



## Growth and Instability in Production and Export of Almond in Afghanistan

Abdul Wahid Sultani<sup>1</sup>, Muhammad Hassan Mohammadi<sup>2</sup>, Mirwais Rasoli<sup>3</sup>

<sup>1,3</sup>Teaching Assistant, Sayed Jamaluddin Afghani University, Kunar province, Afghanistan

<sup>2</sup>Senior Teaching Assistant Sayed Jamaluddin Afghani University, Kunar province, Afghanistan

**ABSTRACT:** The almond is native to Iran and surrounding countries as well as Asia. In 2017, world production of almonds was 2.2 million tones, with the United States providing 46% of the total. According to FAO Afghanistan is one of the 10 top producers of almonds. The study examined the growth and instability of area, production, export and consumption of almond in Afghanistan from 2000 to 2017. Exponential function fitted to estimate compound annual growth rates (CAGR) in area, production, export and consumption of almond, and Cuddy - Della Valle indices are used in the study. The compound growth rates for area, production and productivity of almonds in Afghanistan were 5.77 %, 7.37 % and 1.52 % respectively. Area under almond crop exhibited medium (19,52) instability, where production and productivity shown high (50.05 and 49.01) instability respectively, during this period. Almond consumption grew by 6.75 per cent and export grew with compound annual growth rate of 6.12 per cent from the year 2000 to 2017. Both export and consumption of almond registered high instability in this period.

**KEY WORDS:** Afghanistan, growth, instability in almond production, almond export and almond domestic consumption.

### INTRODUCTION

The almond is native to Iran and surrounding countries as well as Asia. It was spread by humans in ancient times along the shores of the Mediterranean into northern Africa and southern Europe, and more recently transported to other parts of the world, notably California, United States<sup>[1]</sup>(Gharaghani *et al.* 2017). Almonds were one of the earliest domesticated fruit trees due to "the ability of the grower to raise attractive almonds from seed. Domesticated almonds appear in the Early Bronze Age (3000–2000 BC) such as the archaeological sites of Numeria (Jordan), or possibly earlier<sup>[2]</sup>(Capurso *et al.* 2018).

In 2017, world production of almonds was 2.2 million tones, with the United States providing 46% of the total. As other leading producers, Spain, Iran, and Morocco combined contributed 22% of the world total<sup>[3]</sup>(Zhang *et al.*, 2019).

According to FAO Afghanistan is one of the 10 top producers of almonds. Afghanistan has a unique climate that provides perfect conditions for cultivation of almonds. Currently the Ministry of Agriculture, Irrigation and Livestock has 78 native varieties of almonds. Almond farming is limited to the irrigated lands nearby rivers in Afghanistan., there were over 19793 hectares of almond orchards in 2017.<sup>[4]</sup>(FAOSTAT). After decades of war and economic isolation, Afghanistan's historical reputation for the production of quality, uniquely flavored dried fruit and nuts, exported throughout the world, has diminished considerably. About 60 percent of the world's dried fruits and nuts came from Afghanistan prior to 1980<sup>[5]</sup>(Bromand, 2017). As Afghan farmers continue to work toward rebuilding what was destroyed from years of war, with a great deal of international assistance, there is immense potential for Afghanistan to increase exports of dried fruits beyond just regional markets in Pakistan and India. Afghanistan is on the track to regain some of the ground lost.

Afghanistan's almonds are mainly produced in the Central Region (48 per cent), the Northern Region 29 per cent and the Western and Southern Regions 10 per cent each. The Central region of Afghanistan has the biggest almond production regions, with Ghazni one of the largest almond producing provinces in Afghanistan. The Central Region is responsible for 50 per cent of almond production of Afghanistan (35,000 MT/yr.), accounting for approximately 30 per cent of the total production of almonds in Afghanistan. in the Western region and Laghman province in the Eastern Region both produce approximately 10 per cent of the almonds produced in Afghanistan. Around 75 per cent of the almonds produced in Afghanistan are hard/medium-shell. Hard-shell almonds are often shelled in Afghanistan<sup>[6]</sup> (CSO, 2017).

