00058	0.00078	0.17659
Saudi Arabia	0.31892	0.22536	0.02983	0.01760	0.01181	0.00109	0.00004	0.00122	0.00133	0.39281
Pakistan	0.24289	0.23314	0.02267	0.01453	0.00598	0.00093	0.00004	0.00125	0.00056	0.47803
Kuwait	0.39001	0.18012	0.06347	0.01957	0.01187	0.00263	0.00066	0.00216	0.00152	0.32798
Iran	0.34388	0.04434	0.10468	0.01951	0.00572	0.00174	0.01164	0.00331	0.00146	0.46373
Oman	0.21924	0.12430	0.10083	0.01169	0.00009	0.00246	0.01066	0.00334	0.00139	0.52601
Qatar	0.20098	0.01368	0.15189	0.01452	0.00015	0.00194	0.00574	0.01177	0.00426	0.59507
Others	0.15225	0.09783	0.13113	0.00985	0.00007	0.00079	0.00325	0.01621	0.00382	0.58481

Raw Data Source: www.fao.org

Chapter-VI

Production and Export Performance of Grapes in India

The agriculture system in India has undergone rapid transformations over the past few decades particularly after the implementation of trade liberalization policies since 1991. As the agriculture is more market oriented now, it is high time to promote and create benefits through national or regional agri-value chains. The emergence of such integrated agriculture and food supply and value chains is one of the most visible market phenomena in India. Especially in horticulture, the emergence of value chains is more striking as increasing concentration on processing, marketing and export is being observed in all the segments of the chain. The traditional way of fruits and vegetables production in the country is being replaced by practices more similar to manufacturing processes, with greater co-ordination across farmers, processors, retailers, exporters and other stakeholders in the value chain (Kumar *et al.* 2011). Such value chains for horticultural produce focussing both on domestic and export markets can be considered as a powerful tool for poverty reduction and to fight against the challenge of nutritional security in India. As there is more potential for value addition in case of fresh fruits and vegetables compared to conventional crops and that too they are highly perishable, the emergence of value chains through strong inter-linkages between production, processing, marketing and distribution will definitely enhance the value of the final products. As export of grapes contribute to significant foreign earnings in the international market (around 21% of total export earnings of fruits in 2015-16), the same has been considered for this in depth study to analyze domestic production scenario, export scenario, mapping different stake holders involved in grape value chain and to explore potential opportunities for strengthening grape value chain in the production belt of the country.

Production Scenario of Grapes: India is among the first ten countries in the world in the production of grapes (Figure 6). This crop occupies sixth position amongst fruit crops in India with a production of 2.92 m. tonnes (around 3% of world's grapes production of 92.62 m. tonnes) from an area of 0.14 m. ha. in 2018. The area under grape is 1.93 per cent of the total area of fruit crops in the country (www. faostat.com) in 2018. The leading (top three) grape producing countries in the world in terms of production are China (13.49 m. tonnes), Italy (8.51 m. tonnes) and USA (6.89 m. tonnes). India's (21.07 t/ha) higher productivity (4th position) in grapes is next to China (35.12 t/ha) Egypt (22.31 t/ha) and Brazil (21.38 t/ha) has made it to reach 7th position in the world as far as production is concerned (Table 14).

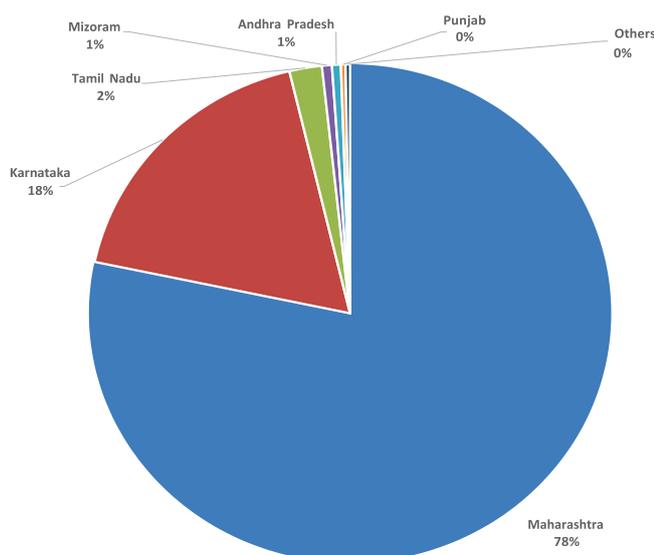


Fig. 6: Leading grape producing countries in the world (2018)

Table 14: Major producing countries of grapes in world (2018)

Country	Production (m. tonnes)	% Share to total production	Rank
China	13.49	14.57	1
Italy	8.51	9.19	2
USA	6.89	7.44	3
Spain	6.67	7.21	4
France	6.20	6.69	5
Turkey	3.93	4.25	6
India	2.92	3.15	7
Argentina	2.57	2.78	8
Chile	2.50	2.70	9
Iran (Islamic Republic of)	2.03	2.19	10
South Africa	1.90	2.05	11
Others	34.99	37.78	
Total	92.62	100.00	

Raw Data Source: www.fao.org

Grape is one of the important fruits of India. In India, during the year 2017-18, area and production was 0.14 m. ha and 2.92 m. tonnes respectively. Area became doubled during the last decade in the country i.e., from 0.068 m. ha in 2008 to 0.139 m. ha in 2018. Similarly, there is sizeable increase in the production from 1.74 m. tonnes to 2.92 m. tonnes during the same reference period (www.faostat.com). Major grape producing states are Maharashtra, Karnataka and Tamil Nadu (Figure 7). Maharashtra was the largest grapes producing state accounting for 78.30 per cent of total country's production followed by Karnataka (17.95%) and Tamil Nadu (2.02%) of total production during 2017-18 (Table 15). Maharashtra and Karnataka together contributed about 96.25 per cent of total national grapes production. Maharashtra again ranked first with 75.95 per cent of total area during 2017-18 followed by Karnataka (19.16%) and Mizoram (1.76%) in the country. However, in productivity Punjab stood first with 28.38 t/ha during 2017-18, followed by Tamil Nadu (27.28 t/ha) and Maharashtra (21.67 t/ha).

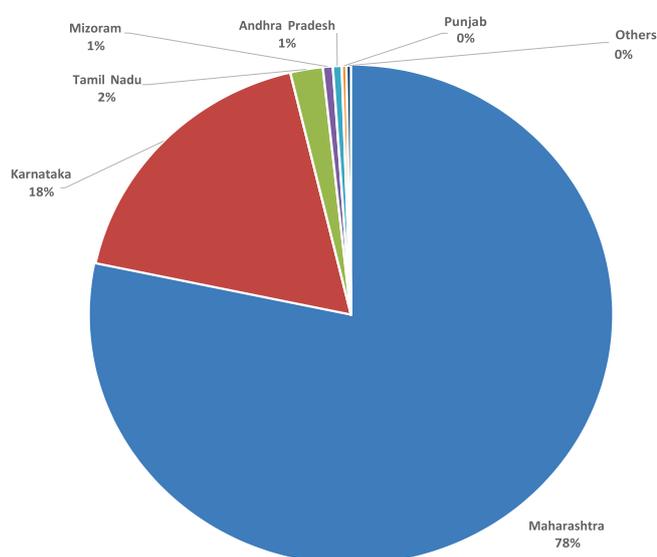


Fig. 7: Leading grape producing States in India (2017-18)

Table 15: Leading grape producing states in India (2017-18)

State	Area ('000 ha)	Production ('000 tonnes)	% share of production to total	Rank in Production	Productivity (t/ha)
Maharashtra	105.50	2286.44	78.30	1	21.67
Karnataka	26.61	524.20	17.95	2	19.70
Tamil Nadu	2.16	58.93	2.02	3	27.28
Mizoram	2.45	18.00	0.62	4	7.35
Andhra Pradesh	0.80	15.92	0.55	5	19.90
Punjab	0.29	8.23	0.28	6	28.38
Madhya Pradesh	0.09	1.28	0.04	7	14.22
Jammu & Kashmir	0.33	0.89	0.03	8	2.70
Haryana	0.04	0.09	0.00	9	2.25
Others	0.64	6.11	0.21		9.55
All-India	138.91	2920.09	100.00		21.02

Raw Data Source: Horticultural Statistics at a Glance 2018, Ministry of Agriculture & Farmers' Welfare, Government of India

Growth dynamics of area, production and productivity: The CAGR in terms of area, production and productivity of grapes are worked out for pre-WTO regime, post-WTO regime and overall reference period. It is interesting that the growth dynamics of grapes has revealed an heartening picture. Area, production and productivity of grapes has registered positive and significant growth rates (at 1% level) during pre-WTO, post- WTO and overall reference periods (except for productivity during post-WTO regime, where the growth rate is non-significant). That is, the increased growth in area (6.69%) under grapes cultivation could compensated the slow growth in productivity (0.003%) and hence, the production recorded positive and significant growth rate (5.81%) during post-WTO regime. Further, the higher productivity levels of grapes in states like Punjab, Tamil Nadu, Maharashtra, Andhra Pradesh and Karnataka are contributing towards positive growth rate. The lower productivity levels in Haryana, Jammu & Kashmir and Mizoram are responsible for decline in growth rate of grapes. The farmers in these states have to face numerous odds from point of view of natural factors like climate and rainfall as well as economic factors like marketing and prices. Due to adversity of these factors, grape growers find difficulties in realizing potential yields of the grape varieties cultivated.

Table 16: CAGRs of Area, Production and Productivity of grapes in India

Period	Area	Production	Productivity
Pre- WTO period (1961-1994)	5.80**	6.42**	0.58**
Post WTO- period (1995-2018)	6.69**	5.81**	0.003NS
Overall Period (1961-2018)	6.59**	7.17**	0.54**

Note: ** - Significant at 1% level; NS – Non-Significant

Raw Data Source: www.fao.org

Export and Import Performance: From the earlier discussion it is evident that, grape exhibited impressive growth rates in terms of area, production and productivity. In addition to this, here an attempt has been made in the following pages to study the major importers of the grapes from India.

The total India's exports of grapes registered at 14504.06 M. tonnes during Triennium Ending (TE) 1992-94 (pre-WTO regime) which increased by multiple folds to 173113.40 M. tonnes during TE 2015-16 to 2017-18 (Table 17). In terms of quantity, the total grape exports from India has increased again considerably by multiple folds from Rs. 32.01 crore to Rs. 1681.31 crore during TE

1992-95 to TE 2015-18. In pre-WTO regime, major grape importing countries from India include UAE (37.53%), UK (24.48%) and Saudi Arabia (12.34%) of the total grape exports in terms of quantity. However, in post-WTO regime, the trade direction was shifted towards Netherlands (31.55%), Russia (11.98%) and UK (9.58%). In pre-WTO regime, 24 countries imported grapes from India and out of this, around 75 per cent of grapes exports from India are concentrated in UAE, UK and Saudi Arabia, whereas in post -WTO regime, the grapes exports from India spread to around 52 countries in the world and exports from India are mainly concentrated (around 54%) in Netherlands, Russia and UK. Market demand and consumer preferences are deciding supply of particular grape types in the market. So, market intelligence has become a very important tool for sustaining grape supply in foreign market. Indian exporters are also eyeing new opportunities in the European market and further explore the possibility of export of grapes to the Russian Federation and Ukraine. Moreover because of free trade agreements with Thailand and Singapore, exports of grapes are likely to accelerate. Hence, India needs to devise a proper marketing strategy and aggressive campaign to nurture these markets. Usually because of extended monsoons with the advent of climate change in India, the grape crop has suffered huge damages to the tune of 30-40 per cent and also affected timely pruning of the crop. Consequently, the export of grapes to Bangladesh, Europe and the Middle East, which begins in November is getting delayed every year. Further, several grape importing countries have become strict on pesticides residue limits on the produce. However, with the spread of the novel coronavirus (COVID-19) and lock downs coming into force across Europe and China, export of Indian grapes has continued unabated. Maharashtra and Karnataka are currently exporting grapes and almost 99 per cent of the exports are from Maharashtra.

Table 17: Country-wise grape exports from India during Pre and Post-WTO regimes

Countries	Pre-WTO regime - TE (1992-95)			Post-WTO regime - TE (2015-18)		
	Export Quantity (M. Tonnes)	% share in total grape exports from India	Export Value (Rs. Crore)	Export Quantity (M.Tonnes)	% share in total grape exports from India	Export Value (Rs. Crore)
Netherlands	249.34	1.72	0.74	54619.28	31.55	615.22
Russia	0.00	0.00	0.00	20740.33	11.98	213.02
UK	3550.45	24.48	10.28	16590.82	9.58	194.64
Germany	33.27	0.23	0.10	10379.75	6.00	116.66
UAE	5443.16	37.53	12.15	13288.17	7.68	108.20
Saudi Arabia	1789.14	12.34	3.73	7426.27	4.29	60.35
Thailand	0.29	0.00	0.00	4232.95	2.45	54.96
Others	3438.41	23.71	5.01	45835.79	26.48	318.25
Total	14504.06	100.00	32.01	173113.40	100.00	1681.31

Raw Data Source: www.fao.org

The CAGRs of exports and imports of grapes both in terms of quantity and value (Table 18) are worked out grapes, so as to its trade prospects in international trade. It is heartening that the exports both in terms of quantity (12.83%) and value (16.46%) had shown positive and significant growth rates during post-WTO regime, 1995-2017. Favourable growing conditions in states like Maharashtra and Karnataka and improved pesticide management by the farmers through better farm practices are believed to be the main reasons for this increase. The exports are found to be more lucrative in European and UK markets. However, the presence of pesticide

residues in the produce has limited the pace of growth of exports of grapes from India. Countries like Russia, Sri Lanka and China have raised plant quarantine issues for importing grapes. As a result, the farmers especially from Maharashtra and Karnataka cannot export the produce and has to transact in the domestic market at a very low price. Even in the States of Maharashtra and Karnataka, the residues of pp-DDE, an isomer of DDT were detected in soil samples which were already banned. The presence of banned pesticide residues in soil samples is a matter of concern for future food chain accumulation and human health also. It was also found that farmers with low education levels used highly toxic pesticides. In 2013, the State Government of Maharashtra has entered into an agreement with Bangalore-based Non-Government Organization, 'International Competence Centre for Organic Agriculture (ICCOA)', engaged in advocating and popularizing organic agriculture' to grow organic grapes. This is the first of its kind project undertaken by any government in the country. This attempt is made to produce organic wine, for which there is a huge demand in the western countries. By doing so, the farmers will not only get higher returns for their produce, but will also familiarize themselves with the idea of growing their produce organically and no rejections from the importing countries on the issue of higher pesticide residues in the produce. It was also found that, organic home grapes are very sweet, unlike when sprayed with pesticides. To realize the true export potential of grapes from India, the complete package of practices including selection of variety and compatible rootstock, vineyard establishment including training systems, variety specific canopy architecture for different end uses such as table grapes, raisin making, or for wine making, use of growth regulators, irrigation and nutrient management, diseases and insect and mite pests management through use of environment friendly chemicals, bio-pesticides, botanicals etc., has to be developed and should regularly fine tune to comply with domestic and international standards. Further, production of quality grapes with sustainable yields are possible only with these measures.

Though imports of grapes showed higher growth rates compared to exports both in terms of quantity (46.32%) and value (56.62%), India still enjoys the net exporter status during the same reference period that too at a significant growth rate of 12.59 per cent. India is becoming an important market for imported grapes in the off season, when the domestic grapes become unavailable. California grapes, claimed to be stronger and sweeter and is frequently imported during July to December, even at very high price, as there is more demand in the Indian market. California, renowned as the producer of best quality table grapes, ranks third in world-wide production and the varieties are becoming increasingly popular. Since these grapes are 100 per cent counter-seasonal to Indian produce, three varieties - Red Globe variety (Flame seeded), Fantasy Seedless (black variety) and Autumn Royal (green seedless), have found their way to the Indian markets during the offseason, starting from July to December. Moreover, their imports are set to increase in the future and India is likely to become one of the top 10 markets for fresh California grapes in the ensuing 3-5 years period. However, due to heavy import costs, there are a very few importers in the country. So, the import prices are quite higher. Further, there is huge difference between the wholesale price and the retail price (around Rs. 100 to Rs. 130/kg). The demand for these imported grapes is very high (from hoteliers who use these varieties as dressing on salads) and when a quality produce is offered to a customer, the price matters less. On the contrary, domestic grape producers are sour for different reasons. They feel that there is very little support from the Indian Government, when it comes to promotional activities for the domestic produce during the season. Exporters from Maharashtra, Karnataka, Tamil Nadu and Andhra Pradesh, incidentally the top grape growing states, feel that there has to be special

marketing campaign in overseas markets, especially for the Indian brands. The farmers are even encouraged to cultivate pink-coloured grapes and musky flavoured varieties also apart from the three existing varieties which are Red Globe, Crimson Seedless and Italia.

