



## Research Article

# Production, Marketing and Future Prospects of Kiwifruit in Nepal

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**Keywords:** Cultivation; Kiwifruit; Market; Production; Trade

### Abstract

Kiwifruit is one of the leading agriculture commodities having tremendous potential of export to the international market. Nepal offers suitable topography, climate and soil for profitable production of kiwifruit having unique taste, precocity and high nutritive and medicinal values. This study attempts to analyze the production trend, export and import, current scenario and future prospects of kiwifruit in Nepal. Findings shows that the production of kiwifruit is in increasing trend with an average annual growth rate of 46.5% from fiscal year 2014/15 to 2016/17 in Nepal. The commercialization of Nepalese kiwifruit is still in the state of infancy. Even though possessing passable shot in local and the global market, country yet produces small-scale of kiwifruit. The main challenges include inadequate scientific research on kiwifruit, lack of adoption of improved technology, insufficient investment, and poor-quality planting material, unstable prices and profit margins along with inappropriate market channels. Thus, to fortify kiwifruit subsector, it is recommended to focus on strategy of improving kiwifruit productivity with conventional mechanization, improved technology adoption, price intervention, market recognition, establishment of storage and processing centers and diplomatic relations for convenient global marketing.

### Introduction

Kiwifruit (*Actinidia spp.*) originating from China is a deciduous vine which was introduced to the world market from New Zealand in the 1950s (Barboni, 2010). It is one of the delicious fruits which has emerged as a leading high value crop and has gained a worldwide popularity in recent few years because of its unique taste, wide climatic adaptability along with its high nutritive and medicinal values. Kiwifruit is primarily produced for the fresh fruit market and its processing is typically only a way of using rejected fruits (Celik, 2006).

Kiwifruit accounts one of the good sources of antioxidant substances along with organic compounds such as amino acids, sugars, proteins, minerals and the necessary vitamins for the human body. Because of its nutritive value as well as the antioxidant properties, there is a tremendous increase in the interest of the crop production in the recent years. The fruit has a good source of vitamin C, exceeding that of orange, pear and apples. Kiwifruit is described as "King of Fruits" due to its high vitamin C content (Xu & Zhang, 2003). Consumption of Kiwifruit has several health benefits in human. This benefit has widened the consumption rate of

fruits by people of different age groups (Ferguson & Huang 2007).

There are more than 70 species of Kiwifruit. Among them *Actinidia deliciosa* (Fuzzy kiwifruit) and *Actinidia chinensis* (Golden kiwifruit) are commercially cultivated species (Ferguson & Huang 2007). The most widely planted kiwifruit cultivar in the world is the fuzzy kiwifruit *A. deliciosa*- 'Hayward'. 'Hayward' accounts for about half of kiwifruit cultivation throughout the world (Guroo et al., 2017). 'Hayward' kiwifruit also represents about 90% to 95% of the kiwifruit traded internationally (Ferguson, 2008). The fuzzy kiwifruit *A. deliciosa* is commercially the most important crop and its total production accounts for about 1.8 million tons per year (Guroo et al., 2017).

The increasing population of the consumers towards the consumption of the fruit has shown an ample space for the expansion of the area under the crop (Poudel, 2019). Kiwi fruit provides high return per unit area and the farmers can earn about Rs. 4 to 5 lakhs per hectare annually (Jindal and Sharma, 2016). Recognizing the benefits of kiwifruit, it has been spread all over the world, primarily including China, Italy, New Zealand, Turkey, Chile, USA, Japan, Greece, France, Portugal etc. In 2018, approx. 4.3 Million tonnes of kiwifruit were produced worldwide; increasing by 4.4% against the last year.

In context of Nepal, kiwi has been reported to show best performance at an altitude of 1200 to 2500 masl. The total area, productive area, production and yield of Kiwifruit in Nepal are 551ha, 186ha, 719 mt and 4 mt/ha respectively (MOAD, 2016/2017). Dolakha, Illam, Kavre, Solukhumbhu, Ramechhap, Sindhuli, Pachthar, Dhankuta, Baglung, Parbat, Kaski, Salyan Nuwakot, Magydi are the potential districts for Kiwi cultivation in Nepal (Gotame et al., 2016).

Besides fresh fruit, Kiwifruit has a tremendous potential for processed value-added products. Kiwifruits can be processed to jam, jelly, candy, marmalade, wine, juice etc. The fruits that do not meet quality standards as fresh fruits in the market, processing is the best alternative for adding value to the product (Guroo et al., 2017). This shows huge scope to scale up the production of Kiwifruit in Nepal for uplifting the livelihood of Nepalese famers and commercializing agriculture industry of Nepal.