### Objectives

1. To estimate the rate of growth in production, export and consumption of almond
2. To examine the extent of instability in growth of production, export and consumption of almond.



## METHODOLOGY

The study is based on secondary data. The data was collected from FAO site for the period from 2000 to 2017. To estimate growth in production, export and consumption of milk in Afghanistan, exponential growth function has been fitted. Growth rates are worked out to examine the tendency of the variable to increase, decrease or stagnate over period of time. It also indicates the magnitude of the rate of change in variable under consideration per unit of time. In present study, compound annual growth rates of production, export and consumption of almond in Afghanistan have been estimated by using the exponential growth function to the following form,

$$Y_t = a e^{bt}$$

Where,

$Y_t$  is production, export and consumption of almond in Afghanistan.

$a$  and  $b$  are constants (parameters)

$t$  is time period from the year 2000 to the year 2017, i.e. 18 years.

To examine the level of instability in area, production and productivity of almond in Afghanistan Cuddy - Della Valle instability indices (CDI) were constructed.

Instability index is a sample analytical instrument to find the variation in any given time series data. Cuddy- Della Valle method is used as it corrects the coefficient of variation if data are scattered around the negative or positive trend line, over estimation can be eliminated. Formula for the construction of Cuddy – Della Valle index is as follows,

$$I_x = CV \sqrt{(1 - \bar{R}^2)}$$

Where,

$I_x$  = Index value

Coefficient of variation (CV %) =  $\left(\frac{\sigma}{\bar{X}}\right) \times 100$

$\bar{R}^2$  = Adjusted coefficient of multiple determination

$\sigma$  = Standard deviation

$\bar{X}$  = Mean value

In the present study the CDI values are grouped into three classes, which represent the different level of instability, as follows:

1. Low instability = value of instability index is between 0 to 15
2. Medium instability = value of instability index is more than 15 to 30
3. High instability = value of instability index is greater than 30

## RESULTS AND DISCUSSION

### Compound Annual growth rates and instability in area, production and productivity of almonds in Afghanistan

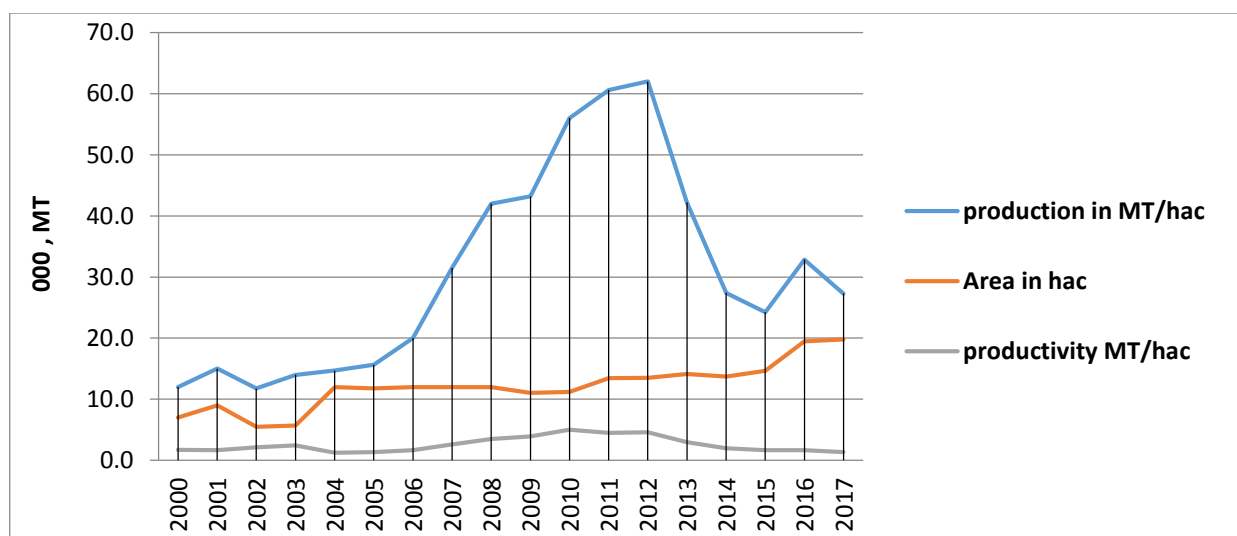
Trends and instability in area, production and productivity of almonds in Afghanistan have been calculated for a period of 18 years (2000 to 2017) presented in the table no 1. The table reveals that the area under cultivation of almond increased from 7000 hectares in 2000 to 19793 hectares in 2017. The production of almonds was 12000 MT in 2000 and increased to 27291 MT in 2017, as it realizes that the area is increase twice as compare to 2000 year but in case of production, it increased about one time from 2000 year, which is because of increment in the cultivated area. And variation in production also affected due to temperature variation during January and February months. Warm temperature in January led almond trees to bloom earlier than normal, leading to low production following the freezing temperatures in February. Similarly, the productivity of almond in 2000 was 1.71 MT/ha and it decreased to 1.38 MT/ha in 2017, but during the year 2012 the area under cultivation of almond was 13490 hectares and the production increased to 62000 MT with the productivity of 4.59 MT/ha. Similarly, the year 2010 has highest productivity of about 5 MT/ha in the study period, this was due to control of adverse factors such as pests and disease. The Plant Protection and Quarantine Department of Ministry of Agriculture has taken safety measures and distributed pesticides and pruning accessories to farmers. The compound growth rates for area, production and productivity of almonds in Afghanistan were 5.77 %, 7.37 % and 1.52 % respectively. Area under almond crop exhibited medium (19,52) instability, where production and productivity shown high (50.05