Table 18: CAGR (%) of Exports and Imports of Grapes from India during post-WTO regime

Year	Exports		Imports		Net Trade (M. Tonnes)
	Quantity (M.Tonnes)	Value ('000 \$)	Quantity (M.Tonnes)	Value ('000 \$)	
1995	22151	16607	29	6	22122
1996	20958	14695	0	0	20958
1997	23680	17421	0	0	23680
1998	11382	8902	0	0	11382
1999	14006	12807	9	15	13997
2000	20646	18468	32	26	20614
2001	14571	13351	244	296	14327
2002	25568	22348	407	356	25161
2003	26470	22271	497	547	25973
2004	35525	24026	1111	1147	34414
2005	53908	48502	1496	1761	52412
2006	85563	66369	1976	2245	83587
2007	96723	76826	2723	4948	94000
2008	118133	84901	2967	6667	115166
2009	117247	89101	2387	5087	114860
2010	129125	102465	2861	6095	126264
2011	75387	77834	3899	8954	71488
2012	114306	131315	3952	9209	110354
2013	148521	194374	4078	9770	144443
2014	136740	223731	3774	9329	132966

*Note: ** - Significant at 1% level Raw Data Source: www.fao.org*

Trade Direction of grapes from India: The dynamics of changes in the export trade of grapes from India were studied through the estimation of a Markov probability matrix. The major importing countries taken for the analysis of trade in grapes exports during the period (2009-10 to 2018-19) were Netherlands, Russia, UK, Germany, UAE, Saudi Arabia, Thailand, Finland, Hong Kong and along with the remaining importing countries grouped under 'others'. The TPM (Table 19) revealed that Netherlands was found to be the most stable importer of grapes, as it retained its original share of around 71 per cent which was the highest among the importing countries. It lost its remaining share of 29 per cent to UK, UAE and others. UK was also found to be stable with 7.88 per cent retention of its shares, while losing major share of 92.12 per cent to Netherlands, UAE, Russia and other countries. UAE was also found to be stable with 3.47 per cent of retention of its shares, while losing major share of 96.53 per cent to Netherlands, Russia and other countries. Superior quality has made Indian grapes more acceptable across the countries in the international market. The higher exports to Netherlands, Russia, UK etc., and retentions by major countries could be due to high export competitiveness of grapes from India across these countries. This implies the imports of grapes from India to these countries will show an increasing trend in the future years.

Table 19: TPM of grapes exports from India (2009-10 to 2018-19)

	Netherlands	Russia	UK	Germany	UAE	Saudi Arabia	Thailand	Finland	Hong Kong	Others
Netherlands	0.709345	0.000475	0.174824	0.002201	0.086308	0.011413	0.000655	0.000039	0.000003	0.014737
Russia	0.671447	0.008415	0.096965	0.000858	0.163510	0.021300	0.003327	0.000025	0.000916	0.033236
UK	0.617817	0.038873	0.078793	0.000657	0.188059	0.033446	0.005971	0.000120	0.000751	0.035514
Germany	0.638555	0.124924	0.108869	0.001061	0.093861	0.017267	0.004328	0.000260	0.001222	0.009654
UAE	0.674777	0.172168	0.088632	0.001860	0.034673	0.016665	0.004466	0.000258	0.000855	0.005647
Saudi Arabia	0.681258	0.096357	0.110069	0.004138	0.084280	0.009157	0.003230	0.000437	0.000823	0.010252
Thailand	0.787684	0.048050	0.096070	0.005531	0.042411	0.009339	0.003070	0.000769	0.000346	0.006730
Finland	0.727890	0.120055	0.044359	0.026354	0.051251	0.012849	0.004892	0.001041	0.001055	0.010254
Hong Kong	0.667467	0.147010	0.067533	0.052852	0.035994	0.017565	0.004968	0.000888	0.000758	0.004966
Others	0.744770	0.130885	0.044164	0.035332	0.023266	0.012082	0.002191	0.000357	0.002326	0.004626

Chapter-VII

Value Chain Analysis (VCA) of Grapes – Case of Mahagrapes in Maharashtra

To understand a firm's competitive advantages, it is necessary to look into all activities executed within the firm i.e., structure, production, sales and services offered. If these activities are analyzed, instead of the firm as a whole, it ensures twin advantages through realizing quality production and cost-effectiveness. The existing value chain of a firm or its product is influenced both by backward and forward linkages i.e., by suppliers and customers respectively. The suppliers (backward) linkage affects downstream (toward the consumers) in a value chain. For example, the quality of the raw material i.e., inputs builds up both the quality and quantity of the final product delivered to the consumers. That is, if the quality of raw material is inferior, it will pass on negative impacts downstream in the system all the way to the consumer. Similarly, the firm has to perceive what the customers actually need from it in the entire value chain. So, these challenges the firm must perceive from time to time and to make it the best fit into the whole system. This is so because, the firm can realize profits, if the final value of the product at the customer is higher than the cost of production and this difference also implies firm's margin in transacting the product in the value chain. Within the entire value chain, the activities that can add value to the product can be conveniently categorized as Primary activities and Support activities. The primary activities range from inflow of raw material into the firm, production processes within the firm and outflow of products and services from the firm towards its customers. That is primary activities include: transportation and warehousing of goods; conversion of raw material to product; storage of product before delivering to the customers; collecting orders from the customers; advertising, pricing and sales of the product; providing service to the product to keeps its functionality and value. These primary activities are supported through firm infrastructure, technology access, human resource management in the firm etc., and these constitute the Support activities.

Growth and development of agricultural value chains for local and external markets can be considered as a powerful tool for poverty reduction and to fight against the challenge of food security in developing countries like India. This particularly makes a strong case in India, where farmers are able to produce agricultural products, such as fresh fruits and vegetables that have higher potential for value addition as compared to conventional crops, If access is made available to processing, marketing and distribution, it could enhance the value of the final products. As Maharashtra is the leading state in the production of grapes in the country accounting for more than 75 per cent of total grapes production in the country, the same is considered to analyze the existing value chain for grapes both for local and external markets.

As discussed earlier, grape is one of the important fruit crops of India. The commercial production of grapes started in India only after seedless varieties were introduced in Maharashtra during the 1960s. Originally, a temperate crop, the major grape area in India lies in the tropical regions of peninsular India, though parts of North India also grow grapes to some extent. The cultivation of grape compared to other perennial horticulture fruit crops is much more complicated and riskier. The heavy initial investment on the supporting structures coupled with high annual maintenance costs makes its cultivation the exclusive domain and heavy returns attracts many enthusiastic growers towards this enterprise. Most of the grape varieties grown in India are mainly used for table purpose.

Grape is one of the most delicious fruits produced in Maharashtra and is widely consumed as fresh fruit. It is also used for producing raisins, wine making, grape seed oil, jam, jelly and juice concentrates (Table 20). In the developed countries, more than 90 per cent grapes are utilized for manufacture of wine. Raisins are rich source of sugar most of which is fructose and antioxidants. In India (Maharashtra), 77 per cent of grapes used as table grapes, 20 per cent is utilized for raisin making, 2 per cent is used for juice making and 1 per cent is used for wine preparation. In India, there are 95 wineries, of which 77 are in Maharashtra, out of which 39 in the Nashik district alone, which is the India's largest grape-producing district in Maharashtra. Hence, Nashik is regarded as 'grape capital of India', with about 0.56 lakh ha of land under grape cultivation in 2018-19. About 3500 ha are used for cultivation of grape wine varieties. The catchment areas of grape production in Nashik district are Kalvan, Peint Igatpuri, Sinnar, Niphad, Yeola, Nandgaon, Satana, Furgana, Dindori, Melgaon, Chandvad and Nashik talukas. Niphad and Dindori are the two major grape growing talukas of the Nashik district, as around 80 per cent of total production of the district comes from these two talukas. Maharashtra produces 75 per cent of India's wine and table grapes and the remaining 25 per cent comes from Karnataka and some other states. However, only two per cent of the total plantations grow wine grapes (most are sold as table grapes or raisins), compared to 90 per cent in Europe and the US, where consuming wine is a part of the dining culture, unlike India where serving any wine or liquor is still considered taboo. As of the early 21st Century, the State was home to nearly 40 wineries. Two of the best known are Chateau Indage at Narayangaon near Pune, which was established in 1979, and Sula Vineyards, 180 km (110 miles) north of Mumbai in Nashik, where the first wine grapes were planted in 1997. Maharashtra's tropical latitude poses significant challenges to growers. The wine regions of the state are much closer to the equator than any in Europe or North America, and the South Asian Monsoon brings heavy rainfall to the region between June and September (the traditional northern hemisphere growing season). The lack of seasonal temperature variation means that growers can delay budburst through aggressive pruning until after the monsoon has passed, and the growing season instead follows that of the southern hemisphere, from September to March. The hot, humid climate is further moderated by the high altitude of the state's wine regions, which are mainly centered around the Western Ghats. At higher altitudes, sunny days are followed by cooler nights, slowing the ripening process; this helps the grapes to retain acidity as they develop flavor. As a result, Maharashtra wines are well balanced and display good varietal character. When unseasonal rains and hailstorms damage the high-value horticulture crops in Maharashtra, particularly grapes, converting them into resin was not feasible. Then a large number of wineries, including domestic leader Sula Vineyards, chipped in to pick up rain affected crop at half price and to crush the damaged grapes. Similarly, a large number of wineries will enter the market to procure and crush the damaged grapes. This is a win-win situation for both farmers as well as the wineries. The peel of grapes is also the source of essential oil and pectin. It can also serve as a raw material for the production of cattle feed and in preparation of candies.

Table 20: Products derived from Raw Grapes in Maharashtra

Raisins	Raisins are the dried grapes and are eaten raw or used in cooking and baking. Raisins are rich source of sugar most of which is fructose and antioxidants. Raisin varieties depend on the type of grape used. Mostly seedless varieties such as Thompson Seedless (Sultana) are used for making raisins.
Wine	Wine is an alcoholic beverage obtained from the fermentation of grape juice. The natural chemical balance of grapes is such that they ferment without the addition of sugars, acids, enzymes or other nutrients.

Grape Seed Oil	Grape seed oil is also called grape oil. It is a vegetable oil pressed from the seeds of various varieties of grapes. It is used for salad dressings, marinades, deep frying, flavored oils, baking, massage oil, sunburn repair lotion, hair products, body hygiene creams, lip balm and hand creams Also used for preparation of cosmetics.
Jam	Jam contains both fruit juice and pieces of the fruit's flesh. Properly, the term jam refers to a product made with whole fruit, cut into pieces or crushed. The fruit is heated with water and sugar to activate the pectin in the fruit. The mixture is then put into containers.
Jelly	Jelly is also made from grapes. Jelly refers to a type of clear fruit spread consisting of firmed fruit juice made with pectin. Jelly can be made from sweet, savory or hot ingredients. Jelly is made by a similar process to jam, with the additional step of filtering out the fruit pulp after the initial heating.

Source: Department of Horticulture, Government of Maharashtra

The total area and production of grapes in Maharashtra are 130 thousand hectares and 22.84 lakh tonnes respectively in 2018-19. In Maharashtra, Nashik, Sangli and Solapur are the three major districts with 12.57, 5.18 and 3.52 lakh tonnes production of grapes respectively in 2018-19. The year wise data on area, production and productivity of grapes in five major grape growing districts of Maharashtra for the period of last fourteen years i.e. from 2003-04 to 2018-19 have been analyzed and triennial averages are worked out (Table 21). The highest area under grapes was noticed in Nashik district i.e. 25.74 thousand hectares during TE 2005-06 and it has increased to 56.26 thousand hectares during TE 2018-19 (Horticultural Statistics at a Glance, Ministry of Agriculture & Farmers' Welfare, Government of India) and the production of grapes has increased from 7.63 to 12.51 lakh tonnes, while the productivity of grapes has declined from 29.65 to 22.23 tonnes/ha during the same reference period. Sangli district ranks second in the area and production of grapes and it was 5.88 thousand hectares and 1.43 lakh tonnes, respectively during TE 2005-06. During TE 2018-19, both area and production of grapes showed increasing trend and reached to 21.89 thousand hectares and 5.82 lakh tonnes respectively. Similarly, the productivity of grapes also showed increasing trend from 24.31 tonnes/ha to 26.61 tonnes/ha during the same reference period. Solapur, Pune and Osmanabad stands third, fourth and fifth positions in the area under grapes respectively. The area and production of grapes showed increasing trend across all these three districts during TE 2005-06 to TE 2018-19, while the productivity of grapes increased in Solapur and decreased in Pune and Osmanabad districts during the reference period. Due to the extended monsoon, there were heavy rains when grapes are at the fruit formation stage, and the crop in the major grape producing districts viz., Nashik, Sangli, Solapur and Osmanabad districts suffered severe damage in 2016-17 and 2017-18. Further, unseasonal hailstorm and rainfall across these four districts during 2018-19 adversely influenced the grapes productivity in these districts. However, the farmers in Pune witnessed higher productivity during the above reference periods, as they have taken early harvest of the fruit for selling to some northern states as well as for exporting it to Bangladesh. So, the grapes from Pune reached market in the month of November, whereas from other districts, the peak arrivals started only from January. This led to higher productivity of grapes in Pune, unlike other districts. Thus, in terms of area, production and productivity of grapes during TE 2018-19, Nashik and Sangli are two predominant districts in Maharashtra. Next to these five major grape growing districts, grapes are grown in Ahmednagar, Satara, Latur and Jalana districts on nearby 500 hectares acreages in each district during TE 2018-19.

Table 21: Triennial Averages of area, production and productivity of grapes across major grape production districts in Maharashtra

(A-Area in '000 ha, P-Production in Lakh Tonnes, Y-Productivity in t/ha)

Districts	TE 2005-06			TE 2008-09			TE 2012-13			TE 2018-19		
	A ('000 ha)	P (Lakh tonnes)	Y (t/ha)	A ('000 ha)	P (Lakh tonnes)	Y (t/ha)	A ('000 ha)	P (Lakh tonnes)	Y (t/ha)	A ('000 ha)	P (Lakh tonnes)	Y (t/ha)
Nashik	25.74	7.63	29.65	32.81	9.78	29.82	33.84	11.36	33.58	56.26	12.51	22.23
Sangli	5.88	1.43	24.31	6.67	1.61	24.07	1.02	0.34	33.45	21.89	5.82	26.61
Solapur	2.64	0.36	13.53	1.91	0.47	24.88	1.84	0.49	26.83	13.07	2.59	19.79
Pune	0.91	0.29	31.89	1.29	0.38	29.34	1.03	0.16	15.47	2.71	0.56	20.79
Osmanabad	0.44	0.15	32.86	1.20	0.22	18.15	2.26	0.63	27.94	2.75	0.41	14.91

Raw Data Source: Horticultural Statistics at a Glance – Various Issues, Ministry of Agriculture & Farmers' Welfare, Government of India
Directorate of Horticulture, Government of Maharashtra

Nashik region

- Biggest wine producing region in India. This region includes Pune, Nashik and Ahmednagar. It is above 800 meter sea level. Thompson Seedless, Sonaka, Sharad Seedless and Tas-e-Ganesh, are some of the major varieties grown in Nashik region of Maharashtra. Harvesting of grapes is being done from early February to early April. The climate of Nashik is relatively cooler and suitable for cultivation of quality grapes. Water availability through Godavari river and its tributaries, easy availability of related inputs, and presence of prominent institutional organizations i.e. Maharashtra Rajya Draksha Bagaitdar Sangh, Mahagrapes, National Horticulture Board Office, District Superintendent of Agriculture are an added advantage. Nashik district, located in the northwest part of Maharashtra state, has around 54 per cent of total grape area and around 8 per cent of total fresh fruits cultivation in Maharashtra during 2018-19 (Figure 8). The average size of holding in Nashik is the same as the average for the state (1.67 ha).

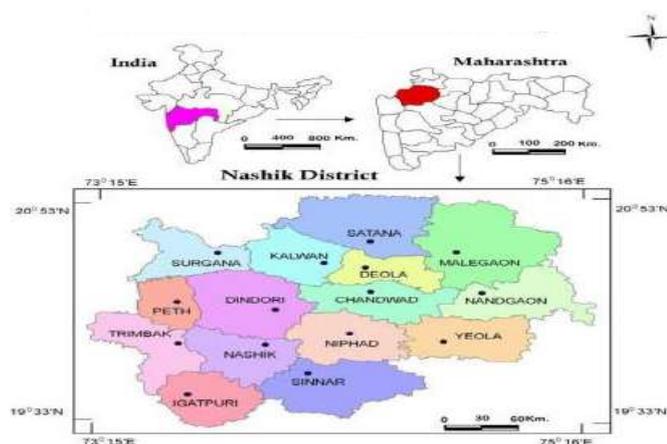


Fig. 8: Location Map of Nashik - Leading grape producing district in Maharashtra

Sangli region

- This region includes Solapur, Sangli, Satara and Latur. It is also above 800 meter sea level.

