

Mohammad Maqbool Mir
Munib Ur Rehman
Umar Iqbal
Shabir Ahmad Mir *Editors*

Temperate Nuts

 Springer

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Mohammad Maqbool Mir
Division of Fruit Science, FOH
Sher-e-Kashmir University
of Agricultural Sciences
and Technology of Kashmir
Srinagar, Jammu and Kashmir, India

Munib Ur Rehman
Division of Fruit Science, FOH
Sher-e-Kashmir University
of Agricultural Sciences
and Technology of Kashmir
Srinagar, Jammu and Kashmir, India

Umar Iqbal
Division of Fruit Science, FOH
Sher-e-Kashmir University
of Agricultural Sciences
and Technology of Kashmir
Srinagar, Jammu and Kashmir, India

Shabir Ahmad Mir
Department of Food Science & Technology
Government College For Women
Srinagar, Jammu and Kashmir, India

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Editors and Contributors

About the Editors

Mohammad Maqbool Mir PhD, is an associate professor cum senior scientist in the Division of Fruit Science, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, Srinagar. He is associated with many externally aided projects and also with research groups working on canopy architectural management, production technology, and standardization of production protocols for different temperate fruits and nuts. He has supervised/co-supervised several MSc and PhD scholars and is associated with many academic and professional societies. To his credit, Dr. Maqbool has published more than 68 scientific papers in different reputed journals at national and international level and 30 other popular articles, book chapters, and extension bulletins, and he has edited 3 books.

Munib Ur Rehman works as an associate professor in the Division of Fruit Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, Srinagar. He obtained his master's degree and PhD from Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad. He has been associated with three externally aided projects as PI and also been associated with research group working on crop production management and standardization of production protocols for temperate fruit and nut crops. He has guided two MSc students besides postgraduate teaching. Munib has published more than 46 research publications in different reputed journals at national and international level along with 10 other review articles and 12 book chapters, and has edited 1 book and extension bulletins.

Umar Iqbal PhD, is an assistant professor cum junior scientist in the Division of Fruit Science, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, India. He has concluded satisfactorily two externally funded projects by HTM and MIDH as principal investigator and being Co-PI in another externally funded project by Potash Research Institute and International Potash Institute.

Dr. Umar has supervised/co-supervised several MSc and PhD students in fruit science and has published more than 44 papers in Indian and foreign journals. Dr. Umar has contributed chapters in more than four books and edited two books.

Shabir Ahmad Mir obtained his PhD in food technology from Pondicherry University, Puducherry, India. He is presently an assistant professor at the Government College for Women, M. A. Road, Srinagar, India. He received the best PhD Thesis Award for outstanding research in the field of food technology. He has organized several conferences and workshops in food science and technology. Dr. Mir has published numerous international papers and book chapters, and he has edited ten books.

Contributors

Shabnam Ahad Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

M. Amin Mir Ambri Apple Research Centre, Shopian, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Syed Andleeba Division of Soil Science and Agricultural Chemistry, FOA, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Wadura, Jammu and Kashmir, India

Tashi Angmo Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Mohammad Mehdi Arab Department of Horticulture, College of Aburaihan, University of Tehran, Tehran, Iran

T. J. Archana Division of Food Science and Postharvest Technology, ICAR-Indian Agriculture Research Institute, New Delhi, India

Hojjat Ataee Department of Horticultural Sciences, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran

Zahoor Ahmad Baba Division of Basic Sciences and Humanities, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Wadura, Jammu and Kashmir, India

Hujjat Ul Baligah Division of Soil Science and Agricultural Chemistry, FOA, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Wadura, Jammu and Kashmir, India

Shafat Ahmad Banday Krishi Vigyan Kendra, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Ganderbal, Jammu and Kashmir, India

Ajay K. Banyal Department of Fruit Science, YSPUH&F College of Horticulture and Forestry, Neri, Hamirpur, Himachal Pradesh, India

Sanjeev K. Banyal Department of Fruit Science, YSPUH&F College of Horticulture and Forestry, Neri, Hamirpur, Himachal Pradesh, India

Tabish Jehan Been Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Khalid M. Bhat Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

M. A. Bhat Division of Plant Pathology, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Rifat Bhat Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Shahzad Bhat Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Z. A. Bhat Division of Plant Pathology, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Irfan A. Bisati Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

M. H. Chesti Division of Soil Science and Agricultural Chemistry, FOA, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Wadura, Jammu and Kashmir, India

M. P. Ellampirai Department of Horticulture, School of Life Sciences, Central University of Tamil Nadu, Thiruvavur, TN, India

Saqib Farooq Department of Food Technology, Islamic University of Science and Technology, Awantipora, Jammu and Kashmir, India

Angela Feechan School of Agriculture and Food Science, University College Dublin, Dublin, Ireland

Institute for Life and Earth Sciences, School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University, Edinburgh, UK

Nazir Ahmad Ganai Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

S. Gouthami Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Yasmeen Gull Department of Physics, GDC, Kulgam, Jammu and Kashmir, India

Asaad Habibi Department of Horticulture, College of Aburaihan, University of Tehran, Tehran, Iran

Mehvish Hanief Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

G. I. Hassan Research Centre for Residue and Quality Analysis, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Umar Iqbal Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Sehrish Jan Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Sonika Jaryal Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Aroosa Khalil Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Inayat M. Khan Division of Soil Science and Agricultural Chemistry, FOA, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Wadura, Jammu and Kashmir, India

Saba Q. Khan Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

K. Rama Krishna Department of Horticulture, School of Life Sciences, Central University of Tamil Nadu, Thiruvavur, TN, India

Amit Kumar Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Sunil Kumar ICAR-National Research Centre on Litchi, Muzaffarpur, India

Zaffar Mahdi Division of Basic Science & Humanities, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Romana Mahmood Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

A. R. Malik Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Naveen Kumar Maurya Division of Fruits and Horticultural Technology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Nirmal Kumar Meena Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi, India
Agriculture University, Kota, Rajasthan, India

Zaffar Mehdi Division of Basic Science & Humanities, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

M. Menaka Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Mahrukh Mir Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Mohammad Maqbool Mir Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Shabir Ahmad Mir Department of Food Science and Technology, Government College for Women, Srinagar, Jammu and Kashmir, India

Shakeel A. Mir Division of Soil Science and Agricultural Chemistry, FOA, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Wadura, Jammu and Kashmir, India

Amir Mirzadi Gohari Department of Plant Protection, University College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran

Munib Ur Rehman Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Safura Nabi Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Newsheen Nazir Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Jamasb Nozari Department of Plant Protection, College of Agriculture and Natural Resources, University of Tehran, Tehran, Iran

Gepu Nyorak Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Ashaq H. Pandit Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Mir Uzma Parveze Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Uday Raj Patial Department of Fruit Science, PAU, Ludhiana, Punjab, India

Satyabrata Pradhan Division of Fruits and Horticultural Technology, ICAR-Indian Agricultural Research Institute, New Delhi, India

K. Prasad Dr. Rajendra Prasad Central Agriculture University, Samastipur, Bihar, India

Tabasum N. Qadri S.P. College, Srinagar, Jammu and Kashmir, India

Bashir Ahmad Rather Mountain Research Centre for Field Crops (MRCFC), Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Khudwani, Jammu and Kashmir, India

Gh. Hassan Rather Ambri Apple Research Centre, Shopian, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Saadat Sarikhani Department of Horticulture, College of Aburaihan, University of Tehran, Tehran, Iran

Satpal Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Manzoor Ahamd Shah Department of Food Science and Technology, Government Degree College for Women, Anantnag, Anantnag, Jammu and Kashmir, India

