

Contents

Acknowledgement	I
Contents	III
List of Tables	X
List of Figures	XII
List of Abbreviations	XII

Chapters	Page No.
1. Introduction	1-29
1.0 Overview	1
1.1 Horticulture and Five Year Plan	4
1.2 Foreign Direct Investment (FDI) in Indian Agriculture	5
1.3 Statement of Problem	7
1.3.1 Agricultural Problems	7
1.3.2 Irrigation-related Problems	8
1.3.3 Problems of Horticulture Sector	8
1.3.4 Problems of Wine Grape Growers	8
1.4 Significance of the Research	9
1.5 History of Grapes Cultivation in India	10
1.5.1 Basic Information of Horticulture	11
1.5.2 Horticulture Sector in India	12
1.6 Uses of Grapes	14
1.6.1 Raisin making	14
1.6.2 Juice making	14
1.6.3 Table purpose	15
1.6.4 Wine making	15
1.7 Literature Review	15
1.8 Conceptual Framework	16
1.8.1 Regional Innovation Systems	17
1.8.2 Types of RIS	19
1.8.3 The Components of Regional Innovation System	20

1.9 Regional Innovation Systems and Horticultural (Grapes Production) Sector	21
1.10 Objectives	21
1.11 Research Questions	22
1.12 Research Methods	22
1.12.1 Tools and Techniques	22
1.12.2 Data Source and Sampling Design	23
1.12.3 Selection of District	24
1.12.4 Selection of Talukas	24
1.13 Universe of the Study	24
1.13.1 Agriculture Universities in Maharashtra	25
1.13.2 Industries and Companies	25
1.13.3 Research and Development of Grapes Production	25
1.13.4 Organizations	25
1.14 Chapter Scheme	26
1.14.1 Chapter 1: Introduction	26
1.14.2 Chapter 2: Literature Review	26
1.14.3 Chapter 3: Conceptual Analysis of Grapes Producing Process in Maharashtra with Regard to Regional Innovation System	27
1.14.4 Chapter 4: Grapes Production in Maharashtra: Current Scenario and Socio-Economic Impact Measurement	27
1.14.5 Chapter 5: Overview of Manufacturing Processes of Grapes Products and its Benefits	28
1.14.6 Chapter 6: Role of Grapes in Wine Making and its Impacts on Economic Development in Maharashtra	28
1.14.7 Chapter 7: Conclusion and Findings	28
1.15 Limitations of the Study	29
Chapter 2nd Literature Review	30-71
2.1 Introduction	30
2.2 Innovation Systems	50
2.2.1 National Innovation Systems Contexts	54
2.2.2 Regional Innovation Systems Contexts	64
2.3 Co-related with above both contexts	70

2.4 Summary	71
Chapter 3rd Conceptual Analysis of Grapes Producing Process in Maharashtra with Regard to Regional Innovation System	72-104
3.1 Introduction	72
3.2 The Main Components of Systems of Innovation (SIs)	78
3.3 Interaction between Regional Innovation Systems and Horticulture Sector	78
3.3.1 Components of Regional Innovation System	79
3.4 Components of Regional Innovation System (RIS) in Horticulture Sector of Maharashtra	79
3.5 Role of Universities in Horticulture Sector	81
3.5.1 Mahatma Phule Krishi Vidyapeeth, Rahuri	82
3.5.2 Vasant Rao Naik Marathwada Agricultural University, Parbhani	84
3.5.3 Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola	84
3.5.4 Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	85
3.6 Industries and Companies	86
3.6.1 Maharashtra Agro Industries Development Corporation Ltd (MAIDC)	86
3.6.2 Jain Irrigation Industry, Jalgaon	87
3.6.3 Jaihind Agro Services A-656, Nashik	88
3.6.4 Monarch Horticulture Private Limited, Nashik	89
3.6.5 Jagtap Horticulture Pvt. Ltd. Pune	90
3.6.6 Sula wine industry, Nashik	90
3.7 R&D Centres of Grapes Production	91
3.7.1 The ICAR-National Research Centre for Grapes, Pune	91
3.7.2 Maharashtra Rajya Draksha Bagaitdar Sangh, Pune	97
3.7.3 Gargi Agriculture Research & Training Institute (GARTI) Nashik	101
3.8 National Horticulture Mission in Maharashtra	102
3.9 Summary	103
Chapter 4th Grapes Production in Maharashtra: Current Scenario and Socio-Economic Impact Measurement	105-132
4.1 Introduction	105