Grape cultivation requires heavy investment of capital. In addition, to produce grapes of high quality, the farmers have to put in hard efforts and additional investment. Nevertheless, the grape growers are always found to suffer from the variations in the prices of grape in the market and often fall into several economic crises. Emergence of the value chain in grapes has given a real boost to cultivation of grapes in Maharashtra. There are two main types of grapes grown namely seedless and seeded variety. About 78 per cent of grapes are used for table purpose. When the era of 'value addition' began through the large scale industrial processing, grapes are processed into various products like wine, raisins, juice, jam and pulp etc. With this background, the players involved in value chain management of grapes are studied in Maharashtra in general and with a special focus on how best we can re-orient the value chain mechanism in the context of outbreak of COVID-19 pandemic in 2020 in particular. As in Maharashtra, past studies have focused on production and marketing of grapes. However, studies on VCA of grapes were lacking. Value addition enhances about primary assembling market till grapes reaches ultimate consumer. Further, with the advent of this pandemic, COVID-19, it is high time to analyze the value chain mechanism of grapes in Maharashtra through measuring the degree of value addition across major market players in transacting table grapes and its processed products. This study is certainly a contributing one in the context of analyzing the disruptions of value chain of grapes due to the COVID-19 pandemic and suitable suggestions thereon to suggest for resilient value chain.

Mapping Value Chain of Grapes: Before discussing the value chain actors of grapes in Maharashtra (Nashik district is considered, as it produces 55% of total state's production), it is essential to know different types of varieties cultivated (Table 22). Currently, Thompson Seedless

is the ruling grape variety occupying 55 per cent of the area with its clones. In Nashik, this variety is mostly grown because it is more suitable for raisin preparation, lucrative market prices, and even demand for fresh grapes is more. The average yield is around 75 t/ha, the average selling price of fresh grapes in 2018-19 was Rs. 85/kg in Nashik.

Table 22: Details of Grape Varieties Cultivated in Nashik, Maharashtra

Category	Varieties	% to total area	% to total farmers
White seedless grapes	<ul style="list-style-type: none"> Thompson seedless Manik Chaman Super Sonaka India RK Sonaka 	80	73
Black seedless grapes	<ul style="list-style-type: none"> Sarita seedless Sharad seedless Nath Jumbo Seedless ARI-516* 	16	18
Wine grapes	<ul style="list-style-type: none"> Chenin blanc (white) Riesling grape (white) Shiraz (dark-skinned grape variety to produce red wine) Cabernet Sauvignon (red wine grape variety) 	4	9

*- Recently developed Scientists at the Agharkar Research Institute (ARI), Pune. It is a hybrid grape variety which is resistant to fungal diseases, high yielding and has excellent juice quality.

The value chain of grape is complex and harbor a big number of actors and each actor is connected to other(s) in a value chain and also across more than one value chain. So, the first step in the VCA is to identify the actors and then trace out the connections between them to get the chain mapped out (Figure 9). This can be done with a qualitative study, followed by a quantitative study when the map of the chain is completed. The quantitative study helps to investigate the costs incurred and prices realized by each agency from which the net output value can be calculated.

Functions	Actors/Players in Value Chain						
	Nursery developers	Input suppliers	Farmers	PHC/Traders	Wholesalers	Processors	Retailers
Input Supply	■	■					
Production			■				
Assembling				■			
Wholesaling					■		
Processing						■	
Retailing							■
Upcountry market				■	■	■	

Fig. 9: Functions of Actors in Grape Value Chain in Nashik, Maharashtra

Actors involved in Value Chain of Independent Grape Growers: In Nashik, grape value chain of independent grape growers includes the following actors and they can perform more than one function.

- Nursery developers
- Input suppliers

- Farmers
- Pre-Harvest Contractors (PHC)/Traders
- Wholesalers
- Processors (some Processors also act as Wholesalers)
- Retailers

A brief description of these actors, their roles and position in the value chain is given below:

- **Nursery Developers:** In Nashik, the number of grape nurseries are around 25- 30 and usually large farmers procure root stocks from these nurseries. Small farmers procure root stocks from local market. This is unfortunately the weakest link in the value chain since no certified planting material from registered nurseries is available to grape producers.
- **Input Suppliers:** Input suppliers include private agencies supplying fertilizers, pesticides, machinery etc., Government distributors and retailers. Here agricultural credit is also considered as input. These input suppliers play a crucial role in the production of healthy and disease free grapes. However, majority of the farmers especially resource poor farmers do not have much confidence and satisfaction over the services of the majority of agro-chemical input suppliers.
- **Farmers:** Majority of the farmers in Nashik are small farmers with area less than 2 hectares and are largely dependent on grapes cultivation. Nearly 90 per cent of the farmers are selling the harvesting rights of their orchard to local private contractors. Only 10 per cent of the farmers are involved in marketing the produce themselves, primarily with the expectation of better returns. Reasons for the dominance of the contracting system include immediate cash requirements to meet the pressing family needs, preparation for next season's cultivation, overcome price risk, hassle involved in self-marketing and lack of expertise in dealing with the labor and marketing of produce.
- **Pre-Harvest Contractors (PHC)/Traders:** These are highly specialized agencies involved in procuring the produce directly from the farmers' fields, as trading of seedless variety of grapes is highly seasonal which last for only few months i.e., from February to May. These PHC are big traders who sell the produce to wholesalers in the upcountry markets of Andhra Pradesh, Tamil Nadu, Kerala etc. However, the trading of seeded variety of grapes takes place through the year. These PHC perform a key role in the marketing of grapes through maintaining close contacts with the commission agents in the wholesale and terminal markets as well as with the producers. While contracting an orchard, the PHCs estimate the total volume of production and make an assessment of expected marketing costs to be incurred (supervision, harvesting, transportation, and transaction costs). The requirements for own domestic consumption and payment in kind to the orchard – owner and labour engaged plus pre and post-harvest losses, are also the factors considered by the PHC before purchasing the contract from the farmer making an offer to the producer.
- **Processors:** Processors purchase the produce from PHC/traders and also from wholesalers. They purchase only Bangalore blue variety of grapes for processing. The processor processes the produce to make pulp and later they sell the pulp to Hindustan Unilever Limited (HUL),

where it is further processed into grape juice that is ready to serve. This variety is also procured for making wine.

- **Wholesalers:** They deal with raw or unprocessed grapes who handle the produce in bulk quantities. These wholesalers purchase from PHC and transact the raw produce in upcountry markets i.e., sell the produce in significant quantities to processors and insignificant quantities to local retailers. However, some processors also act as wholesalers in transacting processed products of grapes.
- **Retailers:** Retailers are many in number in the market. They act as facilitators in making the produce available to the customers and are the closest to the consumers in the value chain. The majority of grape retailers are selling from barrows (hand cart) consisting of a wooden platform mounted on four cycle wheels and Suzuki vans. They move from street to street to offer fruit for sale. Moreover, a number of retailers are found standing at focal places of a town, particularly railway stations, bus stands, vicinity of courts, schools, and hospitals. Among retailers, there is a high degree of competition because the objective is to completely dispose off the purchased produce due to its highly perishable nature. Now, proper shops exclusively established for grapes and other perishable fruits have started emerging in big towns. The departmental stores have also started establishing fruit and vegetable sections from where you can pick the quality grapes. The prices in such shops/stores are a bit higher than market rates, but the quality of produce is also better. Retailers buy grapes from the wholesalers on a 24–48 hour credit basis.
- **Service providers:** They include both Government agencies, Private agencies, Cooperative agencies and PPP initiatives that support the value chain of grapes in Nashik district. The principal Government agencies include: National Research Centre for Grapes (NRCCG) of Indian Council of Agricultural Research (ICAR), Pune, DoH, Krishi Vigyan Kendras (KVKs) and Maharashtra State Agricultural Marketing Board (MSAMB), Pune. 'MAHAGRAPE' - a co-operative partnership firm located at Pune has been established on 19th January, 1991 with the help of the MSAMB, Pune. Maharashtra State Grape Growers Association (MSGGA), officially Maharashtra Rajya Draksha Bagaitdar Sangh (MRDBS), Pune, is an association of grape growers which was established in 1960 with the aim of development of grape horticulture in Maharashtra. This association will link grape growers, Government agencies, Research institutions and the National Horticulture Board (NHB) and APEDA. These Government and Cooperative agencies will provide both technical and extension support to the farmers. DoH mainly involve in monitoring of nursery farms and providing technical support. KVKs conduct good number of training programmes to the farmers and also extend technical support. The Sustainable Grapes Initiative - India (SGI-I) came to shape after a request from Sustainable Initiative Fruit and Vegetables (SIFAV) partners in Europe to source sustainable grapes from India. The outcome of the program will not only benefit SIFAV partners when importing grapes from India, but also support the domestic market by decreasing risk and increasing quality through sustainability. At the same time, the project will also help improve the businesses and livelihoods of small farmers, workers and relatively larger grape growers in India. The private agencies like private local nurseries and financial institutions like farmer cooperatives and other commercial banks operating in the district advance loan/credit to the farmers for carrying out production activities.

Based on the functions performed by various actors in the VCA of grapes, the entire process right from the point of flow of resources and resource services to the farmers and up to the final delivery of product to the ultimate customer can be depicted through Value chain map (Figure 10). This map is structured based on the information collected from

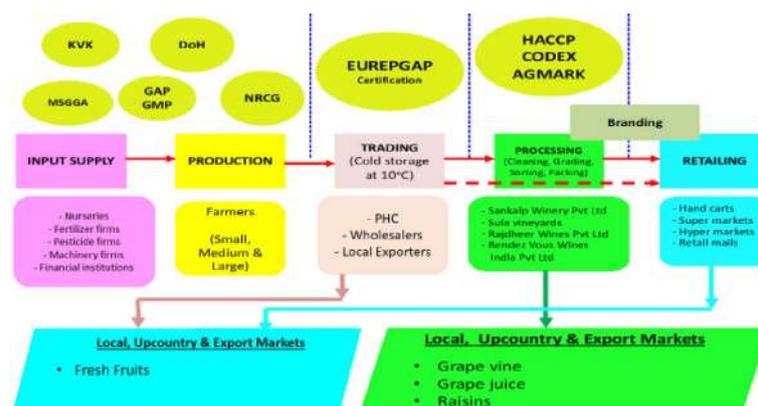


Fig. 10: Value Chain Mapping of Grapes in Nashik, Maharashtra

the Officials of DoH and NRCG. The functions or key stages to be performed in the value chain are represented in the form rectangles and below each rectangle, the respective actors or key players associated with these functions are indicated. On the top of the key stages of the value chain, the respective support activities such as KVKs, DoH, MSGGA, NRCG, Good Agricultural Practices (GAP), Good Marketing Practices (GMP) etc., are also represented. The movement of the produce in the local, upcountry and export markets is represented at the bottom in the form of hexagonal boxes and the actors involved in these markets to transact both fresh grapes and processed produce are indicated through arrows of the respective colours. Degree of Value Addition for Grapes: After mapping the value chain of grapes, the degree of value addition on fresh and processed grapes (raisins) were calculated (Tables 22 to 25). Following are the predominant value chains identified for transacting fresh grapes and its processed products in Nashik, Maharashtra:

Sl. No.	Commodity /Product	Predominant Value Chains	% of Marketable surplus transacted
1	Fresh Grapes	Farmer ----> PHC -----> Wholesaler in Fruits & Vegetables market -----> Retailer -----> Consumer	55
		Farmer ----> PHC -----> Local Exporter -----> Retailer-----> Consumer	12
		Farmer -----> Wholesaler in Fruits &Vegetables market ----->Retailer-----> Consumer	21
		Farmer ----> Retailer-----> Consumer	7
		Farmer -----> Consumer	5
2.	Grape juice	Farmer ---> PHC -----> Processor cum Wholesale Distributor ----> Retailer -----> Consumer	55
3	Raisins	Farmer ---> PHC -----> Processor cum Wholesale Distributor ----> Retailer-----> Consumer	60
4	Grape wine	Farmer ---> PHC -----> Processor cum Wholesale Distributor ----> Retailer -----> Consumer	45

It is important that the degree of value addition varies at each stage/player in the value chain. The degree of value addition in a chain is calculated by considering the price differences of the product at each agency and this implies GMM. Later, NMM is obtained after subtracting the transaction costs from GMM or price difference. The NMM is divided by the purchase price and the percentage figure indicates the extent of value addition.

During pre-COVID scenario, the degree of value addition for table grapes (Thomson seedless) indicated that 23 per cent of the value addition takes place during the sale of the produce from PHC/trader to wholesaler followed by 28 per cent during the sale of produce to retailer (Table 23 & Figure 11). At the retailer level, 21 per cent of value addition takes place during sale of produce to the ultimate consumer. Compared to retailer, the extent of value addition by wholesaler is little bit higher, as he has to perform facilitating functions like cleaning, grading, weighing, storage, packaging and packing etc. However, in case of table grapes, there is little variation in the degree of value addition at different stages from growers to end consumers because, there will not be change in the form of grapes. It is interesting that, in this value chain, the transaction costs are increased for PHC, while the same was decreased for wholesalers and retailers during post-COVID scenario compared to pre-COVID scenario. This is because, with the advent of corona pandemic, the farmers started early harvesting of grapes, fearing about shortage of labour in the near future. The PHC exploited this (glut) situation and they even went to remote villages to procure the produce at low prices. Though they incurred more transaction costs, they realized higher NMMs due to lower purchase price of fresh grapes from the farmers. They further moved the produce to local assembling centres thus, the wholesalers and retailers incurred lower transaction costs compared to PHCs.

However, in the value chain of grape juice, 27 per cent of value addition takes place during the sale of the produce from PHC to processor cum wholesaler followed by 47 per cent of value addition during the sale of juice from the latter to retailer (Table 24). Only 5 per cent of value addition takes place during sale of juice from the retailer to the ultimate consumer. This implies, the processing function from raw grapes to grape juice ensured more value addition in the transaction process. The farmers cultivating grape varieties suitable for grape juice (and raisins also) enjoy contractual agreement with the local processors cum wholesalers in the district. Due to lack of adequate cold storage facilities in the district and with the grape juice processors (existing storage capacity already in full), the processors could not advocate the farmers to go for early harvesting of the produce. Consequently, the transaction costs incurred by the juice processors cum wholesalers and retailers was increased during post- COVID scenario because of acute labour shortage and transportation bottlenecks.

Similar is the case in the in the value chains of raisins and grape wine, as the extent of value addition is highest during the processing function i.e., 66 and 83 per cents respectively (Tables 25 & 26). That is, at processor level across the above three value chains, the extent of value addition for the final product is significantly higher, as in this stage, the grapes change their original form and a more value added product is being produced. As in the case of grape juice, even for both these products (i.e., raisins and grape wine), the extent of value addition at the retailer level is very meagre (4 and 3 per cents respectively). Even during the post-COVID scenario, the demand for processed products of grapes (grape juice, raisins and grape wine) is on the rise, as their consumption promote immune to the customers. This prompted the PHCs to procure the produce even from the remote villages at lower prices though incurring higher transaction costs and later they supplied the same to local wine processors and able to realize higher NMMs. On the contrary, the wine manufacturers operating on large scale enjoy tie up or contractual agreements with the farmers has recommended the latter to harvest the produce well in advance to overcome labour shortage. These manufacturers have their own transportation networks and thus they incurred lower transaction costs, unlike PHC and retailers.

Across all the four value chains, at retailer's level, the degree of value addition is less as compared to previous stage because, the retailer do not perform any value addition activities. This analysis also highlights that by processing the grapes, the agency ie., processor cum wholesaler is gaining maximum NMM to the tune of 17, 19 and 25 per cents in the respective Consumer's Purchase Price (CPP) in transacting grape juice, raisins and grape wine respectively. However, the share of farmer in the CPP is highest in transacting fresh grapes (Table 23) to the tune of 34 per cent and this share declined in the production of processed products.