Mahender K. Sharma Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Nirmal Sharma Division of Fruit Science, FOH, SKUAST-Jammu, Jammu, Jammu and Kashmir, India

Shivali Sharma Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Vishal Sharma School of Agricultural Biotechnology, Punjab Agricultural University, Ludhiana, Punjab, India

Abdollahif Sheikh Department of Horticulture, Faculty of Agriculture, Vali-e-Asr University of Rafsanjan, Rafsanjan, Kerman, Iran

Gurupkar Singh Sidhu School of Agricultural Biotechnology, Punjab Agricultural University, Ludhiana, Punjab, India

Shamim A. Simnani Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Amarjeet S. Sindouri Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Ajit Kumar Singh Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Jagveer Singh School of Agricultural Biotechnology, Punjab Agricultural University, Ludhiana, Punjab, India

Department of Fruit Science, College of Horticulture & Forestry, Acharya Narendra Deva University of Agriculture & Technology, Ayodhya, India

Kappat Valiyapeediyekkal Sunooj Department of Food Science and Technology, Pondicherry University, Puducherry, India

Anamika Thakur Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Kouros Vahdati Department of Horticulture, College of Aburairhan, University of Tehran, Tehran, Iran

B. R. Vinod Division of Food Science and Postharvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi, India

Tajamul F. Wani Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Ashok Yadav ICAR-Central Agroforestry Research Institute, Jhansi, India

Iftisam Yaseen Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Chapter 1

Global Scenario of Temperate Nuts



Amit Kumar, Nirmal Sharma, Shivali Sharma, Gepu Nyorak, Satpal, Sonika Jaryal, Mohammad Maqbool Mir, Umar Iqbal, Amarjeet S. Sindouri, and Khalid M. Bhat

Abstract The major temperate nut crops grown in different parts of the world include almond, walnut, pecan nut, chestnut, hazelnut and pistachio nut. The geographical features and agro-climatic conditions prevailing in the entire United States of America, China, Turkey and Iran are conducive for the cultivation of temperate nut crops. A continuous increase was observed in the area, production and export of all the temperate nuts crops in the last 5–6 years. In 2020, the United States of America is the leading producer of almond and pistachio nuts, while China is the leading producing country of walnut and chestnut. Mexico and Turkey were the leading producers of pecan nut and hazelnut, respectively. The United States of America (almond, walnut, pistachio nut, pecan nut), Spain (almond), Mexico (pecan nut), Turkey (hazelnut), China (walnut, chestnut, pistachio nut), Italy (hazelnut, chestnut) and Iran (pistachio nut) are the exporting countries of temperate nut crops. All the European countries are importers of all major temperate nut crops.

Keywords Global · Temperate · Nut · Walnut

1 Introduction

Nut crops are a group of botanically unrelated crops belonging to different botanical families. They are grouped together because the fruit type is a nut (generally) and harvesting, postharvest processing, nutritional value and marketing characteristics are relatively similar. A nut is a fruit consisting of a hard or tough shell protecting a kernel which is usually considered as edible part. Based on usage or in gastronomic sense, a wide variety of dry seeds are called nuts, but in botanical way, nut infers

A. Kumar (✉) · S. Sharma · G. Nyorak · Satpal · S. Jaryal · M. M. Mir · U. Iqbal ·
A. S. Sindouri · K. M. Bhat

Division of Fruit Science, FOH, Sher-e-Kashmir University of Agricultural Sciences and
Technology of Kashmir, Srinagar, Jammu and Kashmir, India

N. Sharma

Division of Fruit Science, FOH, SKUAST-Jammu, Jammu, Jammu and Kashmir, India

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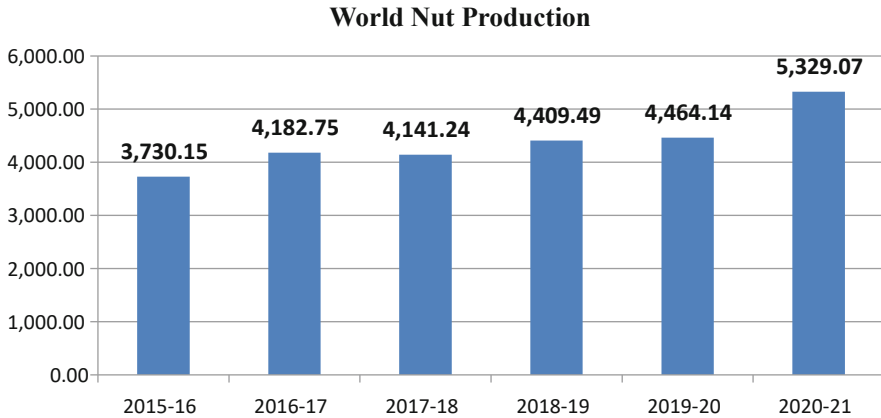


Fig. 1.1 Nut production scenario worldwide during the last 6 years. (Source: Statistical Year Book 2020–2021)

kernel or seed imbedded in hard cover, i.e. shell. Nuts are often wind pollinated and generally produce a lot of pollen, often in specialised male inflorescence, to ensure that the female flowers get fertilised. Nuts are monoecious (walnut and pecan nut) and dioecious (pistachio) in nature, however protandrous and protogynous also exist which are referred as heterodichogamy. Walnut and pecan nut are closely related as both members belongs to family Juglandaceae, however, they are not cross or graft-compatible and are not similar as walnut yields much higher than pecans which is due to propensity to bear nuts from lateral buds on 1-year-old wood in walnut and not just on terminal buds. Majority of the seeds free themselves from the shell naturally upon maturity, except hazelnuts and chestnuts, which have hard shell walls and originate from a compound ovary. According to climatic conditions walnut, pecan nut, hazelnut, chestnut and pistachio nut are temperate nuts and, cashew nut and macadamia nut are tropical nuts.

Over the last decade, global nut production has steadily increased, reaching over 5.3 million MT during 2020–2021 which was 15.0% higher than that produced during 2019–2020 and 65% higher than a decade earlier. Between 2011–2012 and 2020–2021, global nut production increased at an average annual rate of about 212,400 MT per year (Fig. 1.1).

Almonds and walnuts are the most productive nut crops, accounting for 31% and 19% of the global share, respectively, followed by pistachios (19%), hazelnuts (10%), chestnut (5%), pecan nut (2%) and other nut crops accounted for the remaining 14%. When analysing the annual growth rates of various tree nut crops over the last 10 years, it can be seen that the walnut, pecan nut, almond and pistachio crops had the most important linear increments with the following annual growth rates:

- Walnuts: 59,082 MT/year
- Pecans: 7396 MT/year

- Almonds: 53,885 MT/year
- Pistachios: 42,426 MT/year

According to the production data from the last 5 years, the USA led the world nut production with an average share of 40%. The most produced crops were almonds (59% of country production), pistachios (21%) and walnuts (15%). Turkey came in second with 11% of the global share, with hazelnuts and pistachios accounting for 64% and 31% of the country's production, respectively.

Almonds and walnuts accounted for estimated half of total tree nut consumption worldwide in 2019 which was 30% and 20%, respectively, followed by cashews and pistachios which accounted for 18% and 15%, respectively. Following Europe as the leading consumer, Asia and North America are the second and third largest consuming regions with similar market shares.

