

## RESEARCH PAPER

# An overview of production and export trade performance of walnut in Afghanistan

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## ABSTRACT

World walnuts production was 2063.14 thousand metric tonnes, of which China alone accounts for about 50 per cent share. Although, Afghanistan is not a major producer of global walnuts, it contributes to country's GDP earnings. Using secondary data on area, production and export of walnut, the growth in production and trade were estimated. Growth rate in area, production and productivity of walnut in Afghanistan for the period of 2007-16 indicates that the harvested area had increased by registering a CAGR 2.9 per cent, while production and productivity registered a negative CAGR of 5.8 per cent and 8.5 per cent, respectively. The world total walnut export in 2016 was 667,602 MT. U.S.A. was in the leading position among the walnut exporting countries in the world in 2016 with the contribution of 39 per cent share followed by Turkey and Chile which accounted for 19.42 per cent and 7.35 per cent, respectively. Shelled walnut export growth rate from Afghanistan registered a negative CAGR of 15.05 per cent for the period of 2007-16. The total export of shelled walnut from Afghanistan in 2016 was 510 metric tonnes and it was 2514 metric tonnes for the walnut with shell. The major destination for Afghanistan walnut in 2016 was India accounting for 84.53 per cent, followed by Pakistan. The transition probability matrix for pip of walnut export from Afghanistan for the period 2012/13-2016/17 was highly unstable which indicates that there is no loyal market for pip of walnut export from Afghanistan. The major destination countries were India, Pakistan, United Arab Emirate and Turkey.

**KEY WORDS :** Walnut, Afghanistan, Production, Trade, Markov chain

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Walnut is harvested from any tree of the genus *Juglans*, mainly the Persian or English walnut (*Juglans regia*). Trees are large, 20 to 30 m tall, deciduous, spreading and not dense. The major forests are found in the Jalal-Abad province of Kyrgyzstan at heights of 1000-2000 meters above mean sea levels. The first ancient account of walnut plantation dates back to Babylon (now Iraq) around 2000 BC. Though, archaeological diggings of Neolithic sites in southwest France has exposed roasted walnut shells,

representing walnuts were being eaten in Europe at least 8000 years ago (Jalal, 2011). These trees produce both male and female flowers, but at different times. Flowers form on previous year's growth and walnuts are wind pollinated. Buds burst in the spring and pollen is released 10 to 12 days afterwards. Full bloom of female flowers is 15 to 18 days later. Nut maturity is in the fall. Common varieties include Franquette, Hartley, Sunland and Chandler (Hassanpour *et al.*, 2013).

Walnut- inshell is enclosed in an outer husk covering which during the ripening process become fragile and the shell becomes hard. The shell encloses the kernel, which is usually made up of two halves separated by a partition. The seed kernels commonly available as shelled walnuts are enclosed in a brown seed coat which contains antioxidants. The economic life of walnut orchard is assumed to be 35 years (Safi and Bunnell, 2014). Walnuts are 65 per cent fat by weight and 15 per cent protein. They are richer than most nuts in polyunsaturated fats and particularly rich in an omega-6 fatty acid called linoleic acid. Walnuts also have a relatively high amount of omega-3 fatty acid called alpha-linolenic acid (ALA). They are a rich source of vitamins like vitamin C, B6, thiamin, riboflavin, niacin, pantothenic acid and folate, as well as minerals such as calcium, iron, magnesium, phosphorus, potassium, sodium and zinc (Honaryar, 2010). Keeping in view of the economic importance of walnuts in Afghanistan, the research was initiated to understand the trend in walnut area, production, exports and direction of trade.

## METHODOLOGY

The secondary data on area, production, productivity and export of walnut were obtained from FAOSTAT, Ministry of Agriculture, Irrigation and Livestock of Afghanistan and Central Statistical Organization (CSO) of Afghanistan. The data were analyzed with the help of compound annual growth rates (CAGR) using the formula:

$$Y_t = AB^t u_t \quad (1)$$

where,

$Y_t$  = Area (production/ export) during time t

A = Constant

t = Time period

$u_t$  = Error term

B = (1+g), where g = growth rate

By taking the logarithm, eq. (1) was reduced to the

following form.

$$\text{Log } Y_t = \text{Log } A + t (\text{Log } B) + \text{Log } u_t \quad (2)$$

Where log A and log B were the parameters of the function obtained by ordinary least square (OLS) method. Once the above equation is estimated, g can be computed as:

$$g = [\text{Antilog } (b)-1] \times 100 \quad (3)$$

Markov Chain Analysis was employed to analyze the direction of walnut exports from Afghanistan. The basic assumption of first order Markov process is that the average export of a commodity (walnut) from a country to its importing countries in any period depends only on export in the previous period and this dependence is the same among all periods. This is algebraically expressed:

$$X_{jt} = n \sum_{i=1}^n X_{it-1} \cdot P_{ij} + e_{jt}$$

where,

$X_{jt}$  is the export of walnut from Afghanistan to  $j^{\text{th}}$  country during the year 't'.