Table 23: Degree of value addition for Table grapes (Thomson seedless) in Nashik, Maharashtra during both Pre-COVID (January, 2020) and Post-COVID (May, 2020) scenarios (Rs. /qtl)

Item	Farmer		PHC		Wholesaler		Retailer		Consumer	
	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID
Selling Price	3100	1800	4700	4100	6800	5900	9200	7000		
Purchase Price			3100	1800	4700	4100	6800	5900	9200	7000
GMM			1600	2300	2100	1800	2400	1100		
Transaction costs			900	1200	800	700	1000	600		
NMM			700	1100	1300	1100	1400	500		
Degree of Value Addition (%)			22.58	61.11	27.66	26.83	20.59	8.47		
PSCR (%)*									33.70	25.71

Note: * - Producer's Share in Consumer's Rupee; **Raw Data Source:** Directorate of Horticulture, Maharashtra

Table 24: Degree of value addition for grape juice (ARI-516) in Nashik, Maharashtra during both Pre-COVID (January, 2020) and Post-COVID (May, 2020) scenarios

Item	Farmer (Rs. /qtl)		PHC (Rs. /qtl)		Processor cum Wholesale Distributor (Rs. /100 litres)		Retailer (Rs. /100 litres)		Consumer (Rs. /100 litres)	
	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID
Selling Price	3350	2700.00	5350	5100	13200	13900	14700	15800		
Purchase Price			3350	2700	5350	5100	13200	13900	14700	15800
GMM			2000	2400	7850	8800	1500	1900		
Transaction costs			1100	800	5350	5800	800	1100		
NMM			900	1600	2500	3000	700	800		
Degree of Value Addition (%)			26.87	59.26	46.73	58.82	5.30	5.76		
PSCR(%)									22.79	17.09

Raw Data Source: Directorate of Horticulture, Maharashtra

Table 25: Degree of value addition for raisins (derived from Sharad seedless) in Nashik, Maharashtra during both Pre-COVID (January, 2020) and Post-COVID (May, 2020) scenarios (Rs./qtl)

Item	Farmer		PHC		Processor cum Wholesale Distributor		Retailer		Consumer	
	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID
Selling Price	7500	6800	14500	14200	45000	48000	49800	52000		
Purchase Price			7500	6800	14500	14200	45000	48000	49800	52000
GMM			7000	7400	30500	33800	4800	4000		
Transaction costs			4500	3800	21000	22800	3000	2500		
NMM			2500	3600	9500	11000	1800	1500		
Degree of Value Addition (%)			33.33	52.94	65.52	77.46	4.00	3.13		
PSCR (%)									15.06	13.08

Raw Data Source: Directorate of Horticulture, Maharashtra

Table 26: Degree of value addition for grape wine (derived from Cabernet Sauvignon) in Nashik, Maharashtra during both Pre-COVID (January, 2020) and Post-COVID (May, 2020) scenarios

Item	Farmer (Rs. /qtl)		PHC (Rs./qtl)		Processor cum Wholesale Distributor (Rs. /10 litres)		Retailer (Rs./10 litres)		Consumer (Rs./10 litres)	
	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID	Pre-COVID	Post-COVID
Selling Price	5500	4800	7800	9600	25300	24700	26500	27700		
Purchase Price			5500	4800	7800	9600	25300	24700	26500	27700
GMM			2300	4800	17500	15100	1200	3000		
Transaction costs			1200	3100	11000	9600	500	1700		
NMM			1100	1700	6500	5500	700	1300		
Degree of Value Addition (%)			20.00	35.42	83.33	57.29	2.77	5.26		
PSCR (%)									20.75	17.33

Raw Data Source: Directorate of Horticulture, Maharashtra

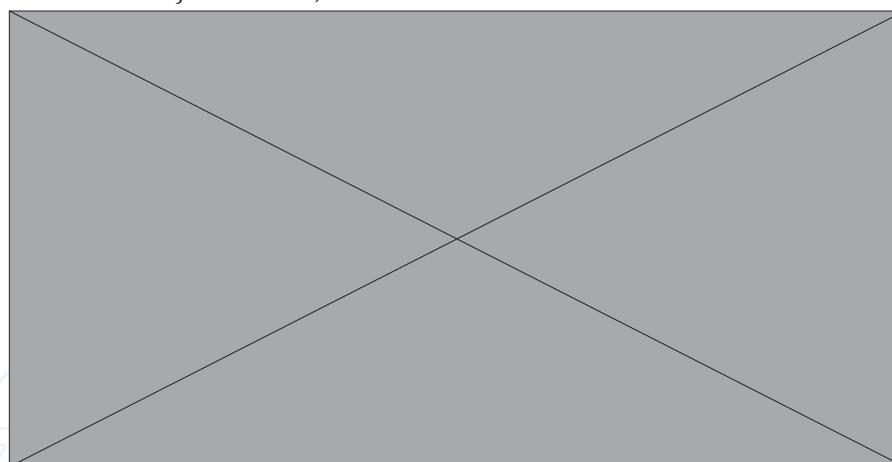


Fig. 11: Degree of Value Addition (%) across different players in the Value Chain of Grapes and its Processed Products in Nashik, Maharashtra during both the Pre-and Post-COVID Scenarios

During post-COVID scenario, it is quite disheartening to note that the PHCs gained significantly in procuring fresh grapes in the value chains at the cost of farmers. As there is declined demand for fresh grapes in the market due to barriers in inter-state transport (consequently domestic supply exceeds the local demand), processors have to necessarily utilize the installed capacity of processing equipment/machinery and increasing demand for processed products like raisins and grape juice (improve the immune system of consumers), the PHCs are greatly benefited in the value chain of grapes. So, the PHCs exploited the situation by quoting low price to the grape farmers, arranged their own labour (even engaged students of local schools/colleges) to harvest and transport the grapes. So, the PHCs with their strong backward and forward linkages in the value chains i.e., with farmers and processors cum wholesalers respectively are actively involved in procuring the fresh produce from the farmers' fields directly and transacting the same at exorbitant prices to the subsequent agencies. As a result, the degree of value addition of PHCs in the value chains of grapes and its processed products showed considerable increase during post-COVID period compared to pre-COVID scenario. Accordingly, the increase in degree of value addition of PHCs in transacting fresh grapes to wholesalers (for table purpose) is highest to the tune of 38 per cent (Table 2 and Figure 4). This is followed by grape juice (32%), raisins (20%) and grape wine (15%) during the above reference period in transacting fresh grapes from PHCs to respective processors. Even the degree of value addition by processors cum wholesalers of grape juice and raisins showed increasing trend by 12 and 11 per cents respectively during the above reference period.

So, with the drastic increase in NMMs of both PHCs and Wholesalers (table grapes)/Processors cum wholesalers (grape juice, raisins and wine), the PSCR declined during post-COVID period compared to pre-COVID scenario. These findings highlight poor market linkages of farmers in transacting grapes in the local market. The disruptions in the grape value chains in terms of labour shortage, transportation, cold storage and other logistics further aggravated the problems at the farmers level. The intermediary/agency closest to the grape growers in the locality i.e., PHCs gained significantly during this post-COVID period and they exploited the farmers on all grounds i.e., quoting low price for the produce, arranging for labour to harvest the produce, transport of produce from farm gates to cold storage units and processing units. Their linkages with the cold storage units in the locality further exploited the farmers, as they latter could not avail such facility. All these factors cumulatively affected the farmers in deriving low price for their produce and hence low PSCR in transacting grapes across value chains of both fresh and processed products.

The discussions held with the Officials of DoH revealed that since the local mandis are now closed, there is no other go for the grape growers to transact their produce directly to the PHCs. Some growers are even entering into verbal agreements with the PHCs in the post-COVID period to support their orchards in the future. Though MSGGA has taken the lead earlier to bring Farmer Producer Companies (FPCs) associated with grape farming under a common federation, the marketing of grapes from this federation too got affected during post-COVID period. It was found that a farmer under this federation would have earned Rs. 250 per box in the international market, but instead, now has to settle for the price of Rs. 70 per box in the local market. Grapes from FPCs under a common federation are commonly exported to West Asia and European countries, but it has halted due to this pandemic. It was estimated that due to this pandemic, grape industry suffered a huge loss of around Rs. 1,000 crore, as the harvesting of grapes is not in

progress and now the produce is found rotting in the fields. Even if inter-state transport revives due to exemptions given by the Government during lockdowns, still the demand may not shoot up for fresh produce because the big buyers are far away and urban demand is likely to be minimal during the lockdown period. When the grape market collapses, farmers turn to raisins. It ensures return of at least the production cost with 100 kg of grapes turned into 25 kg of raisins. But farmers are facing trouble on this front as well, as they need dipping oil and potassium carbonate to make raisins. These two products are usually imported from China. The cost of dipping oil stands at Rs. 190 per litre normally and potassium carbonate costs about Rs. 100 per kg. But with no import, the farmers are forced to buy both the products at inflated prices of Rs. 230 and Rs. 120 respectively. One litre of the oil and one kg of carbonate is required for the making of 100 kg raisins. At a time when farmers are already incurring losses, the increased cost of the two items is digging a deeper hole in their pockets.

Mahagrapes – Improved value chain mechanism for grapes: From the preceding discussion it was evident that Nashik district of Maharashtra is world famous for grapes cultivation and exports of grapes to various countries. The commercial production of grapes started in India only after seedless varieties were introduced in Maharashtra during the 1960s. Maharashtra accounts for 76 per cent of total grape acreage, and 78 per cent of total grapes production at All-India level in 2017-18. The exports of fresh grapes from Maharashtra constitute around 92 and 97 per cents of All-India fresh grapes exports in terms of quantity and value respectively during 2018-19. Within Maharashtra, the grape occupies 14 per cent of the total fruit acreage, with 1.05 lakh ha. Nashik district leads other districts in Maharashtra with 0.56 lakh ha under grape cultivation and around 50,000 farmers are associated with grape farming. Besides Nashik, Sangli (0.22 lakh ha), Solapur (0.18 lakh ha), Osmanabad (0.29 lakh ha) and Pune (0.26 lakh ha) are the other major grape growing locations in the State.

There are not many small farmers in grape cultivation, as grapes are costly and risky to grow and hence, 'grape' is considered as 'a rich farmers' crop'. On the other hand, in Sangli, it is mostly small farmers who are into grape cultivation, given small holdings and family labour crop care, and the exportable quality crop proportion is higher (70-80 per cent) in this area. Nashik district accounts for 54 per cent of total acreage and 53 per cent of total production of grapes in the Maharashtra (2016-17). This district recorded an all-time high export of 1.43 lakh tonnes of grapes during 2017-18. It also contributes around 62 per cent of India's and 78 per cent of Maharashtra's grape exports in the same period.

Origin of Mahagrapes: The grape growers in this State (and also in other major grape producing states like Karnataka and Tamil Nadu) are very innovative and very much receptive to new technologies and have registered with GLOBAL G.A.P. certification (The Worldwide Standard for Good Agricultural Practices and is a farm assurance program, translating consumer requirements into Good Agricultural Practice) and this made the transfer of technology to a group of farmers much easier. However, despite having the world class technical know-how, suitable weather conditions, continuous research flow from grape institutes, well organized developmental assistance from the Directorate of Horticulture, the grape growers of Maharashtra, are facing a bunch of problems, which makes the state the excellent producer but unsuccessful exporter of the grapes. Most important is the inability of small farmers to meet the food safety and quality requirement as per GAP and Codex standards. Also standards keep changing and producers have

to be abreast with that information. Many times product attributes are imperfectly observed, especially the goods which have property of credence. The most common institutional solution to these problems is the creation of Producer's Organizations and Mahagrapes is the right step in this direction (Roy and Thorat, 2008). That is, despite being a leader in export and domestic markets, grape farmers in Nashik and other major grape growing districts in Maharashtra continue to remain unorganized and marketing remains a weak point with most. It is also evident from the Tables 22 to 25 that the PSCR is very low across the value chains for transacting table grapes (34%), grape juice (23%), raisins (15%) and grape wine (21%) for the (small and marginal) farmers in Nashik, who transact the produce to the PHC on individual basis. This implies, though Maharashtra contributes around 78 per cent of grapes production in India (2017-18), the PSCR of farmers who transact their produce to the local PHC on individual basis is very low. So, to safeguard the interests of farming community, MSGGA (established in 1960), officially MRDBS is playing a crucial role of providing technical guidance, import fertilizers, pesticides, insecticides, growth hormones and provide them to grape growers and facilitate loan procuring for buying equipments etc. It plays a vital role in establishing several grape growers marketing co-operative societies by bringing its members together locally for strengthening the marketing structure. All these marketing co-operative societies came together to form a federation namely 'Mahagrapes' for promoting exports. But, MSGGA does not directly involve itself in selling grapes, but help the grape growers indirectly in promoting sales through Mahagrapes. It is working with the sole purpose of addressing the problems of grape growers on a single platform and head quartered at Pune. It has regional offices at Nashik, Sangli, Solapur and Pune. As on today, there are 27,000 registered members, accounting for approximately 80,000 hectares of land under grape gardens. The MSAMB, Pune was established on 23rd, March 1984 to look after the development and coordination of agricultural marketing system in the State of Maharashtra. In order to boost the export of grapes from Maharashtra, 'Mahagrapes', a co-operative partnership firm has been established on 19th January, 1991 with the help of the MSAMB.

Major objectives of Mahagrapes: This Mahagrapes was established with the main objectives of elimination of middlemen in marketing process, encouragement and development of agricultural export, and the provision of extension services and inputs to the members. It negotiates better prices for its members and also provides technical assistance, inputs and information to the farmers to enable them in meeting stringent quality requirement of export markets. It also aims to encourage and develop agricultural export, maximize foreign exchange earnings and update the farmers on the latest technology in farming and accept global challenge with a commitment to quality.

As in India in general and in Maharashtra in particular, more than 70 per cent of the farmers are having only small and marginal holdings ie. less than two hectares, and hence most of these farms are not viable and especially to cultivate rich crop like grape. Linking these small primary producers with markets has been identified as one of the major issues in policy and practice in improving livelihoods for millions of poor in the developing world. Also 12th Five Year Plan placed more emphasis on mobilizing farmers through Cooperatives and Producers' Organizations. The latter could be the best alternative for enabling farmers / producers to get better remuneration for their produce because it enables aggregation of the produce and in turn gives the necessary bargaining power to get better price. Mahagrapes is such an organization, which helps in linking

small and marginal farmers to export market. It acts as a marketing partner to the group of producers' cooperatives in Maharashtra. It came into existence in January, 1991. It owes its origins to the MSAMB. Mahagrapes is the first organization in the State to have the characteristics of both a cooperative and a private sector partnership firm. Since the establishment, it has been able to organize the efforts of grape growers spread across major districts like Nashik, Sangli, Sholapur, Pune, Ahmednagar, Osmanabad and Latur. This pool in the Maharashtra region accounts for almost one-third of India's total production. In the beginning, Mahagrapes had 29 grape growing farmer cooperatives as its members. This number came down immediately within three years and currently there are 16 farmer cooperatives. During the initial periods of its establishment, high rates of consignment rejections are experienced from the European markets and hence severe losses are incurred to the tune of Rs. 20 million. As a result, many farmer-cooperatives left Mahagrapes to concentrate on the domestic market or to look for alternate marketing arrangements thus bringing a reduction in the number of cooperatives to 16 spread across the districts in Maharashtra (<https://www.msamb.com>).

Mahagrapes is considered as a success story because it has linked grape growers to international market and has compressed the supply chain (Figure 12). In doing so, it has assumed barometric role. It is pioneer in bringing pre-cooling technology and array of post-harvest operations resulting in better handling of produce. All these operations have pulled the farmers upwards in the supply chain (Roy and Thorat, 2008). In terms of risk mitigation, the Mahagrapes farmers bear and share the entire risk in production and marketing. However, the level of risk itself is lower to the extent that the cooperative provides technical expertise so that the crop can be saved from damage and satisfy the quality norms. Thus, unlike in a situation where the farmer sells to intermediaries who bear the entire marketing risk here the risk is shared across all farmers. The firm itself covers against such risks by rejecting procurements that do not meet the specifications but once they accept the produce from the farmer, the risk is totally borne by the firm where, everyone owns a share. The underlying principle for Mahagrapes is enabling market access by lowering transaction costs. Farmers realized that there exists an international market for their product. They also know that by getting access to this market they can earn a higher price for their product. It was envisioned that bringing together farmers under one umbrella would give better visibility and greater accessibility in foreign markets. In addition, they would be able to gain from economies of scale. Mahagrapes has been exporting to European markets for past sixteen years. In keeping with the international trend of fruit growers becoming exporters, the grape growers from Maharashtra entered international market with the help of Mahagrapes. Considering the success story of the Mahagrapes, there is need to study its value chain mechanism so that such models can be scaled up and replicated in other parts of the world.