2 Almond

Worldwide, the production of almond in the year 2020 was 41.40 lakh MT from an area of 21.62 lakh hectare with a productivity of 1.91. During that year, production was 16.23% more than the previous year and 55.15% more in the last years. A regular expansion in the area of almond cultivation was observed in the last 6 years from 17.77 lakh hectares in 2015 to 21.62 lakh hectare in 2020 (Fig. 1.2).

In 2020, the USA was the leading producer of almond in the world which produced 19.36 lakh MT from an area of 4.77 lakh hectare, followed by Spain which produces 3.40 lakh MT from an area of 6.87 lakh hectare (Fig. 1.3).

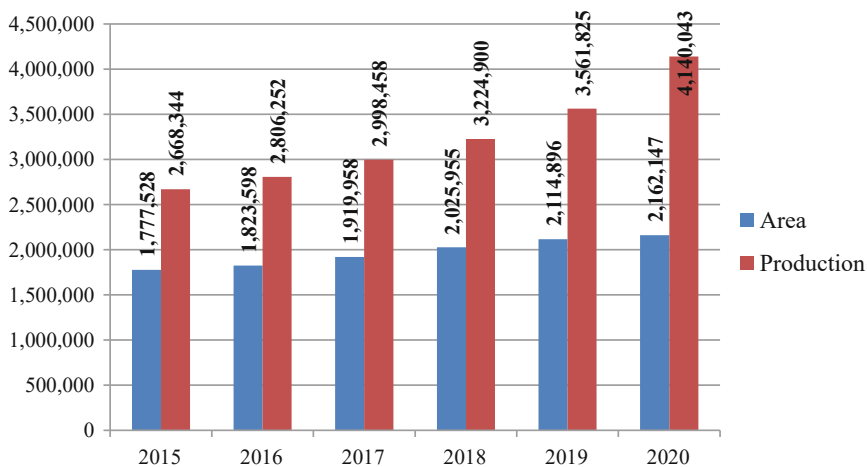


Fig. 1.2 Area and production of almond worldwide during the last 6 years. (Source: FAOSTAT n. d. statistical database)

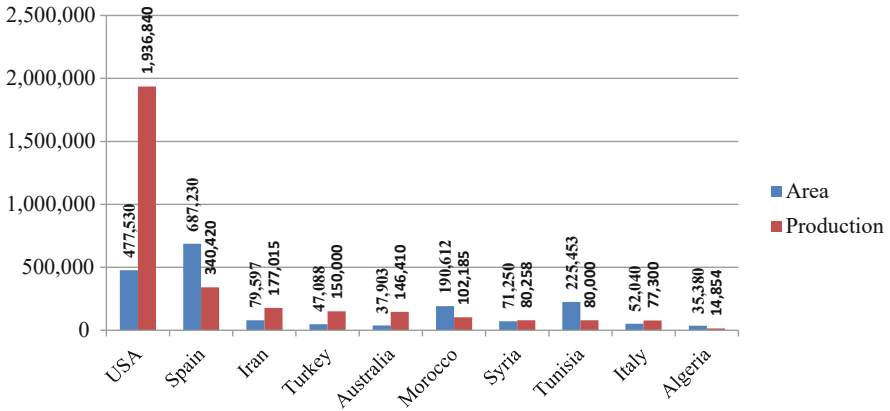


Fig. 1.3 Area and production of almond in different countries during 2020. (Source: FAOSTAT n.d. statistical database)

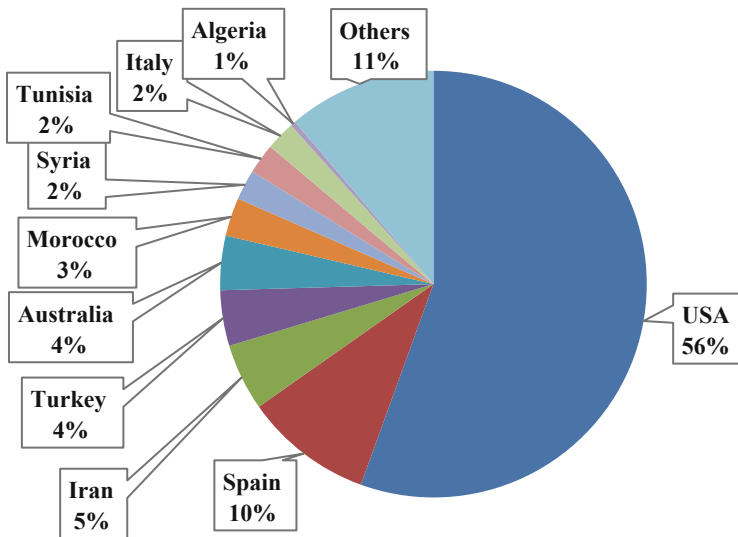


Fig. 1.4 Share of different countries in the almond production during 2020. (Source: FAOSTAT n.d. statistical database)

The productivity of almond in the USA and Spain has been recorded as 4.05 and 0.49 tons/ha, respectively. The other major almond producing countries are Iran (1.77 lakh MT), Turkey (1.50 lakh MT), Australia (1.46 lakh MT) and Morocco (1.02 lakh MT) with a productivity of 2.22, 3.18, 3.86 and 0.54 tons/ha, respectively. The USA and Spain produced 66% of world share in 2020. Australia has doubled its almond production share over the globe during the last 10 years. Both Australia and Spain have surpassed the production benchmark of 1.0 lakh MT in 2020 (Fig. 1.4).

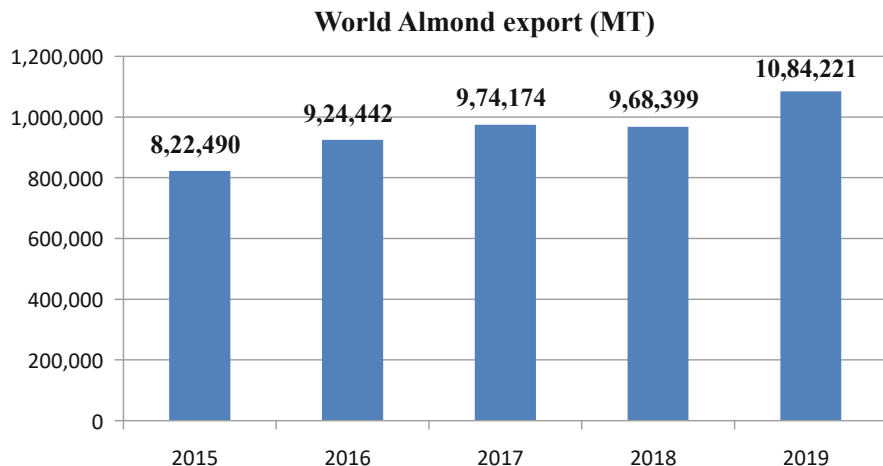


Fig. 1.5 Export of almond in the last 5 years to other countries. (Source: Statistical Year Book 2020–2021)

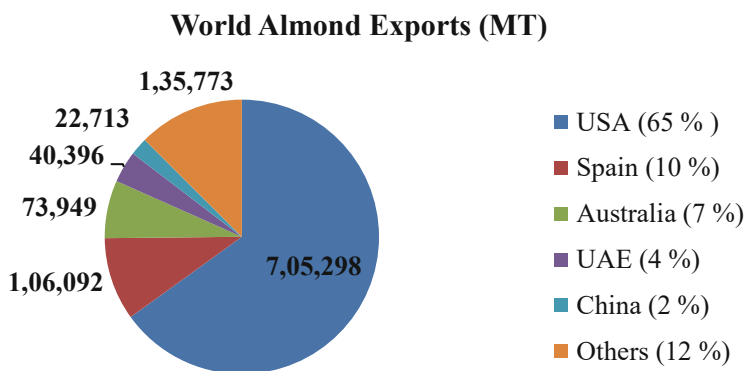


Fig. 1.6 Share of different countries in the export of almond. (Source: Statistical Year Book 2020–2021)

In the year 2019, 10.84 lakh MT of almond was exported by different countries which was 11.96% higher than the previous year and 31.82% higher than which was during the last 5 years. A continuous increase in almond production has been observed in the export of almond in the last decade (Fig. 1.5).