$X_{it-1}$  is the export to  $i^{\text{th}}$  country during the year t-1.

$P_{ij}$  is the probability the exports will shift from  $i^{\text{th}}$  country to  $j^{\text{th}}$  country.

$e_{jt}$  is the error term independent of  $X_{it-1}$ .

n is the number of importing countries.

The transitional probability ( $P_{ij}$ ) is central to Markov chain model which can be arranged in a (c\*r) matrix, has the following properties.

$$0 < P_{ij} < 1$$

$$\sum P_{ij} = 1, \text{ for all 'i'}$$

The transitional probability  $P_{ij}$  indicate the possibility that exports will switch over from country 'i' to country 'j' with the passage of time.

The probabilities  $P_{ij}$  for  $i = j$  (diagonal probabilities) indicate probability of retention of the share of an importing country.

## ANALYSIS AND DISCUSSION

Among the top 10 walnut producing countries, China was in first position with a production of 1.7 million MT in 2016 which accounted for 50 per cent of the world total production, followed by Iran and U.S.A. Iran and U.S.A. produced 450,000 MT and 420,000 MT, respectively in 2016 which accounted for 12.86 per cent and 12.00 per cent share of the global production. The top 10 walnut producing countries contributed 91.8 per cent of the world total production. Afghanistan contributed 0.2 per cent of the world total production of

walnut in 2016 and it is not in the top 10 producing countries, while India is in the 7<sup>th</sup> position with a contribution of 1.34 per cent. The world total walnut production in 2016 was 3.5 million MT (Table 1).

The compound annual growth rate of area, production and productivity of walnuts in Afghanistan is presented in Table 2. Area had increased from 2,300 to 3,949 hectares between the years 2007-16. But, production (9,206 to 6,515 MT) and productivity (4,003 to 1,650MT) registered negative growth of 5.8 and 8.5 for the period due to aberrant weather conditions in recent years. Normally, walnuts require a Mediterranean climate, between 600 and 800 hours of sunshine, below 10°C during winter (winter chill), a frost-free period during flowering and temperatures below 38°C during summer. Soils need to be soft enough to allow the unrestricted

growth of roots (Table 2).

The top 10 walnuts exporting countries by quantity in 2016 is provided in Table 3. The U.S.A. had the leading position among the walnut exporting countries by exporting 260,394 MT, which contributed 39 per cent of the world total walnut exports. Turkey had the second position followed by Chile contributed 19.42 per cent and 7.35 per cent, respectively. The top 10 walnut exporting countries accounted for 89.26 per cent of the world walnut exports in 2016 which was 667,602 MT (Table 3). Afghanistan is not in the top 10 walnut exporting countries and its walnut exports contributed 0.38 per cent of the world total exports in 2016.

Exports of shelled walnuts were up by 19 per cent from 2014 to reach 231,000 MT in 2015. The U.S.A. was the main exporter of shelled walnuts, contributing

Table 1 : Top 10 walnut producing countries of the World				2016
Sr. No.	Country	Production (MT)	% Share	Cumulative percentage
1.	China	1,750,000	50.00	50.00
2.	Iran	450,000	12.86	62.86
3.	U.S.A.	420,000	12.00	74.86
4.	Turkey	215,000	6.14	81.00
5.	Ukraine	115,000	3.29	84.29
6.	Mexico	110,000	3.14	87.43
7.	India	47,000	1.34	88.77
8.	Chile	38,000	1.09	89.86
9.	France	36,000	1.03	90.89
10.	Romania	32,000	0.91	91.80
	Top 10 total	3,213,000	91.80	
	World total	3,500,000	100.00	

Source: <https://www.whichcountry.co/top-10-walnut-producing-countries/>

Table 2 : Growth in area, production and productivity of walnut in Afghanistan				
Sr. No.	Year	Area harvested (ha)	Production (MT)	Productivity (kg/ha)
1.	2007	2300	9206	4003
2.	2008	2300	9660	4200
3.	2009	2382	10002	4199
4.	2010	2380	11900	5000
5.	2011	2317	13902	6000
6.	2012	2317	14002	6043
7.	2013	2317	11122	4800
8.	2014	2317	10426	4500
9.	2015	2317	3650	1575
10.	2016	3949	6515	1650
	CAGR (%)	2.9 <sup>NS</sup>	-5.8 <sup>NS</sup>	-8.5*

Note: NS statistically non-significance

\* indicates significance of value at P=0.1

Source: FAOSTAT

more than half of total exports, Germany being its main destination. Afghanistan export's Value in 2016-17 is US \$ 596,455,337 and Afghanistan's major export destination for all commodities is Pakistan with the share of 47.5 per cent followed by India with a share of 38.6 per cent. Iran, Turkey, Iraq and United Arab Emirates, respectively followed India. Export of all commodities from Afghanistan was directed to 48 countries (Fig. 1).