## Materials and Methods

The study was carried out to know the production and marketing status of kiwifruit in local and global context for Nepal. The study is based on the review and synthesis. A thorough review of the literature along with its relevant database was performed. The data for the study are acquired primarily through the secondary data collection from the publications of Food and Agriculture Organization (FAO),

Statistical Information on Nepalese Agriculture, Trade and Export Promotion Centre (TEPC), publications of Ministry of Agriculture Development (MoAD), Various books, booklets and relevant statistical records.

Dozens of literatures with open access online peer reviewed national and international research papers from different journals, reports, abstract, blogs and websites were reviewed and thus the collected data were assembled in Microsoft Excel and graphs were drawn.

A critical and SWOT analysis was carried out to evaluate prospect of Kiwifruit based on the recent national and international trends of kiwifruit production and import-export performance.

Linear trend line analysis was carried for estimating the average annual change in the kiwifruit production in the country.

Mathematically expression for linear trend line:

$$Y = a + bt.$$

Where "Y" is a production of the kiwifruit at time (t), "b" is an average annual growth (MT), "t" is a time factor in years, and "a" is an intercept.

Percentage change was estimated with the following expression:

$$\text{Percentage (\%)} \text{ change} = \frac{X_2 - X_1}{X_1} \times 100$$

## Results and Discussion

### Global trends of Kiwifruit production

The world kiwifruit production trend (Fig. 1) shows that the area under cultivation and production has been increasing over the years. In 2016, there was slight decline in production of kiwifruit which was followed by slight increment in subsequent years. Though kiwifruit is native to China, commercial production was first exploited by New Zealand. The New Zealand Kiwifruit Industry was originated from a historic import of Kiwifruit seeds from China in 1904 (Ferguson & Bollard, 1990). After commercial development of Kiwi industry in New Zealand, in 1960s plants and seeds of kiwifruit was transported to new destinations such as Germany, Italy, Spain, India, South America, Morocco, Israel and South Africa (Kofoed, 2015). Plants were quickly distributed throughout the world and many countries started its commercial production. Till mid-1980s New Zealand dominated global kiwifruit production. However, its share declined gradually due to increase in cultivation in Europe and Asia (Mani et al., 2018). With the commercial cultivation of kiwifruit across the globe, Asia has emerged as largest contributor in global kiwifruit production and shares 52% of total production of world (Fig. 2).

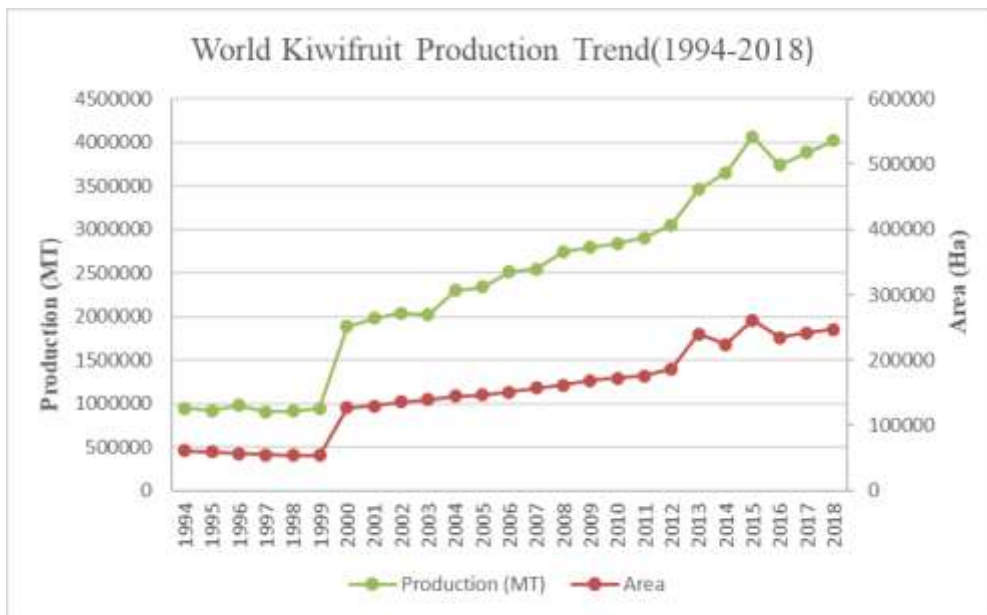


Fig. 1: World Kiwifruit Production Trend (1994-2018). Source: (FAOSTAT, 2018)