The world export of almond is also led by the USA and continues to dominate in the export with a share of 65%. In 2019, 7.05 lakh MT of almond were shipped mainly to Spain (17%), Germany (8%), The Netherlands (7%) and Japan (7%) (Fig. 1.6). Spain exported 1.06 lakh MT of almond and the main importers were other European countries (85%) headed by Germany, Italy and France. Australia exported a share of 7.0% of in-shell almond to Asian countries and the importing countries are China (71%) followed by India (24%). Other exporting countries are UAE (4%) and China (2%).

Table 1.1 World almond imports (MT) in the last 5 years

Country	2015	2016	2017	2018	2019
Spain	86,150	101,070	111,293	99,562	116,552
India	81,705	86,179	114,790	99,048	115,049
China	55,038	80,625	76,998	85,814	93,771
Germany	85,646	86,826	92,783	84,579	93,765
Italy	42,032	44,598	45,865	48,988	59,281
Netherlands	29,988	28,337	36,497	41,846	49,232
UAE	50,014	42,349	39,301	36,542	46,626
France	38,696	38,083	41,764	43,380	45,175
Japan	38,134	28,059	33,573	37,186	40,322
UK	25,078	25,438	31,371	26,434	30,586
Turkey	15,851	27,468	24,579	18,286	30,210
Canada	26,389	30,292	29,821	30,496	30,131
Korea Rep.	20,010	23,962	25,610	22,927	25,459
Vietnam	38,850	70,179	46,409	59,721	21,131
Belgium	15,728	15,812	16,002	14,344	16,680
Saudi Arabia	9910	10,945	11,792	11,177	13,097
USA	11,424	9161	8111	10,687	12,651
Mexico	11,063	9654	9801	10,447	11,858
Greece	4927	6689	7743	7393	9085
Thailand	4332	4181	2711	4579	8680
Others	136,525	154,538	167,362	174,962	214,879

Source: Statistical Year Book 2020–2021

Main importing countries of almond are Spain (1.16 lakh MT), India (1.15 lakh MT), China (0.93 lakh MT), Germany (0.93 lakh MT), Italy (0.59 lakh MT) and The Netherlands (0.49 lakh MT) (Table 1.1).

3 Walnut

Among temperate nut crops, walnut ranks first because of its nutritive value, popularity, area and production in the world. The two major species of walnuts are English walnut and Black walnut. The former is also known as the Persian walnut since it originated in Persia and the latter traces its origin to North America. The walnut seedlings (*Juglans regia* L.) have been found growing in vast region right from the Carpathian Mountains in eastern Europe, across Turkey, Iraq, Iran, southern USSR and Afghanistan to the Northwestern Himalayas. In 2020, world production of walnut (in shell) was 33.23 lakh MT from an area of 10.21 lakh hectare having a productivity of 3.25 ton/ha. The walnut production in the present year remained 11.32% more than the previous year. In the last 6 years, there is a tremendous expansion in the area of walnut in the world which is 55.69% more in

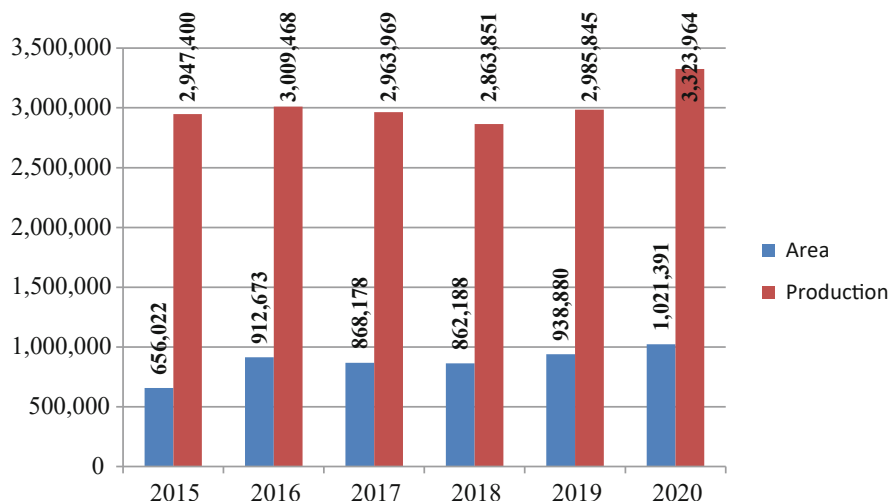


Fig. 1.7 World area and production of walnut during the last 6 years. (Source: FAOSTAT n.d. statistical database)

the year 2020 as compared to 2015, however, production increased only 12.77% during the past 6 years (Fig. 1.7).

Over the past 10 years, production has increased steadily, at a rate of 4.0% per year. But some countries have increased production more than others, and the increase in the USA and Ukraine was around 10%, while it amounted to 20% and 40% in Iran and Chile, respectively.

The important walnut growing countries of the world as per area and production are given in Fig. 1.8. China is the largest producer of walnut in the world contributing 33% share with a production of 11.00 lakh MT from an area of 2.84 lakh hectare. The productivity of walnut in China is 3.86 ton/ha. The USA is the second largest producer with a production of 7.07 lakh MT from an area of 1.53 lakh hectare having a productivity of 4.60 ton/ha. China and the USA together produce more than 54% of the world total walnut production. The other walnut producing countries are Iran (3.56 lakh MT), Turkey (2.86 lakh MT) and Mexico (1.64 lakh MT) with a productivity of 5.95 ton/ha, 2.02 ton/ha and 1.51 ton/ha with a share of 10.73%, 8.6% and 4.9%, respectively (Fig. 1.8).

Ukraine tops in the productivity of walnut with a value of 11.79 in the entire world whereas the share was only 4.7 per cent followed by Iran with a productivity and share of 5.95 and 10.73 per cent. Productivity of walnut in China and USA has been recorded as 3.86 and 4.60 tones/ha, respectively. The Other major walnut producing countries are Iran (3.56 lakh MT), Turkey (2.86 lakh MT), Mexico (1.64 lakh MT), Ukraine (1.58 lakh MT) and Chile (1.13 lakh MT) having productivity of 5.95, 2.02, 1.51, 11.79 and 2.61 tones/ha. China and USA produces more than 54 per cent of world share in 2020. Turkey and Mexico shares 8.6 per cent and 4.9 per cent of the world walnut production over the globe during 2020 (Fig. 1.9).