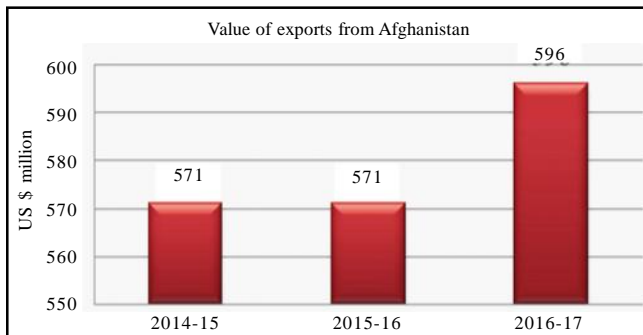


Fig. 1 : Value of exports from Afghanistan

Dry fruits accounted for 28 per cent of total value of exports from Afghanistan in 2016-17 of which fresh fruits and medical herbs each of them contributed 10 per cent share of exporting commodities from Afghanistan's agricultural exports. Carpets contributed 6 per cent and skins contributed 3 per cent of exports from Afghanistan. The rest 43 per cent was contributed by other commodities (Fig. 2).

Dry fruits exports from Afghanistan during 2016/17 accounted for 28 per cent of export share which was mainly contributed by different types of raisins. Red raisin

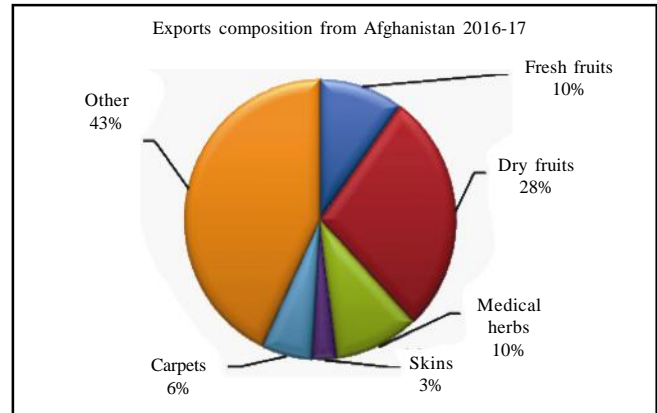


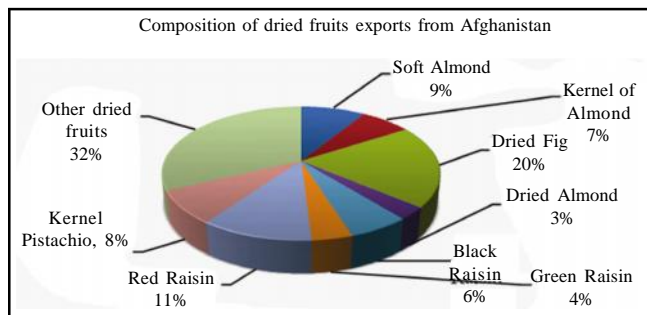
Fig. 2 : Share of exporting items from Afghanistan 2016-17

contributed 11 per cent of the dry fruits export from Afghanistan followed by black raisin with 6 per cent and green raisin shared 4 per cent together accounting for 21 per cent. The second type of dry fruit was figs which contributed 20 per cent of all dry fruits from Afghanistan. Almond is another major dry fruit which contributed 16 per cent of all dry fruits export from Afghanistan. Two types of almonds viz., soft almond (9 %) and kernel of almond (7%). Kernel pistachio contributes 8 per cent of dry fruits exports and dried apricot share 3 per cent of dry fruits exports. The rest 32 per cent was contributed by other dry fruits and walnut is also included in this category because the contribution of walnut export in total dry fruits export was only 2.42 per cent (Fig. 3).