Value chain of grapes through 'Mahagrapes' vis-à-vis 'Independent Grape Growers: In spite of the second largest producer of fruits and vegetables in the world next to China, India is a failed exporter of both fresh and processed products mainly because of the inability to meet the food safety standards. Especially for commodities like grapes, where small and marginal predominate the farming scenario, because of small scale marketable surplus, these farmers could not demand more price in the market. The exports of fresh grapes from India accounts for only 33 per cent of total fresh fruits exports at All-India level and the exports of fresh grapes from Maharashtra accounts for around 51 per cent of total fresh fruits exports from Maharashtra during 2018-

19. Being smallholders, these farmers suffer from some inherent problems such as absence of economies of scale, access to information and their inability to participate in the price discovery mechanism. The participation of farmers is observed to be restricted by limitations like poor vertical and horizontal linkages and limited access to market, training and to finance (Fernandez Stark Karina, *et al*, 2012). Poor information flow along the chain, has also been identified as a vital constraint (Shearer, 2011). The problem of access to market is even more pronounced for small and marginal farmers. So, the challenge now is to optimize benefits through effective and efficient means of aggregation models. An ideal model of aggregation assumes significance in the context of linking farmers to market (both domestic and export), improving bargaining power, economies of large scale, quality output etc. The concept of Mahagrapes – a co-operative form of business promoted by MSAMB works in this direction to promote both scientific production and export of grapes from Maharashtra. Several Government agencies supported its establishment including some federal agencies (like National Cooperative Development Corporation (NCDC), NHB, APEDA). Alongside there were state agencies that helped in establishing Mahagrapes (e.g., Department of Cooperation, Government of Maharashtra and MSAMB). This creation of Mahagrapes is unique in the Indian context as it is the first to make use of a special provision (following an amendment) under the cooperative laws of the state. This amendment in 1984, allowed cooperatives to associate with other agencies (including marketing partners). Such an association of cooperatives with other agencies was forbidden prior to the amendment. Mahagrapes is registered as a marketing partner to the producer cooperatives under the clause following this amendment in the cooperative law of the state.

The primary source of funding of Mahagrapes is membership equity. The Government does not provide any explicit assistance to Mahagrapes in its functioning. The only Government assistance that Mahagrapes receives is the general assistance provided to all horticultural and processed food exporters in the country in the form of transport assistance (from APEDA). With the guidance of the MSAMB, Mahagrapes started exporting grapes to Middle East and Europe. Samples of grapes were flown to Dubai, U.K., Germany, France and Netherland in December 1990. As soon as the samples reached the above places, faxed reports were received stating that Indian grapes were sweeter than grapes from any other countries. However, a lot of variation in berry-size was noticed along with tardy packaging. On the contrary, reports from Middle East were very encouraging wherein both the grapes and packaging was accepted without any complaints. On receiving such favorable reports, Mahagrapes immediately initiated the export activity, wherein consignments were flown to Middle East and Europe. Even on receiving good returns, exorbitant air freight made exports unfavorable. Exporting grapes by sea remained the only option. Societies with good quality grapes were asked to store them in the nearest cold storage available so that export by sea to Middle East was made feasible. Refrigerated containers were sent to such societies for loading the packed grapes with excise and customs formalities completed there itself. Thus, export by sea to the Gulf began and efforts were made to export by sea to Europe. However, the transit period being almost a month, the grapes had to be pre-cooled first in order to increase their shelf-life.

The success of Mahagrapes can be attributed to the strict imposition of Sanitary and Phyto-Sanitary (SPS) standards in the production of grapes in tune with the requirements of the importing countries (berry size, fruit color, bunch weight, blemish, bag weight (minimum–maximum), stem color, berry shrived, split berry, SO₂ damage, waste berry, pest damage, shatter berry, chill

damage, temperature, residue, taints and odor, packing quality and average check weight). To keep abreast with the changing standards from time to time, Mahagrapes will amend their own production, processing, storing and testing methods regularly. By doing so, the consignment rejection rates have gone down substantially. To cope up with the quality standards imposed by the importing countries, Mahagrapes through its quality control officers, tries to maintain quality at all levels of operation. Quality of grapes is maintained through the proper application of bio-fertilizers, bio-pesticides, specialized machinery usage for production and harvesting etc (Figure 12). It is ensured that the European Communities (EC) prohibition directive list related to certain mercuric compounds, persistent organo-chlorine compounds and other compounds are adhered to. The quality control officers ensure that the required quality parameters (medium sized cluster of uniform grapes, large sized berries with characteristic colour, flavor, sugar/acid ratio) are adhered to at the time of fruit selection and packing. The fruit after harvesting, is graded for berry size and colour, packed at the farm itself and then transported to the society for pre-cooling. The pre-cooled fruit is then stuffed in reefer containers which are taken to the port in Bombay. Grapes are then marketed/exported to different Middle East and European countries. Grapes exported to Europe and other countries (Germany, Netherlands, UK, Gulf, Sri Lanka) have mainly been sold through supermarkets. The percentage share of sales to supermarkets have increased considerably over the last couple of years.

Mahagrapes is a for profit organization. The price which each farmer gets is decided based on the quality of the grape that can be ascertained due to traceability of the produce. So, when the price is decided for grapes from a particular farmer, Mahagrapes deducts a facilitation fee per unit of output and passes on the rest to the cooperatives. The cooperative then keeps a part of the price for itself and passes on the rest to the farmer. The amount which the cooperative keeps varies from one cooperative to another depending upon their specific requirements.

From the Figure 12, it is easy to outline the value chain of Mahagrapes and the same is indicated below:

- Grape Growers -----→ Farmers' Cooperative -----→ Mahagrapes ----- → Importers ----- → Super Markets

Thus, there are three stages in the value chain of grapes transacted through Mahagrapes. They include:

- **Grape Growers to Farmers' Society:** Procurement of grapes is done at the society level, wherein grapes are obtained from individual growers. The quality control officers move around in the vineyards and identify grapes suitable for export. Normally, 8 – 10 M. Tonnes grapes per hectare can be obtained for export. The grapes are packed in the farm itself and then taken to the society for pre-cooling.
- **Farmers' Society to Mahagrapes:** On the packing of 15 M. tonnes of grapes, the society inform Mahagrapes who then call for a container from Bombay. Mahagrapes helps in the movement, clearance and insurance of the grapes. It also maintains communications with the importers abroad.
- **Mahagrapes to Importers:** On arrival at the importer's destination, the identified buyer will transfer the consignment to his own cold storages, where quality check is carried out along

with labelling, freight, duty payments, loading, unloading operations etc. These importers charge a fixed percentage of commission on sales in their domestic market. The labelling code specifies name of the society, farmer, date of packing from Maharashtra, India etc.

- **Importers to Supermarkets:** On demand from the supermarkets, the grapes are then supplied by the importers to the cold storages of the supermarkets, where a quality check is further carried out and then it is supplied to their retail stores.

Direct Benefits to Grape Growers transacting produce through Mahagrapes compared to Independent grape grower-seller: As discussed earlier, grape growers are spread all over Maharashtra. Grapes being of perishable nature, had to be disposed off immediately in the domestic market. Unscrupulous traders formally took undue advantage offering nominal price for the fruit and delayed payments. Hard work of the grape growers remained unrewarded. Mahagrapes through its professional management promote the farmers' status in many ways such as:

- Bringing about an awareness among grape growers in producing good quality grapes suitable for export.
- Assistance to farmers in developing pre-cooling and cold storage facilities with the help of technology imported from California. This increased the shelf life of grapes from 6 days to 90 days.
- Bringing about considerable improvement in price realisation at the farmer's level from Rs. 16/kg in domestic market to Rs. 45/kg (average price), a growth of around 180 per cent with on the spot payment.
- Since the grapes exported through Mahagrapes have acquired a special reputation in the world market by the dint of flavour and sweet taste, the grape boxes exported from Maharashtra are displayed with grandeur to attract attention of foreign buyers and fetch a handsome price. The Mahagrapes also advertises about these quality grapes in reputed Magazines and prominent newspapers in the foreign countries through the caption, 'Eat naturally cultivated grapes of India' and this also has contributed significantly in boosting the export of grapes from Maharashtra.
- Mahagrapes also assist the farmers' cooperatives right from the stage of selection of land up to the stage of sale of grapes, inclusive of import of agricultural inputs. It imports Gibberellic acid, a hormone for getting increased yield and grape guard paper-preservative used during export of grapes from foreign countries for distribution to the farmer-members. These inputs are distributed in pure form at a minimum cost on 'no-profit no-loss' basis.
- Mahagrapes also assist the grape growers through conducting group discussions, seminars, printing of leaflets, magazines and booklets on different topics relating to grapes production and export marketing.
- Free guidelines are provided to the members to solve the problems faced by them during producing and transacting the produce through Mahagrapes.
- Technical guidance in cultivation and export of grapes has been provided through inviting experts from NRCC, Pune, Indian Institute of Horticulture Research, Bangalore and SAUs in Maharashtra.

- Mahagrapes is a good example of public-private partnership. Ownership of Mahagrapes lies solely in the hands of the farmers; as they have collectively contributed their share in the fixed and operating costs of Mahagrapes and they also handle the governance of the firm. However, as discussed earlier, during its initial period of establishment and execution, the role of public institutions such as MSAMB was crucial. MSAMB deputed and paid the salaries of the first governing officers of Mahagrapes for three years who were brought in from other state departments. MSAMB also provided for consultancy services from experts on agri-marketing, packaging, technical services such as refrigeration and cooling. All the liaisoning with institutions such as the Central Food Technology Research Institute (CFTRI) was done by Mahagrapes. The NCDC gave loans to the societies for pre-cooling and pack-houses. Loans from the private sector that has a higher discount rate would not be forthcoming (as success in export markets with smallholders usually takes time).
- The collaboration between farmer cooperatives (who have production skills) and a marketing partner, Mahagrapes (with more marketing skills) ensure comparative advantage for the produce in the international market.

The above discussion inferred that Mahagrapes is an unique success story in grapes export marketing, though successes in horticultural exports that too of fresh produce are rare. The information further revealed that Mahagrapes's farmers earn significantly higher income vis-a-vis their outside marketing option and smallholders face no bias in selection. It provides farmers with a platform for collective bargaining especially in negotiation with foreign buyers. Most importantly, Mahagrapes epitomizes the role of scale economies in information procurement and processing regarding the export markets. A group of lead farmers procures information and because of greater skill can process and disseminate it to smaller and lesser skilled farmers. Also, the scale economies in branding (creating and preserving brand value) involves fixed costs, which get averaged out over greater outputs in an organization such as Mahagrapes. Together with the farmer's ability to consistently meet standards, this implies that the model can be scaled up for other products too.

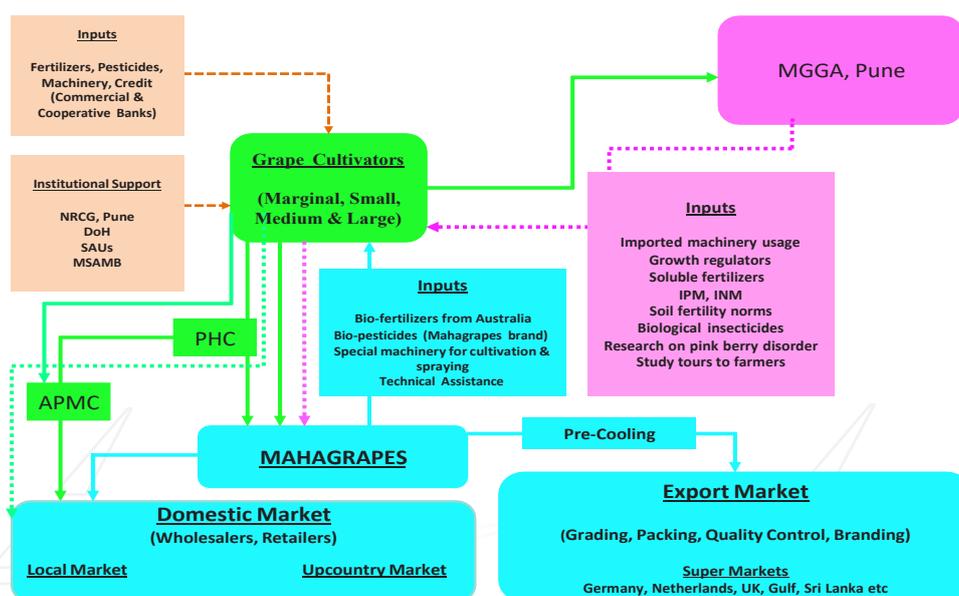


Fig. 12: Supply Chain of Grapes in Maharashtra – Mahagrapes vis-à-vis Independent Grape Producer

Chapter-VIII

Disruptions in Grapes Supply Chains in the Context of Covid-19 Pandemic

COVID-19 is officially a global pandemic, the World Health Organization (WHO) announced on March 11, 2020 the first such declaration since the H1N1 “swine flu” a decade ago. Now confirmed in 227 countries and responsible for 2.83 lakh plus deaths (as on 10th May, 2020) and still rising, COVID-19 has affected all the sectors in general and especially the food sector in particular. No doubt, Covid-19 hasn't yet hit India in a widespread way, unlike many European countries and the USA. Thanks to the Hon'ble Indian Prime Minister, Sri Narendra Modi to impose series of lockdowns in the country as a preventive measure to check the spread of novel coronavirus pandemic. As India is an agrarian economy, the impact of COVID-19 on agriculture is complex and varied across diverse segments that form the agricultural value chain. Even among the different segments, its impacts vary widely among different regions and among producers and different stakeholders. This impact will reverberate across the larger economy and will linger longer than a few months. Though India has taken early action to limit the spread of COVID-19 through ordering nation-wide lockdown for its population of 1.3 billion people, the novel coronavirus disease was spreading fast when compared to other countries. As COVID-19 cases are increasing fast even during the lockdown period, there is increasing concern about the disease's potential spread and control on one hand and to restore the economy back on track on the other. As the Government views the pattern of the spread of COVID-19 is similar to the 2009 H1N1 influenza pandemic, it opines the spread is unlikely to be uniform. Hence, after six weeks of continuous lockdown of economy since 20th March, 2020, the Government is now planning to maintain the full lockdown in 'hotspot' areas and relax it in other places. These measures ensure twin objectives: to focus on health crisis with much more attention in hotspot areas and restoration of economic activities in normal areas (outside hotspot areas) enable the country to come out of economic crisis to a significant extent. No doubt, the prolonged lockdown of economic activities in the country has adversely affected the economy on two grounds. First, the economy started slowing down leading to the problems of unemployment, low incomes, rural distress, malnutrition, and widespread inequality. Second, the agricultural sector on which the economy mainly relies in terms of livelihood and employment, got adversely affected due to scarcity of labour, poor harvesting of produce, supply chain problems, no demand for the produce, poor price realization etc. While the Government has exempted many agricultural operations from harvesting to movement of produce to mandis from lockdown rules, the ground realities at the farmers' level are altogether different mainly due to labour scarcity. Further, farmers, agricultural labourers and other stakeholders at the grassroot level are less aware about the general precautions and safety measures during harvesting, post-harvest operations, storage and marketing of produce (*rabi* crops). Though the Government is taking all the requisite measures such as supplies of staples, fruits, vegetables, and meats in adequate quantities to safeguard both the farmers and consumers, still there are threats to food security, in the long term. Restrictions on transportation and movement of people have already led to some food logistic challenges. Yet the impact of the outbreak will spill over to food processing industries, which have suspended production. Though the present supply of processed food products remains relatively abundant for the time being due to surplus stocks available,

but supplies of raw produce to food processing firms and production may get affected during *Rabi*, 2020-21 and *Kharif* 2021 respectively due to severe manpower crunch, transportation and limited market operations. Especially regarding Horticulture sector, there is widespread disruption regarding harvesting, marketing and value chain mechanisms across all the States in India. Especially the Aggregators/PHC/Traders were unable to purchase at the farm gate, markets were closed, and supply chains were restricted due to quarantines, sick truck drivers, border closures, and trade restrictions. Additionally, reduced incomes limited farmers' ability to hire farm labor, which was highly restricted because collective work was banned in fields. Such disruption of value chains will have significant food and nutrition security implications. As grapes is one of the potential commodities produced and exported from India (ranked second in the exports of fruits), the same is considered here to analyze the possible adverse impacts of COVID-19 pandemic on its value chain in India in general and with special reference to Maharashtra state. To understand these effects, a qualitative and rapid appraisal of the grape value chain was conducted through conducting phone interviews with key stakeholders along the grape value chain Nashik district of Maharashtra. Given that this assessment was done based on a limited and non-representative number of interviews, caution is warranted for extrapolation of our observations. They should be seen more as hypotheses of impacts on the grape value chain in Maharashtra. Following are implications of the COVID-19 pandemic situation – now and in the future – for grapes production, value chain mechanism and export markets:

- **Negative impact on grapes production:** As this pandemic disease is spreading quickly and is no longer a regional issue, both the lives and livelihoods of the grape growers are at risk. This will adversely influence the grapes production in the near future. There is greater risk of shortage of grapes production, unless measures are taken fast to protect the most vulnerable, keep supply chains alive etc. Restrictions on inter-state movements, lack of access to critical inputs (fertilizers, pesticides, machinery etc), migrant labour and quarantine issues etc., could affect the production adversely. The harvesting season (January to April) of Thompson seedless – a one of the predominant varieties cultivated in Nashik coincides with the lockdown period and this restricts peoples' access to sufficient and nutritious sources of food. Although less production of high value commodities (i.e. grapes and other fruits and vegetables) is already likely in Maharashtra, they are not as yet noticeable because of the lockdowns and disruption in the value chain.
- **Declined domestic demand for fresh grapes:** Due to COVID-19, the domestic demand for grapes and other fresh fruit and vegetables will probably decrease. The decline will be a result of a number of factors: deterioration of consumer mood, worse income situation of many households, temporary closure of schools and colleges (fruit juice shops at schools and colleges), reduction of sales at local mandis, limited activities in the food service due to closure of shopping malls, movie theatres, restaurants, marriage halls, temples etc. The introduction of temporary border controls may additionally cause some difficulties to increase market supply beyond local demand and this leads to price crash. The dynamic increase in purchases mainly concerns products with a long shelf life, including raisins, grape wine, and other processed fruit products, and to a lesser extent fresh fruit (grapes) and vegetables. Disturbances in the supply chains (Figure 13) could take a particularly negative toll on fresh grapes and other products with short shelf lives (such as tomatoes and cucumbers) in Maharashtra. So, the

spread of COVID-19 in Maharashtra has had adverse impact on the fresh grapes and not regarding processed grape products.