4.2 Plant Pest and Diseases of Grapes	113
4.3 Basic information about Grape farming	115
4.3.1 Grapes farming regions	115
4.3.2 Sub-tropical Region	115
4.3.3 Hot Tropical Region	116
4.4 Land Preparation for Grape Farming	116
4.4.1 Suitable Soil for Grape Farming	116
4.5 Nashik District: An Empirical Study	120
4.6 Geomorphology Information and Soil Types	122
4.6.1 Climate and Rainfall	123
4.6.2 Rainfall and Agriculture Crops in Nashik	123
4.7 Major Water Projects in Nashik	124
4.8 Economical Impacts	126
4.9 Social and Cultural Impacts	128
4.10 Environmental Impacts	131
4.11 Summery	132
Chapter 5th Overview of Manufacturing Processes of Grapes Products and its Benefits	133-157
5.1 Introduction	133
5.2 Value Added Products of Grapes	133
5.3 Grapes Varieties for Juice Purpose	134
5.4 Raisins	135
5.4.1 Farming	137
5.4.2 Harvesting and Drying	138
5.4.3 Quality Control	138
5.5 Technical Interventions have been adopted for Quality Raisin Production	140
5.6 Vinegar	142
5.6.1 The Orleans Method	142
5.6.2 The Submerged Fermentation Method	142
5.6.3 The Generator Method	143
5.6.4 Bascsamic Vinegar	143

5.6.5 Quality Control	144
5.7 Pekmez	145
5.7.1 The Steps of Manufacturing Process of Pekmez	145
5.8 Verjus	145
5.8.1 Manufacturing Process of Verjus	146
5.9 Benefits of Grape Seed Oil	147
5.10 Other Dried Products	150
5.11 The Process of Manufacturing Grape-seed Extract	150
5.12 Benefits of Grapes	153
5.13 Wine	156
5.14 By-Products of Grapes	156
5.15 Summary	157
Chapter 6th Role of Grapes in Wine Making and its Impacts on Economic Development in Maharashtra	158-191
6.1 Introduction	158
6.2 Contribution of Wine Parks	167
6.3 Indigenous Wine Production in Maharashtra	169
6.3.1 Chateau Indage	169
6.3.2 Sula Vineyards	170
6.4 Premium Reds	171
6.4.1 Dindori Reserve Shiraz	171
6.4.2 Sula Cabernet Shiraz	171
6.4.3 Sula Zinfandel	171
6.4.4 Satori Merlor Malbec	172
6.5 Rose Wine	172
6.5.1 Sula Zinfandel Rose	172
6.6 Premium Whites	172
6.6.1 Dindori Reserve Viognier	172
6.6.2 Sula Sauvignon Blanc	173
6.6.3 Sula Riesling	173
6.7 Dessert Wine	173
5.7.1 Sula Late Harvest Chenin Blanc	173

6.8 Sparkling Wines	174
6.8.1 Sula Brut Rose	174
6.8.2 Sula Brut	174
6.8.3 Sula Seco	174
6.9 Value Wines	174
6.9.1 Mosaic Grenache Syrah	174
6.9.2 Mosaic Grenache Syrah Rose	174
6.9.3 Mosaic Chenin Sauvignon	175
6.9.4 Dia Red	175
6.9.5 Dia White	175
6.9.6 Madera Red	175
6.9.7 Madera White	175
6.9.8 Madera Rose	175
6.9.9 Port Wine 1000 Gold	175
6.10 Factors Affecting on Wine Quality	179
6.11 Process of Wine Making	180
6.12 Wine Yeast Culture Formulations	183
6.13 Viticulture Aspects Affecting Wine Production	184
6.14 Climate & Soil	185
6.15 Cultivation Aspects	187
6.16 Important grapes production for Wine varieties	188
6.16.1 Red Wine Grape	188
6.16.2 White Wine Grapes	189
6.17 Types of Wine	190
6.18 Summary	191
Chapter 7th Conclusion and Findings	192-202
References	203-219
Bibliography	220-234
Glossary	235-243
Annexure: 1	244-248
Annexure: 2	249-253
Annexure: 3	254-259