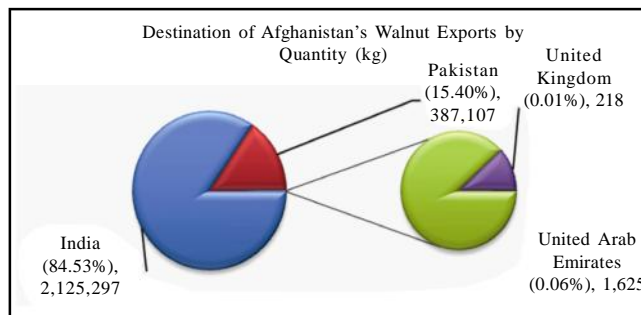
Growth in export of walnut from Afghanistan is presented in Table 4. Shelled walnut exports report registered a negative CAGR of 15.05 per cent from 2007-16 period. Shelled walnut export has exhibited more than

Sr. No.	Country	Quantity (MT)	% Share	Cumulative percentage
1.	USA	260,394	39.00	39.00
2.	Turkey	129,664	19.42	58.43
3.	Chile	49,090	7.35	65.78
4.	France	34,645	5.19	70.97
5.	Italy	27,862	4.17	75.14
6.	Georgia	26,111	3.91	79.05
7.	Ukraine	21,914	3.28	82.34
8.	Moldova	17,329	2.60	84.93
9.	Germany	15,325	2.30	87.23
10.	Azerbaijan	13,563	2.03	89.26
	Top 10 Total	595,897	89.26	
	World Total	667,602	100.00	

Source: [http://agriexchange.apeda.gov.in/product\\_profile/Major\\_Exporting\\_Countries.aspx](http://agriexchange.apeda.gov.in/product_profile/Major_Exporting_Countries.aspx)



**Fig. 3 : Composition of Dried Fruits Exports from Afghanistan 2016-17**  
Source: Afghanistan Statistical Year Book 2016/17



**Fig. 4 : Destination of Afghanistan's Walnut Exports 2016/17**  
Data source: Afghanistan Statistical Year Book (2016/17)

50 per cent reduction from 1219 MT in 2007 to 510 MT in 2016. It may be mentioned here that, the production and productivity of walnut also decreased during the same period. The decline in exports is mainly because of the inconsistent demand for Afghanistan dry fruits from importing countries.

Sr. No.	Year	Walnuts (Shelled)
1.	2007	1219
2.	2008	763
3.	2009	2501
4.	2010	231
5.	2011	241
6.	2012	560
7.	2013	962
8.	2014	183
9.	2015	156
10.	2016	510
CAGR (%)		-15.05 <sup>NS</sup>

Note: NS statistically Non-significance  
Data source: FAOSTAT

Afghanistan exported 2,514 metric tonnes of walnut in 2016/17. India was the major destination country of Afghanistan's walnut export in 2016/17 importing 2,125 metric tonnes of Afghanistan's walnut which became

84.53 per cent of Afghanistan's total walnuts exports. Pakistan was the second major market for Afghanistan's walnut with a share of 15.4 per cent and in terms of quantity 387 MT. United Arab Emirates and United Kingdom were the two other markets for Afghanistan's walnut in 2016/17, while both of them contributed less than one per cent each (Fig. 4).

Direction of pip of walnut exports from Afghanistan shows that the major market for pip of walnut from Afghanistan was India, Pakistan, United Arab Emirates and Turkey from 2012/13 to 2016/17. None of these four major countries and other countries was stable markets for pip of walnut from Afghanistan as revealed by the transition probability matrix.

**Conclusion :**

China is in the top position among the walnut producing countries in 2016 with the contribution of 50 per cent share followed by Iran and U.S.A. and the world total production of walnut in 2016 was 3.5 million tonnes. Harvested area of walnut in Afghanistan had registered 2.9 per cent CAGR from 2007 to 2016 while its production and productivity registered a negative CAGR of 5.8 per cent and 8.5 per cent, respectively. U.S.A. was in the leading position among walnut exporting countries in the world during 2016 with the contribution

Sr. No.	Country	India	Pakistan	UAE	Turkey	Others
1.	India	0	0	0.0996	0	0.9003
2.	Pakistan	1	0	0	0	0
3.	UAE	0.9035	0	0	0.0964	0
4.	Turkey	0.8984	0	0	0	0.1015
5.	Others	0	0.5321	0.0936	0.2379	0.1363

Source: Afghanistan Statistical Year Book (2016/17)

of 39 per cent, followed by Turkey and Chile and the world total export of walnut was 667,602 MT. Afghanistan export's value in 2016-17 was US \$ 596,455,337 and major export destination for all commodities was Pakistan followed by India. Dry fruits contributed 28 per cent of the all exporting commodities from Afghanistan in 2016/17 and walnut accounted for 2.24 per cent of dry fruits exports. The CAGR of walnut (shelled) export from Afghanistan for the period 2007-16 indicates a decline of 15.05 per cent which is mainly due to decrease in production and productivity for the same period. Afghanistan exported 2,514 metrictonnes of walnut in 2016/17 and India was the major destination accounting for 84.53 per cent, followed by Pakistan. Transition probability matrix of pip of walnuts exports from Afghanistan for the period 2012/13-2016/17 indicates that there is no stable market for the pip of walnuts export from Afghanistan and all the destination countries were highly unstab.

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