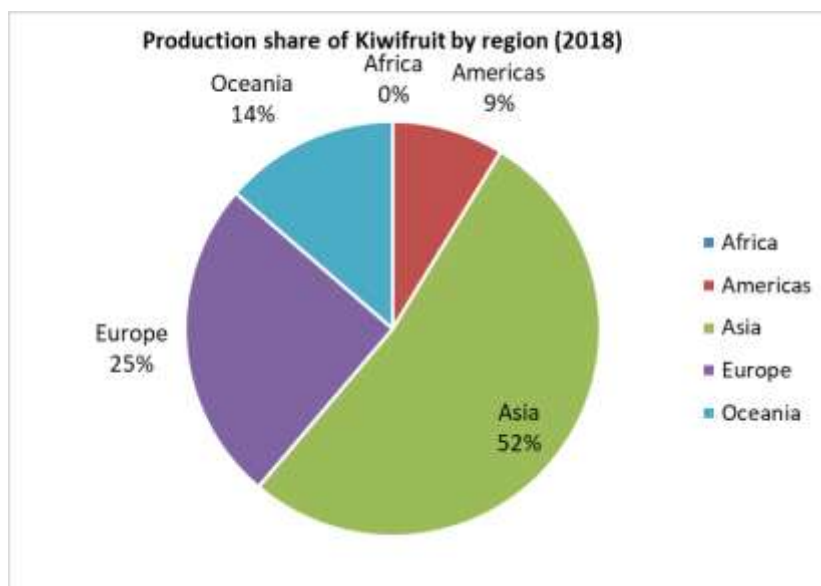


Fig. 2: Production share of Kiwifruit by region. Source: (FAOSTAT, 2018)

The average annual growth rate of kiwifruit production in the world was estimated around 7.19%. The estimation of the percentage change in the kiwifruit production from base year 1994 to recent year 2018 was 324.55% increase. While similar estimation for the kiwi cultivated area showed that there was increase by 302.18% from 1994 to 2018. Annual growth rate of kiwifruit production in the world for individual year is shown in Fig. 3.

Fig. 4 shows the top 10 kiwifruit producing countries in the world. China is top kiwifruit producing country followed by Italy, New Zealand, Iran and Greece. Previously, Kiwifruit was considered as wild fruit in China and it was not produced in commercial scale. But, with the increase in global demand, China has emerged as top producer of Kiwifruit in the world and shares 50.59% of total world

production in the year 2018 (FAO, 2018).The top 10 Kiwifruit producing countries in the world accounts for 98.36% of total world kiwifruit production (FAOSTAT, 2018).

**Status of Kiwifruit Production in Nepal**

According to Dhakal (2018), Kiwifruit was introduced in Nepal during Swiss project in some lands of Charikot and Jiri of Dolakha district during 1980s by a Swiss engineer J. F. Messy. But, the history of commercial farming of Kiwifruit in Nepal is not so long. It has been only 15-20 years (Gotame et al., 2016). During 1990s, ICIMOD established a demonstration/ production plot at Godawari, Lalitpur by importing saplings from India (Gautam & Gotame, 2020). With this, the fruit was introduced to farmers and its cultivation was started in commercial scale.

In recent years, it has emerged as highly popular fruit crop among Nepalese farmers and there is tremendous increment in kiwifruit cultivation area. The average annual growth rate of kiwi production in Nepal was estimated around 46.5% from fiscal year 2014/15 to 2016/17. The percentage change in the kiwifruit production from fiscal year 2014/15 to 2016/17 was estimated 95.32%. Similarly, there was increase in kiwifruit cultivating area by 94.69% from fiscal year 2014/15 to 2016/17. The Fig. 5 shows production trend of Kiwifruit in Nepal.

The total area under kiwifruit cultivation is increasing over the years due to awareness of people about its nutritive and medicinal value and high price it fetches. The total area under cultivation is 551 Ha, where productive area is 186 Ha with production 719 Mt/ha and productivity 4 Mt/ha

(MOAD, 2016/2017). Although area under cultivation is increasing rapidly but the productivity is very low and constantly decreasing. According to MOAD the productivity of kiwi in 2014/15 was 7 Mt/ha and 6.6 Mt/ha in 2015/16. This indicates that the orchards established in Nepal has poor management and inadequate technology.

Recognizing the high potential of kiwi farming in Nepal, Government of Nepal has established Kiwi farm at Boach, Dolakha known as Temperate Fruit Rookstock Development Center. Apart from this, Prime Minister Agriculture Modernization Project has identified three districts (Ilam, Dolakha and Solukhumbu) as Kiwi zone in order to promote Kiwi farming at commercial scale. At present, Kiwifruit is cultivated in most of the mountainous and hilly region of eastern Nepal (Fig.6).