and 49.01) instability respectively, during this period. The figure 1 indicate the changes recorded in area, production and productivity of almond in Afghanistan during the period.

**Table 1:** Growth and instability in Area, Production and Productivity of Almonds in Afghanistan

Year	Area/Hectare	Production in MT	Productivity (MT/ha)
2000	7000	12000	1.71
2001	9000	15000	1.67
2002	5500	11774	2.14
2003	5700	14000	2.46
2004	12000	14700	1.23
2005	11768	15630	1.33
2006	12000	20000	1.67
2007	12000	31481	2.62
2008	12000	42000	3.50
2009	11029	43183	3.92
2010	11210	56000	5.00
2011	13469	60611	4.50
2012	13490	62000	4.60
2013	14114	42215	2.99
2014	13703	27400	2.00
2015	14676	24246	1.65
2016	19481	32843	1.69
2017	19793	27291	1.38
<b>CAGR (%)</b>	<b>5.77</b>	<b>7.37</b>	<b>1.52</b>
<b>Instability</b>	<b>19.52</b>	<b>50.05</b>	<b>49.01</b>



**Fig 1:** Area, Production and Productivity of Almonds in Afghanistan from 2000 to 2017



## Growth and instability in Export and Consumption of Almonds from Afghanistan (2000–2017)

In the figure 1 we observed that there is instability and huge variation in the production and productivity of almond during the study period, however there is substantial increase in domestic consumption of almonds in Afghanistan. There is slight increase in the export of almonds from Afghanistan from 2002 to 2005. Ridiculous decreased in 2006, the exports have increased till 2009 which is the peak of export in study period followed by 2017. We observed huge variation in the export quantity from 2000 up to 2017 which also shows high instability of (63.31) in export almond from Afghanistan during the study period. beside high instability the export of almond grew by more than 6 per cent and consumption grew by nearly 7 per cent during this period in the country, which can be attributed to the activities taken up by almond organizations such as Afghanistan Almond Industry Development Organization and many other almond exporting organizations established during the period and agreement called APTTA (Afghanistan- Pakistan Transit Trade Agreement) signed by Afghanistan and Pakistan which allows Afghanistan trucks to transit goods to both nations. However, it can be noticed that the activities of these organizations have been periodic hence increase in exports can be noticed only in few years. With regard to the domestic consumption people prefer soft shell type of almonds and soft shell and hard medium shell types of almonds are usually exported as kernel or in shells.