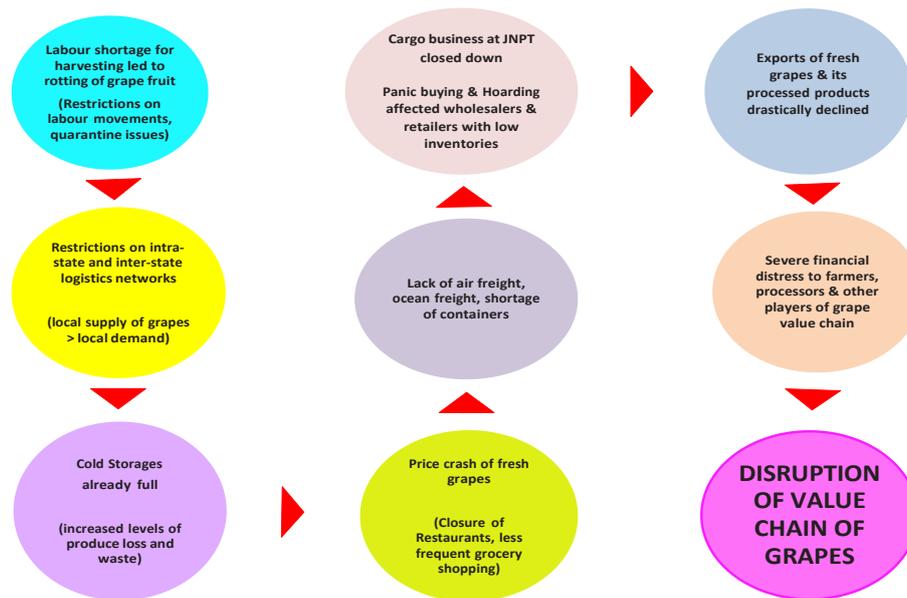


Fig. 13: Sequential Steps leading to Disruption of Value Chain of Grapes in Maharashtra

- Logistics bottlenecks and under-utilization of existing processing equipment:** Up to March, 2020 ending, the value chain disruptions are minimal, as grapes supply has been adequate and markets have been stable. However, since April, 2020 the challenges in terms of logistics bottlenecks (not being able to transport grapes from point A to point B) are on the rise and this greatly affected the flow of produce through the value chain. This is mainly because of the restrictions of movement as well as basic aversion behaviour of workers to work in groups that impeded farmers from farming and market players - who handle the produce beyond the farm gate till it reaches the ultimate consumers. Further, closures of restaurants and less frequent grocery shopping diminish demand for fresh grapes. The under-investment in value chain particularly in processing of grapes and under-utilization of existing processing equipment will further amplify the disruption of grapes value chain.
- Transportation restrictions:** In the fruits sub-sector and especially in case of grapes, due to transportation restrictions, the implications can be quite complex. Due to grapes' delicateness and extreme perishability, the losses due to limited transportation logistics are severely high, though some major mandis are kept open for market transactions at different locations within the State and upcountry markets. Blockages to transport routes are particularly obstructive for fresh grapes supply chains and may also result in increased levels of produce loss and waste. Harvested grapes are found rotting as there are no trucks available to transport the fruit to neighbouring States like Telangana, Karnataka, Andhra Pradesh, Gujarat, Delhi and Tamil Nadu. Though Farmer Producer Companies (FPCs) have been allowed to sell fresh grapes in local markets, they cannot consume the excess production. Fresh grapes, which are highly perishable and therefore need to be sold, processed or stored in a relatively limited time are at particular risk. Added to these, the sanitary measures are difficult to abide during transportation and this can generate a domino effect throughout the value chain in terms of supply of grapes, in general, and the availability of specific variety in particular (say, suitable for

processing into wine). So, due to the restricted transportation and border closure issues, the cargo owners may demand higher prices. On the contrary, the reduced demand in restaurants and hotels can generate significant market changes – affecting prices. These consequences will on the whole adversely affect the flow of produce throughout the value chain in general and are likely to impede farmers' access to markets, curbing their productive capacities and hindering them from selling their produce.

- **Panic buying of processed products:** It is interesting that the recent outbreak of the coronavirus has greatly affected people's behaviour. On the demand side, people are stockpiling shelf-stable food, like processed fruits and vegetables. On the supply side, the processing companies are struggling to meet this demand due to labour and logistics capacity issues. With the outbreak of COVID-19, people started to buy huge amounts of shelf-stable and processed food. This panic buying has positively affected the demand for processed fruit juices and products. This is so because with the outbreak of COVID-19, it has become all the more important to have a strong immune system. The new research* suggests that besides orange juice, grape juice may be an immune system booster, too and the people who sipped Concord grape juice daily for nine weeks had higher blood levels of a special type of infection-fighting cell. However, the people prefer to have small can sizes (say up to 5 kg) of processed fruit juices (say, grape juice) and with the closure of restaurants, the demand for bigger cans has drastically decreased. This forced the juice and wine processing units in Maharashtra to cancel their prior orders for fresh grapes from the farmers. So, the farmers have had many order cancellations, forcing them to redirect produce to sell as table grapes. On the negative note, panic buying and hoarding in some parts of Maharashtra added to worries that wholesalers and retailers, whose inventories are small are wiped out of the business.

Considering the importance of grape juice in improving the human immune system, the sales of grape have increased. So, the majority of bottling companies in Maharashtra are focusing on the production of grape juice along with orange juice, as exotic ingredients are hard to source. Raisins were also in higher demand (and had higher prices as a result) because of the idea that they strengthen the immune system.

- **Labour force shortage:** In major grape producing areas like Nashik, Sangli, Solapur, Osmanabad and Pune districts of Maharashtra, labour are not available to harvest the produce since last week of March, 2020. Limitation of movement is one of the main reasons, but also fear of infection by workers. Almost all the farm workers are locked in their houses. This also has stopped the production and processing activities in almost all the grape orchards. So, the orchards cannot bear new fruits in the ensuing seasons and they are to be uprooted. Some of the farms in Nashik have harvested grapes during first fortnight of March due to fears that they would not have enough labour. This resulted in lower quality products and problems in supply chain logistics.
- **Price crash:** Since mandi operations have almost stopped, the grape farmers are in panic because ripened grapes will rot. Further, farmgate prices are plunging, as many PHCs have halved the price they pay farmers, while remote farmers are not even finding buyers. The Horticulture Officers are of the opinion that this situation is worse than demonetisation, which

<https://www.sharecare.com/health/juices-health-nutrition/article/boost-your-immune-system-concord-grape-juice>

only delayed payments and did not damage the crop. But this pandemic led to much more losses because of harvesting time for grapes. Considering the severity of spread of pandemic in Maharashtra, the State is not allowing the farmers to harvest, go to market yards and preventing buyers to buy, though the Centre is emphasizing on allowing the essential services. Prices of fresh grapes have fallen by 15-20 per cent in the open market, as bulk demand from hotels and restaurants has nosedived and there is uncertainty over exports. Further, around 35,000 tonnes of fresh grapes of Maharashtra to be exported into the international market got affected, as the customs gates of Netherlands, Russia, UK and China were closed due to the Corona virus epidemic. In December, 2019 China first suspended customs clearance of goods at its border gates to prevent spread of the disease, resulting in congestion of goods in India - China border gates. So, the export of grapes and its products from Maharashtra to China are greatly affected. All these resulted in glut and consequently there is severe price crash of grapes (and other fresh fruits) in the domestic market. Due to non-availability of adequate quantity of grapes suitable for winemaking for the processors, the firms have started approaching the Government, seeking loan restructuring and financial incentives to survive. However, there is more demand for processed products like grape juices, raisins and wine that have longer shelf life.

- **Declined exports:** Around 35,000 tonnes of fresh grapes of Maharashtra to be exported into the international market got affected, as the customs gates of Netherlands, Russia, UK and China were closed due to the Corona virus epidemic. In December, 2019 China first suspended customs clearance of goods at its border gates to prevent spread of the disease, resulting in congestion of goods in India - China border gates. So, the export of fresh grapes from Maharashtra to China are greatly affected. All these resulted in glut and consequently there is severe price crash of grapes (and other fresh fruits) in the domestic market. Though farm-gate prices of fresh grapes have fallen due to scare of COVID-19, the demand for processed products has not been affected both in the domestic and international markets. This is because, as of now, there is no dearth of stock of produce (processed grape products) lying in the supply chain, as most of the exporters and the traders across the country generally keep a buffer stock of 45-60 days. So, presently, the supply chain is fully geared up and be able to deliver goods and hence, packaging and dispatches for exports of grapes and its products have not decreased. However, with the problems reported in the logistics sector (say, lack of air freight, ocean freight, shortage of containers etc), the export price of grapes at farm gate has fallen from about Rs. 100 per kg to Rs. 70-75 per kg. This situation may further get worsened in the future, as majority of workers are not reporting for work insisted by the Government to fight against the coronavirus pandemic. So, with the expected steep reduction in demand due to sudden stoppage of exports and imports and also domestic sales due to the closure of restaurants, malls and retail showrooms, the grape industry is likely to face unprecedented and severe losses. Recently, the European Union (EU) has eased rules for import of fresh fruit and vegetables from India. It has done away with the requirement for a physical certificate assuring food safety, and animal and plant health standards. That is, before this relaxation, the EU has strict phytosanitary requirements to prevent the entry and spread of organisms harmful to plants and plant products into its country from other countries. So, to export any specified plants or plant products, including fruit and vegetables and wood products to EU,

the consignment must be accompanied by a plant health certificate issued by the relevant authorities of the exporting country (say, India). Now, after giving relaxation, only an online certification will be enough. That is, the EU has begun accepting online or e-certification for the products (fruits and vegetables viz., Indian walnut, grapes and gherkins) they are already importing from India. This relaxation comes in the wake of global trade disruptions due to the spread of the Covid-19 pandemic. This is a reciprocal measure for India continuing to import from the EU. So, India exported grapes worth \$334.79 million in 2018-19, with The Netherlands, Russia, UK, Bangladesh and Germany being the major destinations. However, the exports of grapes to the USA and Japan will suffer as they send inspectors before finalising their orders. Now, their inspectors are not coming due to the travel bans and hence, there are no export orders.

Thompson Seedless variety, which are green in colour, and Sharad Seedless and Jumbo variety, black coloured ones from Maharashtra have become an integral part of certain French sparkling wines and Australian wines. Even as some grape exporters are engaged in setting up sustainable business practices with European importers, these varieties have found favour in France and Australia despite both origins being major grape producers. Exports of concentrated grape juice and even dried grapes have shot up considerably from Nashik, Sangli and Ahmednagar to the Netherlands and the European Union. That is, the European Union is the largest international market for Indian grapes from Maharashtra. In 2018-19, while grape (fresh) exports from India to the Netherlands were the highest, Russia and UK secured the second and third spots respectively. Similarly, India also exports significant quantity of grapes (fresh) to China and in 2018-19, it amounts to 2677 M. Tonnes worth of Rs. 38.60 crores. Though India also significantly imports fresh grapes from China to the tune of 1307 M. Tonnes worth of Rs. 11.45 crore during the same year, it enjoys net exporter status for fresh grapes. Before this COVID-19 pandemic, India sees a window of opportunity for agri-exports to China, as the latter targeted US agricultural imports amid a trade war between those two countries. However, with the advent of this pandemic, Maharashtra's grape growers are in a tight spot with the export of about 35,000 tonnes stuck to these countries due to the coronavirus spread. As of 20th March, 2020, Maharashtra has exported over 74,000 M. Tonnes of grapes to various countries, compared to 89,000 M. Tonnes in March 2019. The maximum number of grape consignments have gone to the Netherlands (48,000 M. Tonnes) followed by the UK (9,800 M. Tonnes) and Germany (8,835 M. Tonnes). However, as on 20th March, 2020, almost 30 per cent of the grapes are still in the fields in Maharashtra. This would amount to about 25,000-30,000 M. Tonnes of export of quality grapes. Labour restrictions, non-operation of cargos and closure of borders due to severe coronavirus spread in Maharashtra adversely affected both grapes harvesting and exports. Lockdowns and depleting demand for grapes abroad is also a cause for concern for farmers. The demands from supermarkets in the UK and Germany has gone down drastically.

- **Adverse impact on Cargo business:** In Maharashtra, the cargo business got negatively impacted by 20 to 30 per cent since 20th March, 2020. That is, export and import business through sea and air has been affected. As the cargo vessels at Jawaharlal Nehru Port Trust (JNPT) primarily arrive from China, Thailand, Hong Kong, Singapore, Japan, South Korea, Vietnam, Indonesia, Malaysia, Nepal, Italy and Iran (these countries are also battling against the COVID-19), the port officials have been taking all precautions to prevent the spread of

coronavirus at JNPT. However, since 1st April, 2020 the cargo business has been virtually closed down at this port. Only oil vessels are coming at JNPT, as this business has not been much impacted because of coronavirus. The export of processed grape products (raisins, grape juice and grape wine) was drastically declined to Netherlands, Russia, UK, Germany, UAE, Saudi Arabia, China etc., due to the closure of JNPT. Due to the multitude of possible scenarios, it is difficult to clearly assess the possible scale of coronavirus impact on the fruit and vegetable sector in Maharashtra. Even in future, the logistics problems and concerns about the quality of products from this State, will cause some recipients to demand additional security certificates and this may result in some of the demand switching to other fruits growing countries. The effect of that rise in the demand may be negligible in the case of a scenario of control of spread of COVID-19 in India in general and in Maharashtra in particular due to frequent lockdowns imposed by the Government of India. However, serious concerns will be experienced to have imports from China ports for grapes and other commodities like apples, pears, tagetes (marigold flower) seeds, animal feeding, kidney beans, bamboos, wheat gluten, apple juice etc., as the COVID- 19 outbreak was first identified in Wuhan, China, in December 2019.