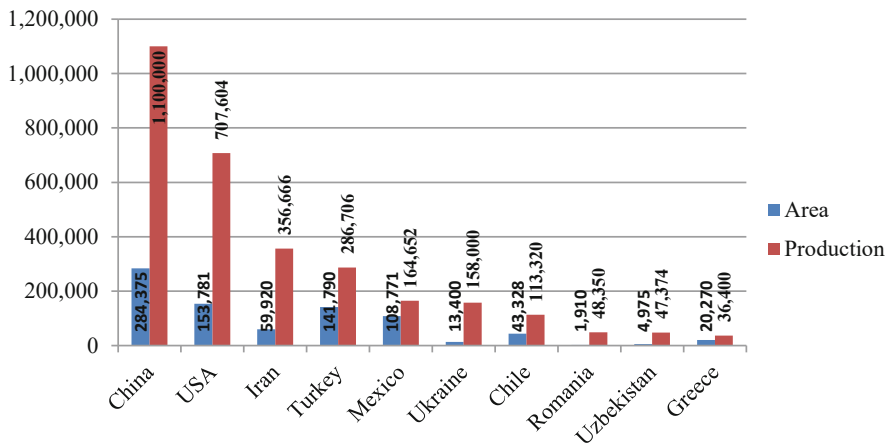


Fig. 1.8 Area and production of walnut in different countries during 2020. (Source: FAOSTAT n.d. statistical database)

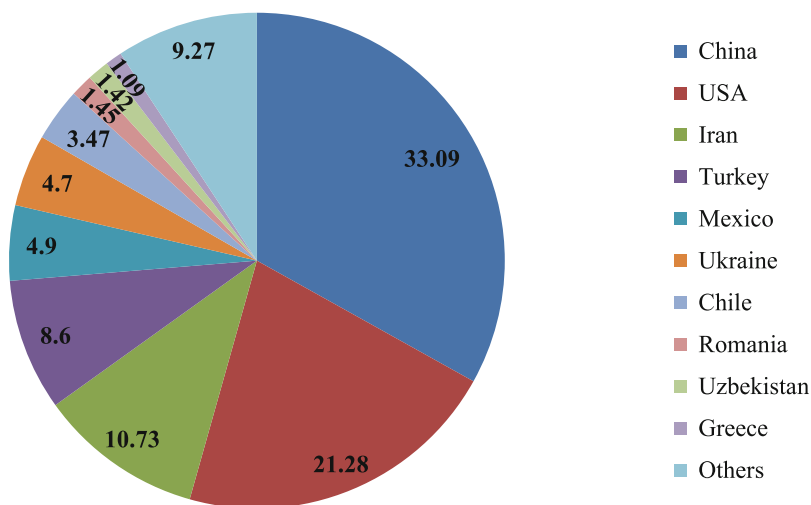


Fig. 1.9 Share of different countries in the walnut production in 2020. (Source: FAOSTAT n.d. statistical database)

Walnuts are the only temperate nut crops of India grown commercially in the hilly states of the country viz. Jammu and Kashmir, Himachal Pradesh, Uttarakhand and Arunachal Pradesh. The total area under the walnut cultivation in India is 108.63 thousand hectares having production of 299.71 thousand MT with a productivity of 1.97 ton/ha. In India, Jammu and Kashmir is the leading walnut producing state with a production of 2.62 lakh MT from 0.84 lakh hectare area. It produces about 90% of the total production in India with an average productivity of 3.09 ton/ha. Other walnut producing states are Himachal Pradesh (2.46 MT), Uttarakhand (21.17 MT).

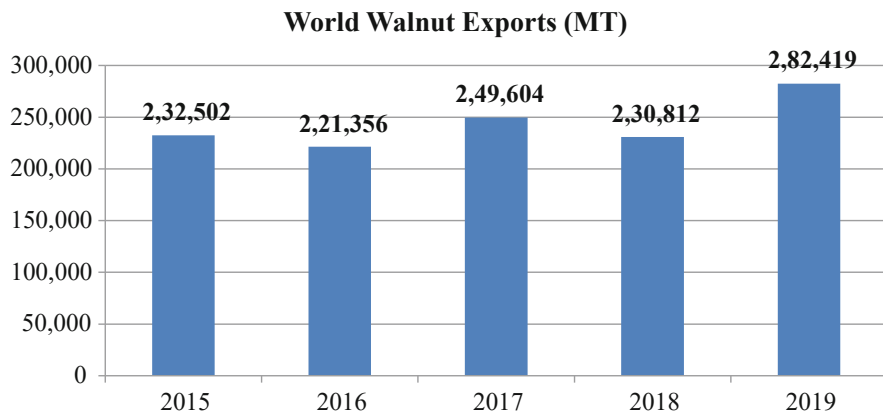


Fig. 1.10 Export of almond in the last 5 years to other countries. (Source: Statistical Year Book 2020–2021)

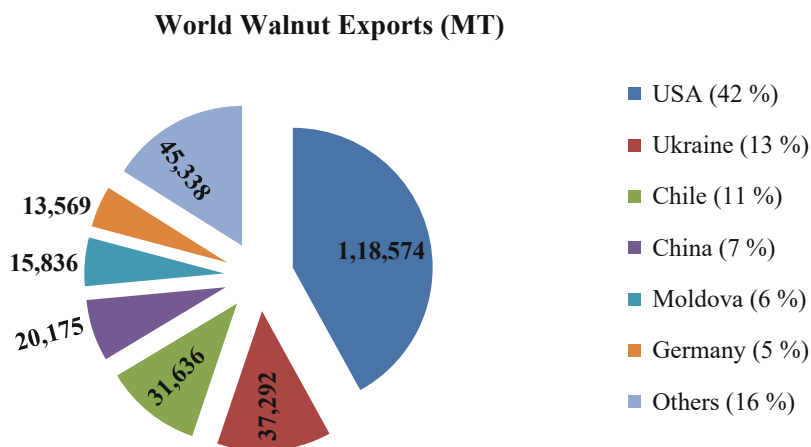


Fig. 1.11 Share of different countries in the export of walnut during 2020. (Source: Statistical Year Book 2020–2021)

Walnuts have always been a highly valued commodity and their consumption has increased considerably in recent years. The walnut market is showing increasing potential, both in terms of household consumption and as a raw material for the food industry, resulting in new opportunities for walnut producers. In 2019, the total shelled walnut shipment was 2.82 lakh MT which was 22.36% more than the previous year and 21.47% more in the last 5 year (Fig. 1.10).

The USA (1.18 lakh MT), Ukraine (0.37 lakh MT) and Chile (0.31 lakh MT) are the major exporter countries in the world with a share of 42%, 13% and 11%. China ranked fourth place in the export of walnut with a share of 7.0% to different countries due to the high consumption of its own production by the domestic market (Fig. 1.11).

Table 1.2 World walnut imports (MT) in the last 5 years

Country	2015	2016	2017	2018	2019
Germany	24,815	25,978	32,667	35,297	41,451
Japan	14,918	18,392	21,172	17,038	19,009
Netherlands	14,026	12,691	17,579	14,535	18,909
Spain	12,204	14,709	14,745	15,983	17,509
Turkey	7827	3892	9195	9093	16,189
France	10,179	9768	13,181	11,215	12,941
Korea Fed.	12,631	16,130	12,685	12,459	12,760
Canada	9386	10,862	10,287	11,160	11,596
Italy	6116	7630	7633	7554	9711
UK	8617	9559	10,552	8892	9508
Israel	4810	5170	5139	5614	6180
UAE	3709	4347	4245	3335	5583
Austria	3654	3621	4791	5033	5122
Australia	5117	4660	5527	4086	4197
Russian Fed.	651	755	2152	2017	4167
Brazil	2659	3187	3287	3583	3855
Greece	2670	2681	3198	3508	3774
Azerbaijan	1611	1872	3182	2580	3467
Moldova	1634	1446	755	329	3336
Saudi Arabia	1299	2135	2137	2196	3063
Others	83,969	61,871	65,497	55,306	70,094

Source: Statistical Year Book 2020–2021

Walnut imports are dominated by the European countries as Germany (41,000 MT) which ranks first in importing walnut followed by Japan (19,000 MT), The Netherlands (18,000 MT) and Spain (17,000 MT). Other major European importers include France, Italy. Canada and Mexico are North America's leading importers, while Turkey and Korea are leading the rest of the world (Table 1.2).