Annexure: 4	260-262
Annexure: 5	263-268
Annexure: 6	269-273

List of Tables

Table No.	Table Title	Page No.
1.1	Major Agricultural Revolutions in India, Major Production Impact and Approximate time Period	3
1.2	Total FDI inflows in agriculture sector from 2013-14 to 2016-17 in million	6
1.3	Grapes Varieties Cultivated in Different Region of India	11
1.4	Indian Production (in ' 000 MT) of Grapes in 2016-17	13
1.5	Area and Production of Grapes for Major Producing Districts of Maharashtra	14
2.1	Problems in Production of Grape Cultivation (N = 30)	46
2.2	Tahsil wise Distribution of Wineries in Sangli District	47
2.3	Wine Productions in Sangli District 2003-04 to 2012-13	47
2.4	Problems as Perceived by the Wine Grape Growers	49
3.1	All India Area, Production and Productivity of Horticultural Crops over the years 1991-92 to 2014-15	74
3.2	State-wise Areas of Grapes in India	75
3.3	State-wise Production of Grapes in India	76
3.4	State-wise Productivity of Grapes	77
3.5	RIS Components and Horticulture Sector Maharashtra and their Activities	80
3.6	Research Activities of University, 2016-17	83
3.7	Three Years Results of MAIDC, Nashik	86
3.8	Productions of Jain Irrigation System, Jalgaon	87
3.9	Financial Results Summary of Jain Irrigation System Ltd. 2016	88
3.10	Production of Jaihind Agro Services A-656, Nashik	89
3.11	Collaborations of National and International level of ICAR-National Research Centre for Grapes, Pune	93
3.12	Technologies Developed and are Ready for Commercialization, NRCG, Pune	95
3.13	Technologies under Development	96

3.14	Grape Varieties Released by Grape Growers	100
3.15	Research Activities of Maharashtra Rajya Draksha Bagaitdar Sangh and National Research Centre, Pune	101
4.1	Quantity & Value of Exports of Fruits, Vegetables & Flowers	107
4.2	Area and Production of Selected Horticulture Crops in India 2017	109
4.3	Main Grapes Producing Areas in India	110
4.4	India Export of Agro Food Products (Product: Fresh Grapes)	111
4.5	Two Year Export Statement of APEDA Products of Fresh Fruits & Vegetables	112
4.6	Grape Diseases and its Effects	113
4.7	Area, Production and Productivity of Grapes in India (1987-1988 and 1991-1992 to 2015-2016-3rd Advance Estimates)	118
4.8	Crop Combinations and Average Rainfall	123
4.9	Grapes Land Area with Category and Education	125
4.10	Average of Annual Income of Farmers before and after cultivation grapes with landholding size	127
5.1	Cultivation Factors Influencing Juice Quality	134
5.2	Varieties of Grapes Juice in India	135
5.3	Varieties of Raisins with Price in India	139
5.4	India Export of Agro Food Products to Top Ten Country: Product of Raisins (Grapes Dried) (08062010)	140
5.5	List of Best Grapeseed Oils in India	148
6.1	Machine and Equipments used to Wine Making	161
6.2	Revenue Credited (In Lakhs) in the Month of November -2016	166

List of Figures

Figure No.	Figure Title	Page No.
1.1	Depicts the Concept of RIS, Showing the Main Actors and Dimensions and how they interact.	20
2.1	Proportion of articles in the Social Science Citation Index	68
3.1	Multidimensional Activities of Maharashtra Rajya Draksha Bagaitdar Sangh	97
4.1	Images of Disease Effects	115
4.2	Selected State-wise Production of Grapes in India (2015-2016)	117
4.3	Area, Production and Productivity of Grapes in Maharashtra of India (2012-2013 to 2014-2015)	119
4.4	Production of Grapes in Maharashtra (2015-2016)	120
4.5	Using Irrigation Resources for Grapes Cultivated land area in Acres	126
4.6	Percentage Change in Annual Income after Cultivating Grapes	128
4.7	Category-wise Grapes Cultivators	129
5.1	The Manufacturing Process of Raisins	137
5.2	The Production of Vinegar	144
5.3	Impressive Benefits of Grape Seed Oil for Skin, Hair and Health	147
5.4.	Primary Grape Products and By-Products and Their Beneficial Effects on Human Body	152
6.1	Geographical Areas of Nashik	160
6.2	Major Wine Producing Regions of India.	165
6.3	Wine Productions of Last Three Years in Maharashtra	168
6.4	Wine production in Nashik	176
6.5	Annual Income and Expenditure on Wine Consumption par Month	177
6.6	Improvement of Income after Grapes Production in % and Expenditure on Wine Consumption	178
6.7	Customers of Wine Consumption with Age	179

List of Abbreviations

LGR	Linear Growth Rate
INR	Indian Rupee
AD	Anno Domini
SIA	State of Indian Agriculture
TERIS	Territorially Embedded Regional Innovation Systems
NABARD	National Bank for Agriculture and Rural Development
A	Area
P	Production
Pdy	Productivity
ha	Hectors
NRCG	National Research Centre for Grapes
ICAR	Indian Council of Agricultural Research
R&D	Research and Development
GDP	Gross Domestic Product
NGO	Non-Governmental Organization
M.Sc.	Master of Science
PhD	Doctorate of Philosophy
MAIDC	Maharashtra Agro Industries Development Corporation Ltd
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
PBT	Profit before Tax
FDI	Foreign Direct Investment
MCA	Ministry of Corporate Affairs
APEDA	Agricultural and Processed Food Products Export Development Authority
NRSA	National Remote Sensing Agency
IGGP	International Grape Genome Programme
CSIRO	Commonwealth Scientific and Industrial Research Organization
INRA	Institute National de la Recherché Agronomique
FERA	Food and Environment Research Agency
MRDBS	Multidimensional Activities of Maharashtra Rajya Draksha Bagaitdar Sangh, Pune