- **Severe financial distress:** The current lockdown in the country due to the coronavirus pandemic has hit grape growers in Maharashtra hard. With no buyers in sight, the growers are forced to leave their fruit which is ready for harvesting on the grapevines itself. During the crisis of the Covid-19 pandemic, growers of seedless grapes are now looking at the option of drying and converting them into raisins which has huge market demand. Hot weather is the best suited as it can be stored away till the growers find a market. So, the ICAR- NRC- Grapes, Pune, has advised grape farmers, who were unable to harvest or sell their produce due to Covid-19 pandemic to convert 'table grapes' to 'raisins' by drying the berries on the vine. Around 40000 ha of area growing grapes in Maharashtra are yet to be harvested at a time when there is no manpower. This means that around 10-12 lakh metric tonnes of grapes are still on the vine. However, the firms who are now considering processing these grapes into raisins find that the rates of chemicals which includes dipping oil (potassium carbonate) have gone up and are in short supply. As a result, 50 litres of dipping oil which was earlier available at Rs 8,000-8,500 is now available at Rs. 11,000. Further, as mentioned earlier, the marketing of grapes has been badly affected due to the outbreak of Covid-19. In February, 2019, grape exports had touched 7,893 containers which is around 1,05,965 M Tonnes, while this year, the exports have gone down to 6,110 containers, which is around 81,810 M. Tonnes. Thus, there is a gap of nearly 1,733 containers which is around 24,155 M. Tonnes. The farmers who had already sent containers to markets found that these have been closed due to Coronavirus fears and have remained unsold. It was estimated by the DoH that nearly 40000 ha of grape cultivation in Nashik, Sangli and Solapur has been affected due to the Covid-19 outbreak. One of the remaining 60000 ha, growers estimate that they may manage to sell grapes from barely 10000 ha. Harvesting remains in around 14000 ha in Nashik, 2700 ha in Sangli, and 11000 ha in Solapur. Therefore, farmers are looking at processing the grapes from 30000 ha to raisins and these are in addition to the regular raisin processors. Lack of export and no takers in the domestic market have posed a double whammy for grape growers. Majority of grapes are grown for table purposes, and now, farmers do not know what to do with the produce. The NRCP, Pune further suggested that raisins could be made from harvested grapes. Whether

the grapes are on the vine or harvested they have to be dried to convert them into raisins. To convert grapes into raisins, farmers have to spray a chemical on the grapevine and allow the grapes to dry. The process of drying takes about 12 to 14 days. So, farmers can let the grapes on the vines to dry. Then dried grape bunches could be harvested once manpower is available. If the grapevines are left as it is without subjecting them to the drying process, grapes on the vine may begin to rot or dry. In an effort to address the livelihood concerns, the State Government has permitted some industries including food processing (juice and jam manufacturers) to operate. Above these, the storage issues are also on the rise in Maharashtra, as all the cold storages for grapes are full and have another 300-400 containers and exporters have stopped packaging of these grapes. The shortage of dipping oil has hit these grape growers hard and in the absence of shade nets, they are drying out the grapes without the use of any dipping oil. The pack for storing raisins are in short supply as well. So, grape growers from the state are seeking a loan waiver and grants to overcome financial distress.

- **Effects on market players in grape value chains:** The major market players of grape value chain in Maharashtra viz., PHC, wholesalers and processors are being watchful during this pandemic and trying to do the best they can to minimize the adverse effects on them and hence, on the public. They are careful and resorted to panic buying (the action of buying large quantities of grapes due to sudden fears of a forthcoming shortage), as the scope for labour availability to harvest grapes is less. Now, in the ensuing two to three months say, up to June, 2020 the two agencies viz., PHC and wholesalers continue their business operations and focussed towards sale of fresh produce directly to processors, as processed products (raisins, grape juice and wine) have higher market demand in the context of promoting immune to the consumers against coronavirus. However, the retail business of fresh grapes have taken a hit, as the State Government shuttered non-essential businesses, including restaurants, and set strict limits on numbers of people allowed to gather. Retail grocery stores, however, remained open, and that's the heart of the fresh and processed grapes market. Presently, the food service to customers is only through organized retail stores and hence, most of the movement is on retail sale of processed products of grapes. As food-safety protocols are also being implemented in major retail stores of urban areas, there is no reason to be afraid of purchasing and consuming fresh produce and hence, this market is being exploited by the PHC and wholesalers in Maharashtra by selling the produce to grape processors. Further, as fresh grapes are being offered through sealed plastic covers in organized retail malls, there is less scope for this foodstuff to serve as vector for contaminant. Even the urban customers are also not panic about this, as the market players are even working vigorously to meet their nutritious needs during this challenging period.
- **Effects on informal sector:** The major workforce in the food systems in India in general and in Maharashtra in particular is from the informal sector. They include agricultural, migrant, and other workers who entirely depend on daily wages as a mode of living. These vulnerable groups and their families will be the hardest hit during these unprecedented times. Even though the sudden imposition of the country-wide lockdown was a wise move to contain the spread of the coronavirus, local food systems especially the grape value chain were disrupted. The worst part of the country-wide lockdown was that it coincided with the grapes peak harvesting time (January to April/May). When no labour were allowed to work during this

lockdown period, the entire hard work of grape growers went to waste. In Nashik and Pune areas of Maharashtra, the farmers even engaged student volunteers to harvest their crops. The farmers were forced to sell their produce for a lower price as storage facilities were overflowing. Even the bumper harvest of grapes made so far in Maharashtra got hobbled due to shortage of labour and transportation bottlenecks. The produce already transacted to the local mandis during second fortnight of March, 2020 could not be offered for sale due to absence of facilitative middlemen to load and unload the produce. The farmers and traders found it difficult to transport the fresh grapes across the states, as the panic mode prevailing in the country made the workers and drivers to flee to their homes. So, both the farming and marketing activities to a standstill owing to the shortage of labourers.

Chapter-IX

Post Covid-19 Strategies for Building a Resilient Supply Chain for Grapes

India has begun work on a continuity plan to kick-start both domestic and export trade of grapes, once the country emerges from the shadows of the Covid-19 pandemic. The plan aims at building a resilient supply chain for grapes so has to a proper balance between current state efforts and a long-term foundation for resilience. The plan should also envisage cutting down import dependence, especially from China, by focusing aggressively on substitution while improving safety compliance and quality goods to gain global market share. For example, India is importing grapes significantly from China to the tune of 1301 M. Tonnes worth of Rs. 11.45 crore. So, the country had an arduous task ahead to recover from this viral outbreak. Though COVID-19 has exposed the vulnerabilities of grape supply chains, it has given the immense opportunity to identify the blockages and thereby to plan to strengthen trust across a range of market players for enhancing their efficiencies further. As this pandemic may likely have an extensive and long-term influence on the production and marketing (both domestic and export) of grapes, it may be hard both for the Central as well as State administrations to deliver any further backing of the market players and logistics due to limited fiscal leeway. Thus, the post-COVID planning to build a resilient value chain for grapes needs to be constructive and productive embracing quick, smart and innovative approaches to enhance production on one hand and effective linking of the market players on the other. So, based on the developments from this pandemic, coupled with learnings from past disruptive instances, below are some key pillars to help market players build a resilient supply chain for grapes in India and with special reference to Maharashtra (Figure 14).

- **Re-assessment in supply chain strategies:** The scientific community agrees that major outbreaks of communicable diseases, like COVID-19 will be highly likely in the future, according to the World Health Organisation (WHO). Furthermore, there are also chances likely to experience additional disruptions to supply chains that result from climate change and political instability. So, there should be a thorough re-assessment of present supply chain strategies. Each market player of grape supply chain should re-assess their 'disaster plan' armed with the knowledge from this crisis of just how much degree of their value addition got affected. It is essential to immediately structure and apply the lessons learnt to build a resilient supply chain for the future. This corona pandemic helped the market players in getting awareness about the inherent risks in the grapes supply chain, and thus helps to formulate suitable recommendations to design a newly structured and more reliable supply chain setup.
- **Redefining the Roles of Government agencies:** First, the role of Government agencies must be reinforced decisively. It was experienced that, no country, rich or poor, has ready capacity to handle a pandemic like that requires a 'whole-of- country approach' all at once. The impacts due to pandemic are very different for different metropolis, cities, towns and villages. Therefore, to re-build an efficient and resilient supply chain for grapes, a range of innovative approaches and targeted strategies have to be developed to promote both grapes production and supply across the value chain. As this pandemic affected all stages of grape crop growth

(crop cycle), availability of resources and resource services, logistics and the entire farm value chain, the Government agencies have to be empowered to be able to provide the administrative network and infrastructural support needed for all the firms to operate at economies of scale. It is high time to the Government should enhance the role of the corporate sector more in Public-Private Partnership (PPP) projects to enhance markets and players connectivity and strengthening global supply chains with viability-gap funding to make those investments profitable. To promote transportation logistics especially for fresh fruits like grapes, special trains should be provided with refrigerated coaches to provide a smooth supply chain.

- **Focus on nutrition security:** This should be the top concern, especially when a significant proportion of the population could not have access to nutritious food during major outbreaks of communicable diseases like COVID-19. The lack of availability of inputs, labour, machinery, credit etc., can all lead to major disruptions in the grapes production cycle. So, giving more emphasis on the access to these inputs and at the same time showing concern towards non-degradation of natural resources, especially soil, water and agro-biodiversity is essential. So,

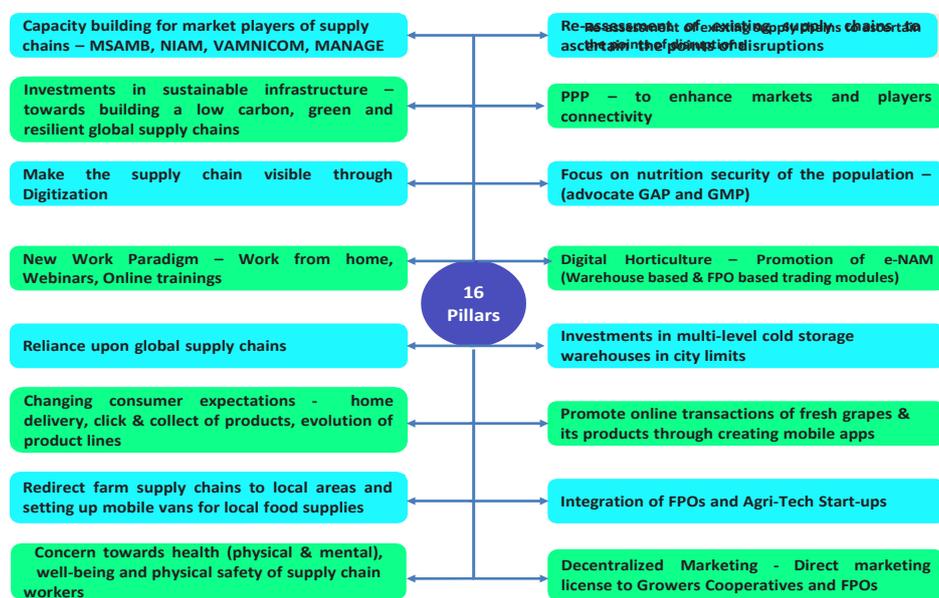


Fig. 14: Pillars to build a Resilient Supply Chain for Grapes in the post-COVID regime

- **Digital Horticulture:** Horticulture sector has to embrace digital tools more quickly. Although online applications have been influencing many aspects of the society, it has not yet been given a priority in the horticulture sector to advocate GAPs and GMPs about the commodities (say, grapes) in horticulture sector. The pandemic has shown the immense value of digital tools and horticulture cannot be left behind. Especially for countries, where fruits production and supply involves many smallholder farmers, systematic application of digital tools can support sustainable production, quality control, price support and timely supply. Digital Technology, like Artificial Intelligence (AI), Big Data Analytics, Blockchain Technology, Internet of Things etc., can play a transformational role in modernizing horticultural activities. The Digital Technology especially through the development of mobile applications helps to disseminate valuable information regarding grape farming, crop related advisories through SMS and online portal, launching an online trading platform, provision of subsidies etc. Better connectivity through digital means can unlock wider opportunities for the Government’s interventions, PPP interventions, stakeholders participations and the farmers both in production and trading

aspects of the fruit crops. This is especially true in case of grapes, as its export market through Mahagrapes already gained the attention in the global market.

- **Promotion of electronic National Agriculture Market (e-NAM):** The lockdown experience has further strengthened the need for expanding role of Electronic National Agricultural Marketing (e•NAM), an important initiative by the Government introduced during 2016. It is high time to promote e-NAM across all mandis to decongest wholesale markets and to make supply chain agile. This also helps to enhance farmers accessibility digitally to multiple number of markets and buyers and to bring transparency in trade transactions with the intent to improve price discovery mechanism, quality commensurate price realization. In a bid to mitigate the challenges faced by stakeholders, especially farmers, during the lockdown, the Ministry of Agriculture has initiated several steps to decongest wholesale markets and to make supply chain agile that includes recently launched modules under e-NAM.
 - o Warehouse based trading module in e-NAM software to facilitate trade from warehouses based on e-NWR. That is, it will enable the farmers to sell their produce from Warehousing Development and Regulatory Authority (WDRA) registered warehouses through uploading produce from collection centres with picture/quality parameter and also avail bidding facility without going to mandis, which will reduce their logistic costs and hassle to sell their produce.
 - o FPO based trading module in e-NAM whereby, FPOs can trade their produce from their collection centre without bringing the produce to APMC.
 - o States can also initiate farm gate trading through e-NAM platform whereby farmers are uploading the details of their produce along with picture for online bidding without reaching to the APMC.
 - o In order to debottleneck logistics of agri-produce and providing adequate and timely transportation facility to the farmers/traders during lockdown period, e-NAM platform has created an interface with large transport aggregators like Blackbuck, Rivigo, Mavyn, Truck Suidha, Truck Guru, Transin Logistics, Elastic Run etc. This would help traders to find and arrange timely movement of produces from mandi to various other locations. With this interface, Traders would be able to access more than 7.76 lakh trucks through eNAM Platform.
 - o e-NAM platform/mobile app has been further strengthened with 'Farmers friendly' features such as advance registration of the lot through app which in turn will reduce waiting time for farmers at gate entry of the mandi and will bring huge efficiency and will facilitate smooth arrival recording at gate.

A total volume of 33.9 m. M. Tonnes worth Rs. 1 lakh crore involving 228 mandis across 12 states was traded on the e-NAM platform as of March- end, 2020 benefiting more than 11.8 million farmers.

- **Collective Action by the Government and Cooperative Organizations:** On the farmers' front, all farming operations – including procurement and marketing – abruptly stopped because of the lockdown. On 27th March, 2020 the Government of Maharashtra has exempted all production, harvesting and marketing activities from the lockdown rules. In addition to

this, input and fertiliser shops, and input manufacturers were also exempted. But due to fear of infection from COVID-19, the shops selling these inputs remained closed and no labour attended the works. So, keeping the pandemic in mind, the DoH, MSAMB and National Bank for Agriculture and Rural Development (NABARD - encourage FPOs) and MSGGA (encouraging grape growers cooperatives), jointly initiated steps to tackle this problem through convergence of their respective roles and responsibilities. They all approached grape growers cooperatives and FPOs (involved in grape farming) and were asked to share their readiness to extend services during this lockdown, with regard to quantity of grapes available, offered price per kg and expected volume of order to deliver doorstep services to households. So, collective action by the Government and Cooperative Organizations enabled both the FPOs and grape growers' cooperatives could transact a lumpsum quantity of table grapes packages based on the online purchase orders received from the local customers. In addition to these collective efforts, FPOs and grape growers' cooperatives developed their own mobile apps for online marketing of fresh grapes. This online marketing is very convenient for them to extend their services to consumers and thereby create a database of consumers for future transactions. To support these transactions in the State, the Public Transport Department has developed a system for issuing a vehicle e-Pass through the link: covid19.mhpolice.in. In addition to this, MSAMB set up the 'Inter-State Fruits and Vegetables Control Room' with a toll-free number - 1800-233-0244 - to manage smooth movement and dispute settlement, if any. This collection action has yielded fruitful results through transacting 222 M. Tonnes of fruits and vegetables have been sold during 27th March to 15th April, 2020. Amidst the lockdown, the FPOs are exploring alternative marketing channels to connect directly with consumers. For instance, Sahyadri Farms of Nashik, a leading FPO with 1,200 farmers, reportedly sold vegetables and fruits worth over Rs. 4 crore during the lockdown by establishing a direct link with 57,000 customers. In a social isolation environment, growers' collectives such as FPOs can work as the only trusted connect between farmers and consumers. Although many FPOs have been established in the country with the support of the Union Government, more farmers need to be included. This lockdown provides an opportunity to focus on making the agriculture supply chain robust in all circumstances.

In addition to this, MAHA-FPC, a State Level Producers Company (SLPC) also initiated a movement in collaboration with district administration and municipal corporations. They have developed a core team comprising of Nodal Officer, Sale Planner and Manager, Department of Agriculture, Municipal Corporation, Regional Transportation Office Coordinator, FPCs Coordinator, the Managing Director of MAHA-FPC and Chief Executive Officer (CEO) to successfully facilitate the smooth delivery of daily stuff (rice, vegetables, fresh fruits like grapes, mango etc) to consumers across the State.