4 Pecan Nut

The world pecan nut production during 2020–2021 was 1.66 lakh MT. The present year production was 7.0% more than the previous year and 39.33% from the previous 6-year average and the highest production was recorded in the last decade (Fig. 1.12).

In 2020, Mexico was the largest producer of pecan nut with a production of 82,000 MT followed by the USA (69,000 MT), South Africa (10,000 MT), Brazil (1700 MT) and Australia (1085 MT) (Fig. 1.13).

Mexico (49.0%) and the USA (41.0%) are the main producers of pecan nut contributing about 90% of the world production and the rest 10% production was

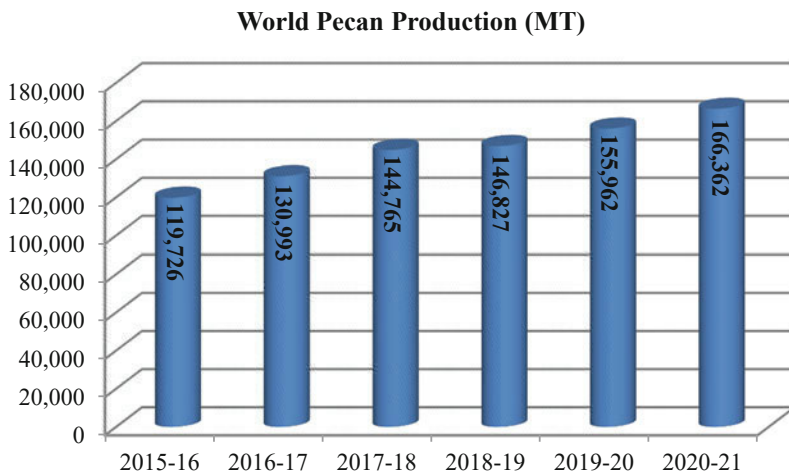


Fig. 1.12 World pecan nut production during the last 6 years. (Source: Statistical Year Book 2020–2021)

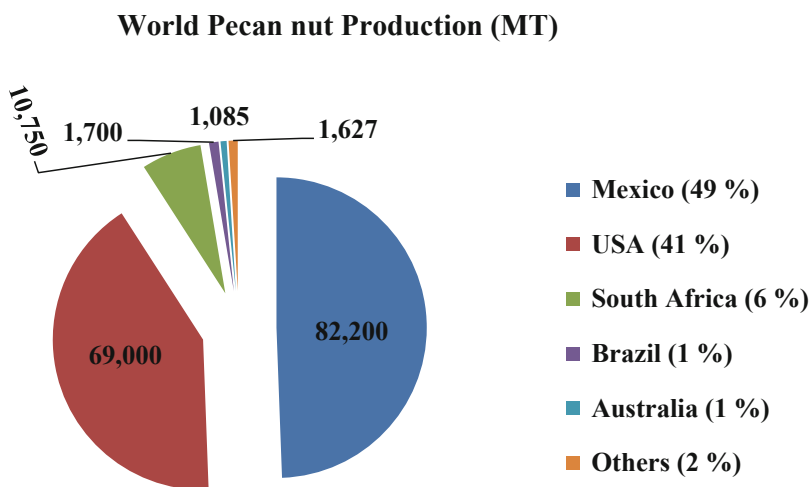


Fig. 1.13 Share of different countries in the pecan nut production in 2020–2021. (Source: Statistical Year Book 2020–2021)

split among South Africa (6.0%), Brazil (1.0%), Australia (1.0%) and other countries (2.0%). Although, South Africa and Brazil produce less quantity of pecan nut, but both countries have seen and consistent increase in the production of pecan nut in recent years and hope this trend continue in the future year also (Fig. 1.13).

In the last 5 years, an increasing trend was observed in the export of pecan nut and in 2019, 82,000 MT of pecan nut was exported which was 8.07% more than the previous year and 48.74% more in the last 5 years (Fig. 1.14). Along with

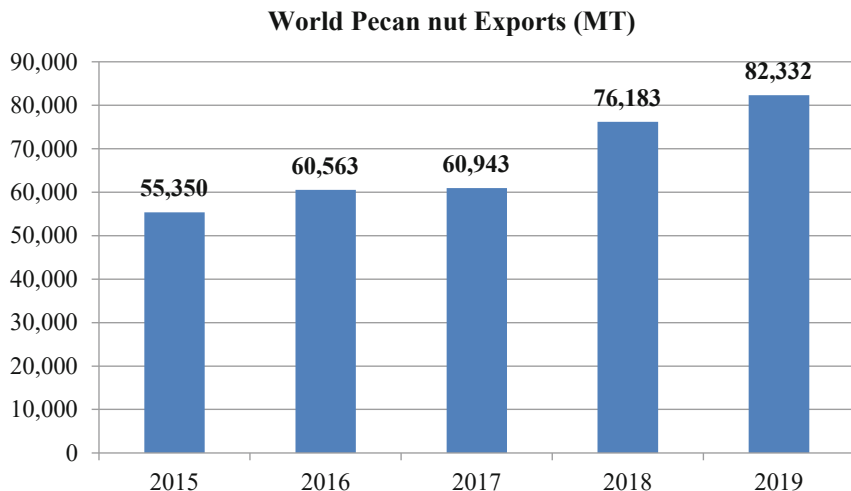


Fig. 1.14 Export of pecan nut in the last 5 years to other countries. (Source: Statistical Year Book 2020–2021)

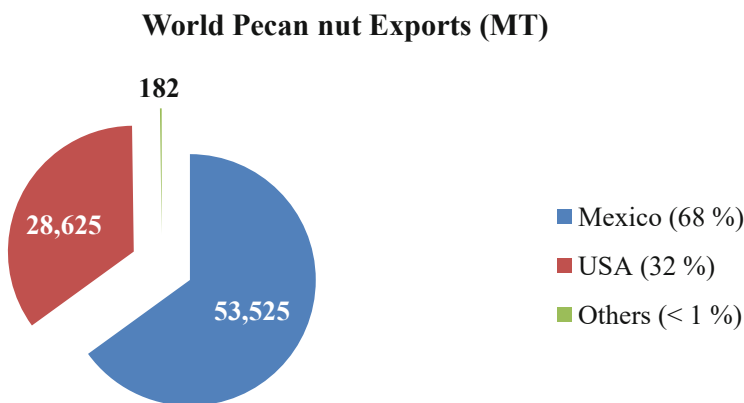


Fig. 1.15 Share of different countries in the export of pecan nut during 2020. (Source: Statistical Year Book 2020–2021)

production, Mexico (53,000 MT) and the USA (28,000 MT) are the main exporter of pecan nut contributing cent percent of the world export. The main destination of the Mexican pecan nut is the USA and the European Union + the United Kingdom (51.0%) and Canada (18.0%) were the main markets for the USA produce (Fig. 1.15).

Among all the importer countries in 2019, the USA led by 53,000 MT of pecan nut followed by The Netherlands (5939 MT), Canada (5223 MT) and Germany (2732 MT) (Table 1.3).