**Table 2:** Domestic Consumption and Export of Almond from Afghanistan (2002 to 2017)

Years	Export MT	Consumption MT
2002	1009	10765
2003	1292	12708
2004	1633	13067
2005	1651	13979
2006	421	19579
2007	1035	30446
2008	2917	39083
2009	4763	38420
2010	1308	54692
2011	2262	58349
2012	1125	60875
2013	2381	39834
2014	2716	24684
2015	2342	21904
2016	1691	31152
2017	3335	23956
<b>CAGR (%)</b>	<b>6.12</b>	<b>6.75</b>
<b>Instability</b>	<b>63.31</b>	<b>62.57</b>

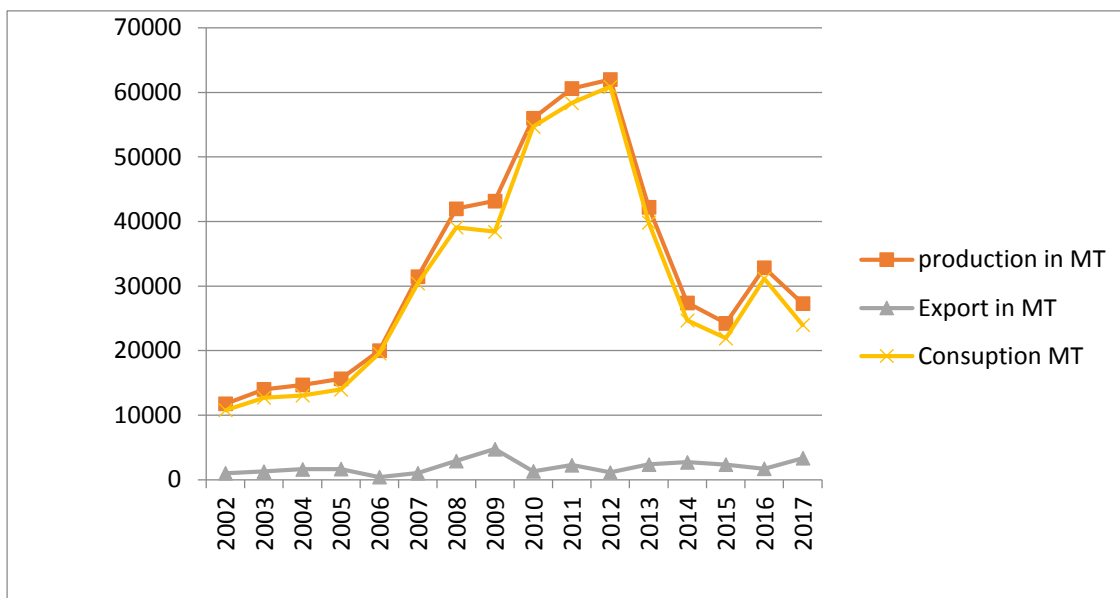


Fig 2: Productions, Domestic Consumption and Export of Almond from Afghanistan (2002-2017)

**CONCLUSION**

The compound growth rates for area, production and productivity of almonds in Afghanistan were 5.77 %, 7.37 % and 1.52 % respectively. Area under almond crop exhibited medium (19,52) instability, where production and productivity shown high (50.05 and 49.01) instability respectively, during this period. almond consumption grew by 6.75 per cent and export grew with compound annual growth rate of 6.12 per cent from the year 2000 to 2017. Both export and consumption of almond registered high instability in this period. the study suggested government should support and give subsidies to the farmers which will help them lower the cost of raw material and inputs. Enhancement of the general level of technical knowledge and marketing skills of farmers is required to have positive impact on production and export of almonds from Afghanistan. Thus it will increase production and farmer’s income as well as trader’s income in the almond value chain.

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