- **Agri-Tech Start-ups:** Agri-Tech start-ups in India are changing the landscape of Indian agriculture. These start-ups are coming up with technology-integrated platforms to address supply-demand asymmetry issues. In the backdrop of the lockdown one such start-up - AgSource: Global Agri Trade Pvt. Ltd., a joint initiative of Ag-Source Group' and Vegetable Growers Association of India (VGAI), - began working as 'farmers marketing and customers' procurement arms' to provide the best quality veggies and fresh fruits to customers at their doorsteps. This is especially true during this lockdown period as the group is more active

and vibrant and meeting the requirements of the people of the State. Daily 200 'fruits and vegetables baskets' (standard package for a week of 10- 15 kg each, and customised package as well) are being delivered to housing societies in Pune and Mumbai as per the orders received from the customers. This WhatsApp group is not only meeting the needs of people but also creating awareness by sharing precautionary messages and images. In addition to this, there may be many more such start-ups, who come forward to create their market on one side and provide food to the needy on the other. There is a Win- win situation by Integrating FPOs and Agri-Tech Start-ups. On one side, FPOs are demanding appropriate and advanced technology for improving efficiency of their business operations besides technology for improving farm productivity, and on the other side, many agri-tech start-ups are ready with their prototypes but find no end users.

- **Decentralised Marketing:** This is the need of the hour – to develop a resilient food value-chain system, and in practice to achieve the concept of a 'farm to fork' and 'fork to farm' approach, where producers' collectives especially Grape Growers Cooperatives and FPOs can reap benefits of the agri-value chain directly. The Government of India and the respective SAMBs – the agency responsible for issuing direct marketing license – should pay attention to this and devise a criteria for issuing direct marketing license for all Grape Growers Cooperatives and FPOs across the country.
- **Capacity Building of Grape Growers, Cooperatives and FPOs:** In Maharashtra, both the Grape Growers Cooperatives and FPOs lack the capability to do agri-business activities professionally and to withstand disruptions in supply chains that result from climate change and corona pandemic. They need to be trained on the Governance, Financial Management, Business Development Plan, and Leadership aspects to run and manage their businesses effectively and efficiently, and thereby make them competitive and sustainable. The Vaikunth Mehta National Institute of Cooperative Management (VAMNICOM), an apex training institute for producers' collectives, National Institute of Agricultural Marketing (NIAM) and National Institute of Agricultural Extension Management (MANAGE) shall undertake such trainings.
- **Investments in sustainable infrastructure:** Infrastructure investments are an effective way to boost economic activity and create jobs. Due to financial crisis amidst corona pandemic, India should take the opportunity to increase support towards green measures such as renewable energy, particularly rooftop solar, through appropriate policies and business models. Decentralized solar power can help spread critical services in remote regions, if the upfront capital constraints can be addressed. Similarly, continued investments in cold storage facilities and in supply chains will ensure the preservation and timely delivery of agricultural produce and reduce losses to farmers. Further, the Government should explore approaches for building a low carbon, green and resilient supply chains. Environmental protection and provision of ecological services should be viewed as key components of economic growth rather than viewing environmental protection as a competitor for achieving economic growth. The Government should also encourage more PPPs in providing these green measures, as the private sector is not looking for any subsidies rather they are looking for a facilitative business environment. For example, with the advent of The Model Marketing Act, it will also allow private markets to come in and they shall be provided a level-playing field on par with the public sector markets and this should be a sufficient incentive for them. The Act also talks

about the PPP model that means those sub-market yards, which are under the APMCs and not utilized today, can be utilized to promote PPP model of APMCs.

- **Make the Supply Chain Visible through digitization:** Supply chain visibility is crucial to understanding the impact of disruption. So, digitizing records will make supply chains more resilient to future shocks. Obtaining this visibility is considered key to optimizing supply chain efficiency and agility during normal production. When critical supply chain disruptions hit, this visibility becomes crucial to understanding the impact of the disruption on the rest of the chain so that others in the ecosystem can plan and take action, such as developing routes to alternative suppliers. Because COVID-19 has led to lockdowns, suppliers in the chain are temporarily ceasing production, and logistics providers can no longer transport goods as seamlessly, particularly across borders. To achieve visibility across the entire value chain, the trade should move away from paper to digitization. This is because, protective measures for COVID-19 have made clear that operations dependent on physical assets, such as paper, can face serious disruption when physical presence of individuals is not a possibility. Wet signatures and paper printouts are usually handled by operations personnel who must come to the office (banks, markets etc), or another place of work, and coordinate with others. In addition, value chains that rely on information in these paper documents lose access to that visibility very quickly and cannot react to changing conditions. So, digitizing the transactions and records ensure visibility and managing supply chain risk. To address the points of disruptions in the value chains, it is important to make data available through digital means. In the current COVID-19 pandemic, Governments and businesses with strong digital infrastructure and enabling regulations such e-signature and e- transactions laws, are dealing with the supply chain disruptions much better than those without. However, the stakeholders have yet to digitize their supply chain processes because, they have determined the cost of doing so does not bring enough efficiency or security to justify the endeavour. The other important reason, why upstream suppliers will not reveal (reliable) information to end customers, even if it's easy for them to do so, is that they fear losing commercial advantage if their customers know even more about their operations, pricing and sourcing. Suppliers have to be able to control exactly who receives what data from them, and independently verify such controls. Both domestic and global trade and supply chains are going through an unusual and massive shock, which strikes from both ends – the supply and the demand side. Companies, whether buyers or suppliers, are facing tremendous challenges in keeping the goods and services flow at a time of global lockdowns. Countries, especially developing countries like India, are carrying the direct consequences of supply chain breakdowns aggravated by trade restrictions. As the COVID-19 situation changes daily, it's crucial for all parties to have visibility into the supply chain, to share data, and communicate effectively. Technologies accompanied by enabling policies can play a significant role in rebuilding the trade and supply chain system, and making the supply chain more shock-proof in the decades to come.
- **New Work Paradigm:** The rapidly spreading coronavirus has prompted for remote working of scientific community (agri-extension related works), heralding a new era in the future of work. Both National and State level institutions alike were nimble enough to adapt to 'working from home', during the early days of the pandemic. Remote working affords the agri-extension professionals and researchers an opportunity to reshape and reassess, how

best they can train the scientific community, farming community and grass-root level agri-extension officers in promoting agri-business. This new work culture also facilitate global connectivity. Such developments are welcome during a pandemic of this scale and the public and private institutions will facilitate reorienting their workforce for critical new learnings that don't involve in- person meetings. Businesses—especially startups—have to create an enabling environment that harnesses productivity. While the reality is that a sharp decline in productivity and business continuity is expected from the virus scare, organisations should adopt strategic measures to ensure continued business growth. In the current times of social distancing, remote participation by the workforce in collaborative efforts has been made possible by virtual web conferencing/meeting tools. Also, technologies such as cloud telephony and cloud-based document sharing have made communication between teams seamless and flexible.

- **Reliance upon global supply chains:** In the context of corona pandemic, there will be re-assessment of existing supply chain strategies of fresh fruits. It is important to rely upon global supply chains, as they will reduce, particularly on single sourcing of components, raw materials and finished products. Subsequently, this could also potentially lead to more positive encouragement of domestic production, processing and exploring the export opportunities. To capture the global market, efficient production counts much and this paves the way for adoption of modern technology and automation.

In the wake of the COVID-19 outbreak, the Government of India has identified 21 agricultural products, including honey, potatoes, grapes, soya beans and groundnuts, in which Indian exports could benefit from trade restrictions against Chinese goods. The total value of China's global exports of these products amounted to \$5488.6 million in 2018. India exported \$4,445.9 million worth of these commodities in the same period and could now have a chance to grab part of China's market share. So, there may be opportunities for Indian exporters of agri-items, in case some countries impose restrictions on Chinese goods in response to outbreak of COVID-19. Present supply shortages and trade restrictions have already had a harsh impact on China's total exports, which dropped more than 17 per cent in January and February, 2020 in comparison to the previous year. Chinese imports fell 4 per cent in the same period. There are 21 agri-tariff lines where China's global exports and India's global exports are more than \$25 million and where India is price and volume- wise competitive and capable to provide an alternative. Some of these products include natural honey, onions and shallots, chillies, potatoes, vegetables, guavas, mangoes, grapes, tamarinds, cashew apples, lychees, black fermented tea, spices, groundnuts, soyabeans, paddy, sesamum seeds, vegetable seeds for sowing and plants used in perfumery or pharmacy. Major markets which currently buy these products from China include Vietnam, USA, Japan, U.K., Philippines, Malaysia, Russia and Korea.

The Ministry of Agriculture and Farmers' Welfare has also said that the impact of the virus outbreak on import of agri-items from China may not affect us to an extent that may lead to any crisis. India imported agriculture items worth \$109.74 million from China in 2018-19, with seven products, including kidney beans, bamboo, cassia, fresh grapes, live plants and plums, accounting for 84% of that. The import of these items are likely to get impacted in case of supply disruption occurs in wake of COVID-19. However, it may be noted that out of the top seven items, only two items – bamboo and kidney beans – are imported in bulk from China in the sense that they respectively

represent 35.5 per cent and 41.2 per cent import from China out of India's total imports from the world. In the case of those two items, India is still striving for self-sufficiency through the Bamboo Mission and the National Food Security Mission. With regard to Indian exports to China, two items — cotton linter and mango pulp — may get impacted, as they are used as raw material by China for further processing and then export. Apart from these two, most major items are used for domestic consumption in China and may not be too badly hit. India exported agricultural items worth \$191 million to China during 2018-19, including capsicum, isabgol and cumin seeds.

- Changing consumer expectations:** During this pandemic, there is significant increase in home delivery and Click and Collect of products in all the sectors. This will lead to evolution of new supply chains for several products and even for fresh agricultural produce like grapes, mangoes, apples, pomegranate etc. This scenario also affects the business firms in two ways viz., increasing business capacity in tune with the customers' needs and serving the products through on-line either for free, or at a low cost and that may be a sustainable business model only in the long run. To ensure focussed marketing, product lines may evolve, with the possibility of a reduction in consumer choice for products. Prior to this pandemic, the consumers have had the benefit of a very wide choice (tens of thousands) of products when they visit the major supermarkets. However, during post-covid scenario, there are considerable supply chain benefits in reducing the range of products available. So, the businesses explore ways to streamline product ranges (Figure 15) to increase the resilience of the supply chain, reduce complexity and make it more efficient. This is the approach favoured by discounters such as Aldi and Lidl of Nottinghamshire and though even if such exact models are not replicated, there can be moves in that direction that could increase both supply chain resilience and supply chain efficiency.



Fig. 15: Product Lines for realizing Supply chain resilience and efficiency

- Redirect farm supply chains to local areas:** As grapes is a high value crop, most farmers generally prefer to choose and invest on it only when there is market assurance and offer greater profitability. But, because cities have less operations at this point due to corona

pandemic, the harvested grapes are going waste and costs aren't even breaking even. So, the existing supply chains can be re-directed to local areas by incentivizing farmers to sell more and more of their produce in local cooperative (Mahagrapes) style channels. These cooperatives-based value chains accrue greater benefits by localizing supply-chains, lowering transaction costs, offering better-more direct prices to farmers themselves, and also changing the crop-cultivation (acreage) pattern to localized demands that are part of the community's palate.

- **Move away from cash crops:** Farmers should be incentivized to move away from cash crops (cotton, sugar cane) and move towards food crops. 'Food crops' largely consist of cereals, millets, pulses, oilseeds, fresh fruits and vegetables etc. An encouraging increase of Minimum Support Price (MSP) for some of these can allow farmers to proximately shift their cultivation-pattern towards food-based crops, which can help in addressing the larger food insecurity concern for most of those living in urban slums, or, in rural areas with limited food supplies, and, at the same time, offer better prices to farmers in local areas for food crops. Additionally, both local and State Governments must empower social organizations, NGOs, cooperative organizations etc., to supply inputs to farmers, allow direct procurement of supplies from local farmers/FPOs and then ensure a more orderly and localized distribution across communities to avoid any possibilities of human starvation, or lack of adequate nutritional supplies.
- **Increasing allocations for direct transfers:** Increasing the allocations for direct transfer to farmers through Pradhan Mantri Kisan and including everyone who is actively involved in farming irrespective of where (s)he owns a given piece of land or not, from Rs 6,000 to at least Rs. 10,000 per farming family for this year (2020-21). This will immediately help most farming families to be partially compensated for the losses seen in months of March and April and shall also give them some cushion against the deflationary effect seen on farm-prices due to the prolonged lockdown.
- **Set up mobile food vans:** To ensure food supplies are frequent, more localized and involve direct procurement of a diverse food basket from farmers, setting up of mobile food vans can be considered. As most weekly markets have now been suspended and may also find it difficult to enforce social distancing norms, mobile vans across each district can be allowed for food supplies in different societies and keep the choice of food offered to be aligned with the local palate and produce. Fruit vendors too can coordinate directly with these mobile van operators for selling off their stock and supplies. This will also allow for retail distribution to be more seamlessly linked with largely wholesale supply-lines.
- **Strengthening of warehouse infrastructure:** Apart from creating FPOs and Gramin Agricultural Markets (GRAMS), it is essential to strengthen cold storage warehouse infrastructure. The Central Institute of Post-Harvest Engineering and Technology (CIPHET) reported that India wastes a significant portion of its farm produce, with 16 per cent of total fruits and vegetables production being wasted every year. According to another study, only 10-11 per cent of fruits and vegetables get access to cold storage, leading to immense wastage and limiting the potential for export. Cold storage investments shall not only improve farmer income by allowing them to leverage better market prices, but also improve nutritional security of the country - a factor of paramount importance during this corona pandemic.

Construction of multi-level cold storage warehouses within city limits may well be the real estate's next big opportunity (through PPP model) in a market completely transformed by the Covid-19 pandemic in Maharashtra. The compulsions of faster e-commerce growth in a post-pandemic world can kick-start demand for tech-enabled multi-storey warehousing. Such solutions are already in place in South Asian countries such as Hong Kong, Singapore, South Korea and Tokyo. With the initiation of warehouse based trading module in e-NAM, the investments in cold storage infrastructure will gain momentum and these investments should be planned within the city limits considering the larger customer base and gained importance for e-commerce in the ongoing lockdown. With an uncertain post-pandemic future looming over the retail sector, retail players may now need multi-level warehouses within city limits to service cities.

- **Physical Safety of Supply-Chain Workers:** In the post-COVID scenario, introducing new marketing reforms to ensure supply chain resilience can be considered similar to opening Foreign Direct Investment (FDI) in manufacturing sector. This is essential at least now, as the agriculture sector in India is not liberated to the extent compared to the industry. So, without compromising food security, agricultural marketing is to be liberated and focus should be on accessing towards global supply chains. Above these, the market players in the supply chains should consider the health and well-being of supply chain workers, supporting their mental health and emotional and physical needs as well as their physical safety. It is extremely vital that they should be provided with adequate amount of safety kits and protective gear to be able to ensure safe, orderly distribution of supplies at less risk of virus transmission.

Concluding remarks: As agriculture accounts for 16.5 per cent of India's GDP and nearly half the population in the country depends on a farm-based income, the big focus should be on new ideas to intervene in the agriculture marketing system to ensure livelihood security of both farming population and agricultural labourers. It is high time to promote integrated markets i.e., one State should be agreeable with another State, so as to have free flow of products and ensure transparency in the supply chain. So, the Government could consider a 'single mandi tax for the country' and 'removal of levies' charged to traders and farmers when farm goods are sold from one State to another, known as inter-state mandi tax. The focus should be on making strategic interventions in the existing marketing ecosystem and bringing appropriate reforms in the context of rapid agricultural development. There should be massive scaling up of a federal e-commerce platform for farmers and traders i.e., selling through e-NAM app. As on 01-01-2019, over 1.66 crore farmers and 1.28 crore traders have already registered with it. State governments must connect their mandis with e-NAM wherever possible. For all these to happen, the existing landscape of policy incentives that favour the two big staples of wheat and rice has to change. India became the second largest producer of fruits and vegetables in the world. The horticulture sector exceeded the production of food grains with total production of 311m. tonnes. These achievements carry no meaning if they don't help producers of these commodities; per day income of farm household was only Rs. 298 in 2016-17. Coronavirus provides a big opportunity to change tack on agriculture, making it market centric.

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compared to the industry. So, without compromising food security, agricultural marketing is to be liberated and focus should be on accessing towards global supply chains. As the pandemic will not be over soon, it is essential to look for the points of disruptions in the supply chains and act accordingly. Also ascertain their root causes and how they can be strengthened. The Government should plan for reallocation of resources to support the market players across the whole supply chain and to enhance overall resilience and help any areas of the supply base at risk from operational and/or financial disruption. Government and market players of value chain should take equal responsibility to keep planning for the investments needed once this crisis passes and economies rebound, while building in the purposeful and responsible features developed during the pandemic.

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