Table 1.3 World pecan nut imports (MT) in the last 5 years

Country	2015	2016	2017	2018	2019
USA	35,252	38,397	37,993	51,767	53,592
Netherlands	3346	4156	4897	4183	5939
Canada	4997	5510	5628	5425	5223
Germany	1186	833	1829	2304	2732
Mexico	1250	779	596	1688	2718
UK	2974	2560	2744	2643	2455
Israel	1316	1531	1681	2077	2383
France	825	999	1027	1195	1099
Belgium	228	373	455	598	933
China	889	2155	690	611	802
Korea Fed.	453	610	650	683	773
Spain	130	191	158	345	737
Saudi Arabia	184	135	299	367	440
UAE	161	147	210	195	340
Australia	162	57	138	160	309
Japan	247	245	211	313	302
Italy	227	306	346	81	248
Lithuania	114	129	150	176	199
Vietnam	176	346	82	70	127
Switzerland	168	231	271	74	87
Others	1067	873	889	1229	896

Source: Statistical Year Book [2020–2021](#)

5 Hazelnut

The world hazelnut production shows fluctuations depending on the climatic conditions from year to year. The global hazelnut production in 2020 was 10.72 lakh MT from an area of 10.15 lakh hectares with a productivity of 1.05 ton/ha which was second largest in the last 10 years and 4.68% less than the previous years (Fig. 1.16).

The main hazelnut producing countries are Turkey, Italy, Spain, the USA and Greece. Although hazelnut is also produced in the Former Soviet Union, Iran, Romania and France, these countries do not have a major input in the world hazelnut trade. Turkey is the major world hazelnut producer and exporter. Turkey ranks first in the area and production of hazelnut in the world which produces 6.65 lakh MT from an area of 7.34 lakh hectare with a productivity of 0.91 ton/ha (Fig. 1.17). Italy is the second largest producer of hazelnut in the world with a production of 1.40 lakh MT from an area of 0.80 lakh hectare with a productivity of 1.75 ton/ha. The other major producing countries are the USA (64,000 MT), Azerbaijan (49,000 MT), Chile (33,000 MT) and Georgia (32,000 MT).

Turkey's crop accounted for 62% of the world total production of hazelnut followed by Italy (13.1%), the USA (6.01%), Azerbaijan (4.61%) and Chile

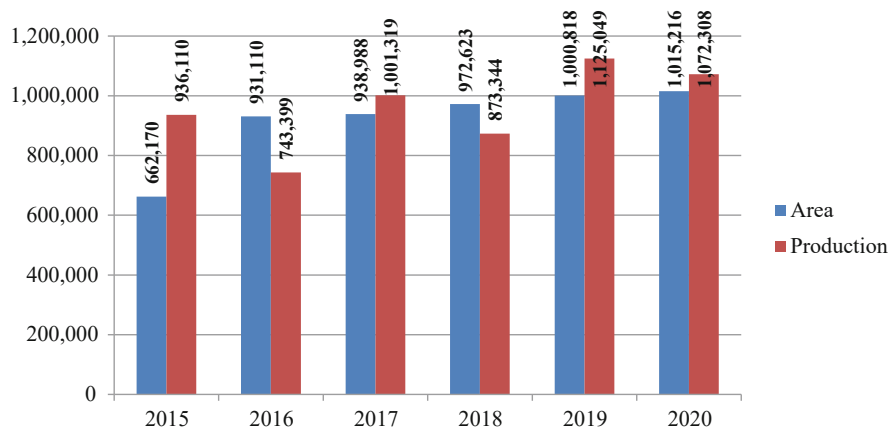


Fig. 1.16 World area and production of hazelnut during the last 6 years. (Source: FAOSTAT n.d. statistical database)

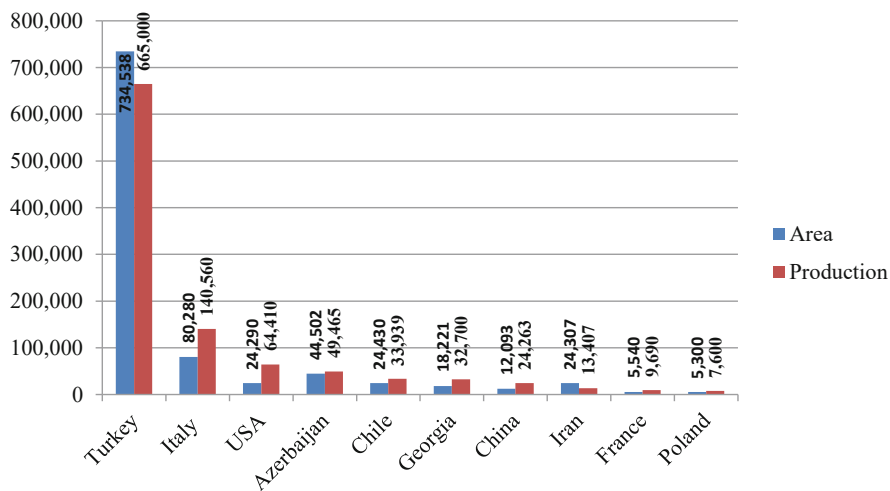


Fig. 1.17 Area and production of hazelnut in different countries during 2020. (Source: FAOSTAT n.d. statistical database)

(3.16%). Among these countries, Italy, the USA and Chile produce a bumper crop reaching record heights in this season (Fig. 1.18).

The total export of hazelnut during the year 2019 was 4.04 lakh MT which was 11.17% more than the previous year. A continuous increasing trend of export to different countries was observed during the last 5 years (Fig. 1.19). The hazelnut exports have grown up by an average value of 30.99% from 2015 to 2019.

The most important hazelnut exporter countries are Turkey with an amount of 3.13 lakh MT and a share of 77.2%. The other exporting countries are Italy (25,000

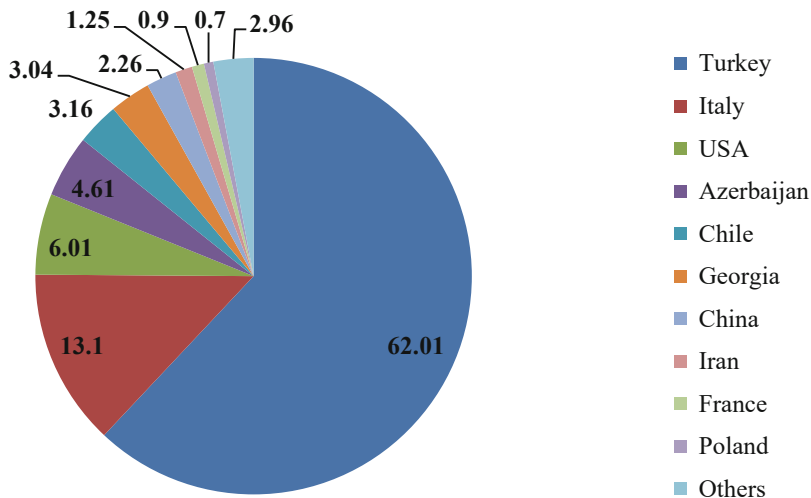


Fig. 1.18 Share of different countries in the hazelnut production during 2020. (Source: FAOSTAT n.d. statistical database)