GARTI	Gargi Agriculture Research & Training Institute, Nashik
MSBTE	Maharashtra State Board of Technical Education, Mumbai
UT	Union Territories
NES	North Eastern States
NHMM	National Horticulture Mission in Maharashtra
NHM	National Horticulture Mission
RIDF	Rural Infrastructure Development Fund
PCIS	Pilot Crop Insurance Scheme
CCIS	Comprehensive Crop Insurance Scheme
NAIS	National Agricultural Insurance Scheme
WALMI	Water and Land Management Institute, Aurangabad
MERI	Maharashtra Engineering Research Institute, Nashik
DIRD	Directorate of Irrigation Research and Development, Pune
EGS	Employment Guarantee Scheme
N	Number
COD	Chemical Oxygen Demand
BOD	Biological Oxygen Demand
TDS	Total Dissolved Solid
IC	Information Centre
MRP	Material Requirements Planning
IS	Information System
OECD	organisation for economic co-operation and development
NBS	National Business Systems
STI	Science, Technology and Innovation
MT	Million Tonne
FPM	Feet Per Minute
TSS	Total Soluble Solids
WHO	World Health Organization
pH	pouvoir hydrogen
EC	Electrical Conductivity
mmhos/cm	milliMhos/centimete
ZnSO	Soils

FeSO	Fe-citrate
FAO	Food and Agriculture Organization
GSDP	Gross State Domestic Product
GCA	Gross Cropped Area
GDDP	Gross District Domestic Product
KM	Kilometres
MACP	Maharashtra Agricultural Competitiveness Project
MSS	Marketing Strategy Supplement
BCE	Before Common Era
MIDC	Maharashtra Industrial Development Corporation
CI	Chateau Indage
CEC	Cation Exchange Capacity
Sq.	square
HDPE	High Density Polyethylene
PVC pipes	Polyvinyl Chloride Pipes
GSDA	Groundwater Surveys and Development Agency
WALMI	Water and Land Management Institute
DIRD	Directorate of Irrigation Research and Development
RIS	Regional Innovation Systems
NIS	National Innovation Systems
IS	Innovation Systems
ICAR	India Council of Agricultural Research
GM	Government of Maharashtra
C	Create
U	Utilise
USA	United States of America
SC	Scheduled Castes
ST	Scheduled Tribes
OBC	Other Backward Classes
US	United States
IARI	Indian Agricultural Research Institute
AICRP	All India Coordinated Research Project

ICAR	The Indian Council of Agricultural Research
CSIR	Council of Scientific and Industrial Research
UK	United Kingdom
UNO	United Nations Organisation
IBEF	India Brand Equity Foundation
NSDC	National Skill Development Corporation
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
SIS	Sectoral Innovation System
TERIS	Territorially Embedded Regional Innovation Systems
RNIS	Regionally Networked Innovation System
RNIS	Regionalized National Innovation System
MRDBS	Maharashtra Rajya Draksha Bagaitdar Sangh
HYV	High Yielding Variety
FEIAS	First Ever-Individual Approach Scheme
PCIS	Pilot Crop Insurance Scheme
CCIS	Comprehensive Crop Insurance Scheme
SSK	Sookha Suraksha Kavach
IT	Information Technologies
S&T	Science and Technology
DUI	Doing, Using and Interacting
NSSI	National Super System of Innovation
SSCI	Social Science Citation Index
Adv. Est.	Advance Estimate
UP	Uttar Pradesh
GPRI	Grape Processing and Research Institute
>	High Temperature
MT	Metric Ton
kg	Kilo Gram
KVK	Krishi Vigyan Kendra, Baramati
MSGGA	Maharashtra State Grape Growers Association
CSIRO	Commonwealth Scientific and Industrial Research Organization

INRA)	Institute National de la Recherché Agronomique
Pvt. Ltd.	Private limited
%	per cent
n. d.	Non Dated
HK	Hong Kong
USSR	Union of Soviet Socialist Republics
CPPU	Cleaner Production Promotion Unit
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária , Brazil
ICGEB	International Centre for Genetic Engineering and Biotechnology, Italy
HDL	high-density lipoproteins
LDL	low-density lipoproteins
GVA	Gross Value Added
RBI	Reserve Bank of India
FEMA	Foreign Exchange Management Act