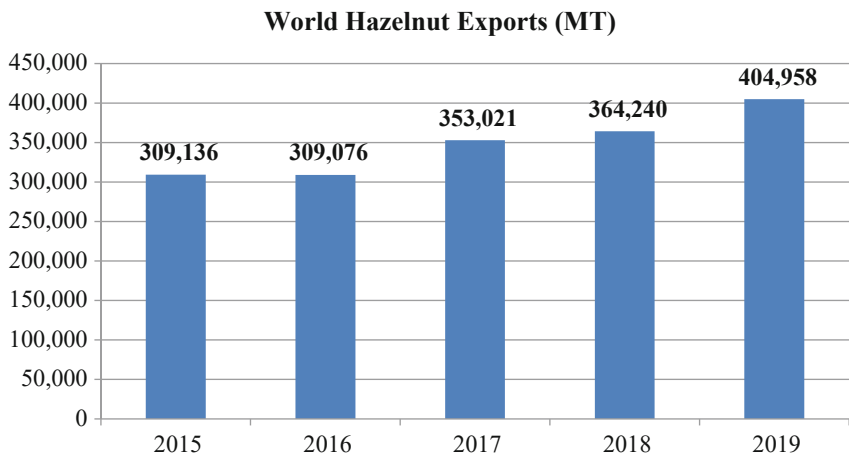


Fig. 1.19 Export of hazelnut in the last 5 years to other countries. (Source: Statistical Year Book 2020–2021)

MT) with a share of 6.0%, Azerbaijan (22,000 MT) with a share of 5.0%, Georgia (11,000 MT) with a share of 3.0% and Chile (9,000 MT) having a share of 2.0% (Fig. 1.20). The most important hazelnut importing countries in 2019 were Italy (1.03 lakh MT), Germany (0.97 lakh MT), France (0.29 lakh MT), Poland (0.15 lakh MT), Russia (0.15 lakh MT) and Austria (0.12 lakh MT) (Table 1.4).

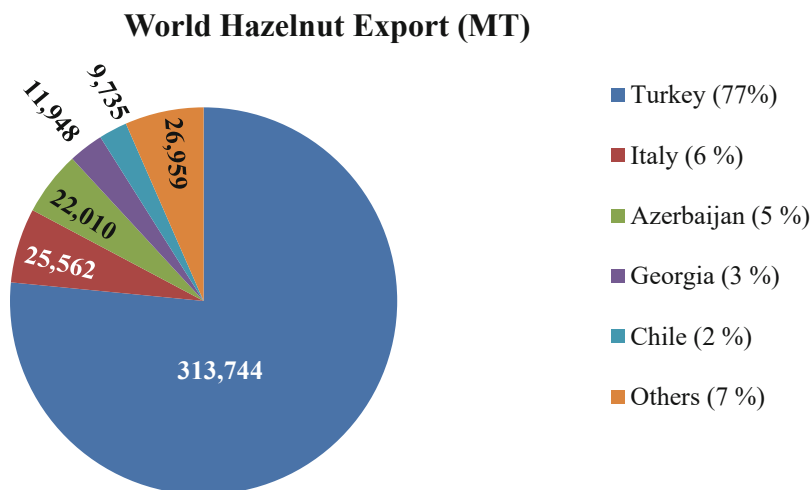


Fig. 1.20 Share of different countries in the export of hazelnut during 2020–2021. (Source: Statistical Year Book 2020–2021)

Table 1.4 World hazelnut imports (MT) in the last 5 years

Country	2015	2016	2017	2018	2019
Italy	61,591	70,000	70,504	68,632	103,985
Germany	83,980	77,087	93,044	91,491	97,617
France	28,617	27,923	29,378	27,803	29,776
Poland	13,214	12,320	14,125	14,805	15,753
Russian Fed.	7923	6229	12,300	15,986	15,557
Austria	10,226	10,277	10,563	10,740	12,121
Netherlands	9525	8639	12,204	11,668	12,036
China	3879	4248	7928	7293	11,313
Switzerland	9962	10,554	11,344	11,125	10,559
Belgium	11,779	11,390	11,402	11,287	10,087
Canada	13,023	11,727	12,139	10,170	9790
Spain	6230	6373	7214	9283	9784
USA	2384	3780	5498	7660	6334
UK	5550	5958	5973	5830	5711
Brazil	3049	2661	3114	4082	4593
Egypt	2939	2829	2391	3778	3859
Australia	2891	3125	3285	3395	3737
Ukraine	1606	1829	2504	3652	3635
Greece	1856	1822	2538	2898	3210
Sweden	2554	2466	2512	2172	2596
Others	87,949	97,838	103,566	109,122	136,892

Source: Statistical Year Book 2020–2021

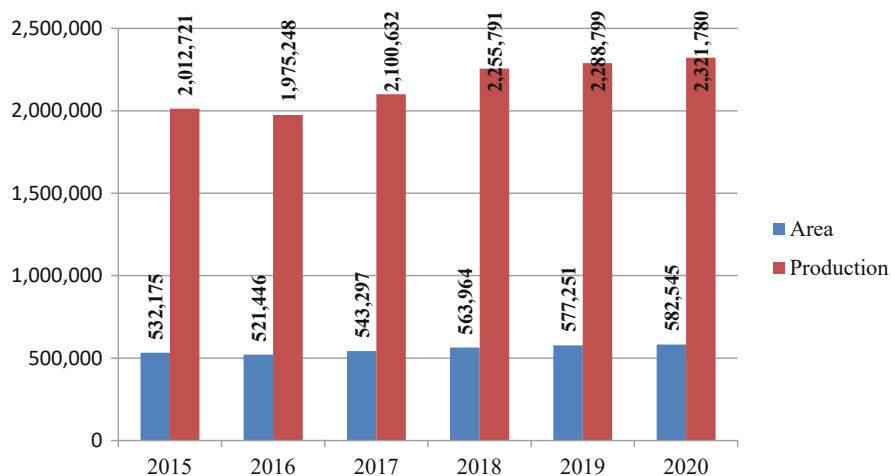


Fig. 1.21 World area and production of chestnut during the last 6 years. (Source: FAOSTAT [n.d.](#) statistical database)

6 Chestnut

The current chestnut global distribution is the consequence of natural colonisation together with a long history of human intervention (Freitas et al. 2021). Presently worldwide, the chestnut is grown on an area of 5.82 lakh hectare being China, Southern Europe, Southwestern USA, Korea and Japan are the major distributing countries. Presently, seven species of chestnut is known worldwide developing in subtropical, Mediterranean and temperate forests in the Northern Hemisphere. Chinese chestnut (*Castanea mollissima*), Japanese chestnut (*Castanea crenata*), American chestnut (*Castanea dentata*) and European chestnut (*Castanea sativa*) are widely cultivated species owing to the economic importance of their fruits. In 2020, the world chestnut production was 24.06 lakh MT from an area of 5.82 lakh hectare which was 1.81% more than in the previous year and 20.8% more than 10 years ago (Fig. 1.21).

The major production comes from *Castanea mollissima* in Asia followed by *Castanea sativa* in Europe. China is the largest producer in the world with a production of 17.43 lakh MT from an area of 3.05 lakh hectare. Among other producers, Spain ranked second with a production of 1.8 lakh MT from an area of 37,000 hectare. Other major producers are Bolivia (80,000 MT), Turkey (76,000 MT) and Republic of Korea (54,000 MT), etc. (Fig. 1.22). According to production share, China alone produces more than 75% of the world's chestnut production followed by Spain (8.12%), Bolivia (3.48%), Turkey (3.27%), Republic of Korea (2.34%), etc. (Fig. 1.23).

With respect to exporters, China exports maximum (30.2%) chestnut with the main destination to Vietnam. The other major exporters are Italy (23.15%), Spain (9.06%), Turkey (8.87%) and Portugal (8.17%), etc.