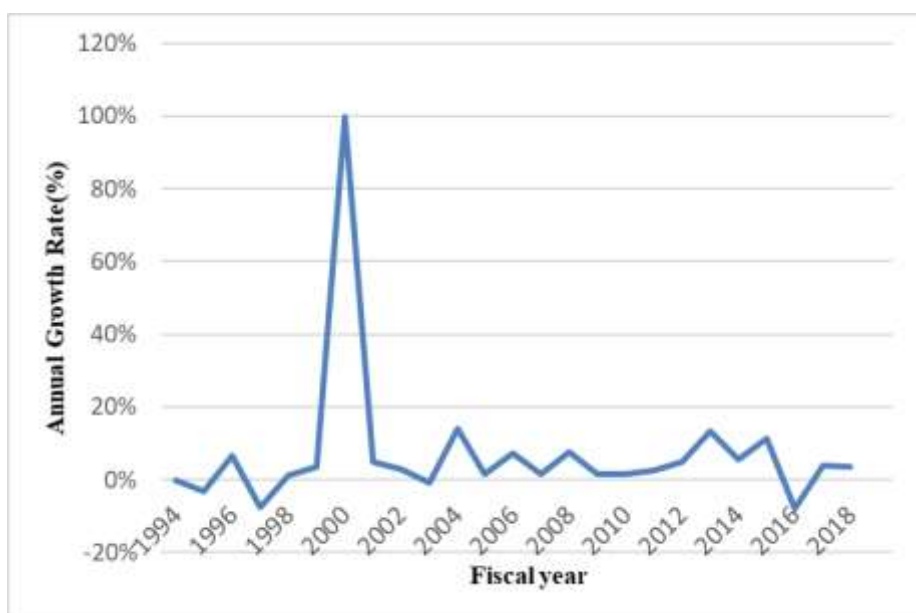


Fig. 3: Annual growth rate of kiwifruit production in the world

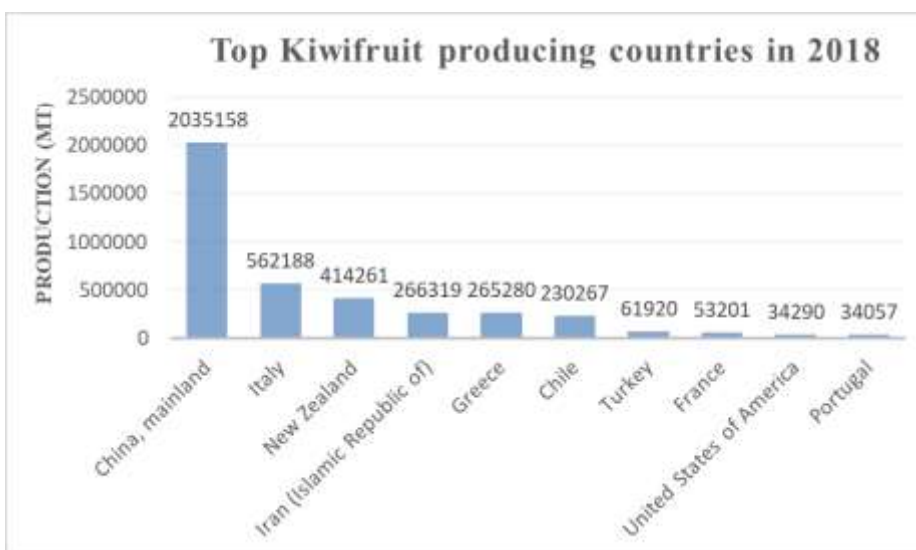


Fig. 4: Top Kiwifruit producing countries in 2018. Source: (FAOSTAT, 2018)



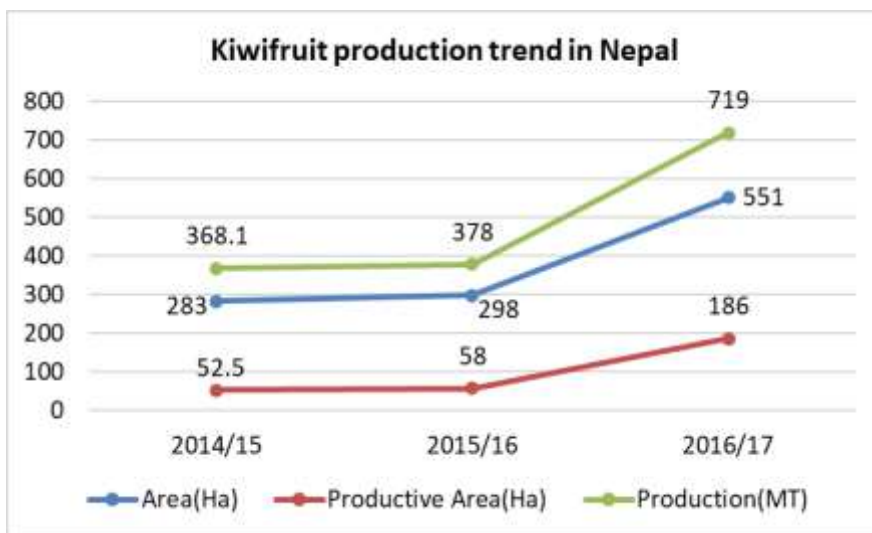


Fig. 5: Kiwifruit production trend in Nepal.[ Source: Statistical Information In Nepalese Agriculture 2016/17]

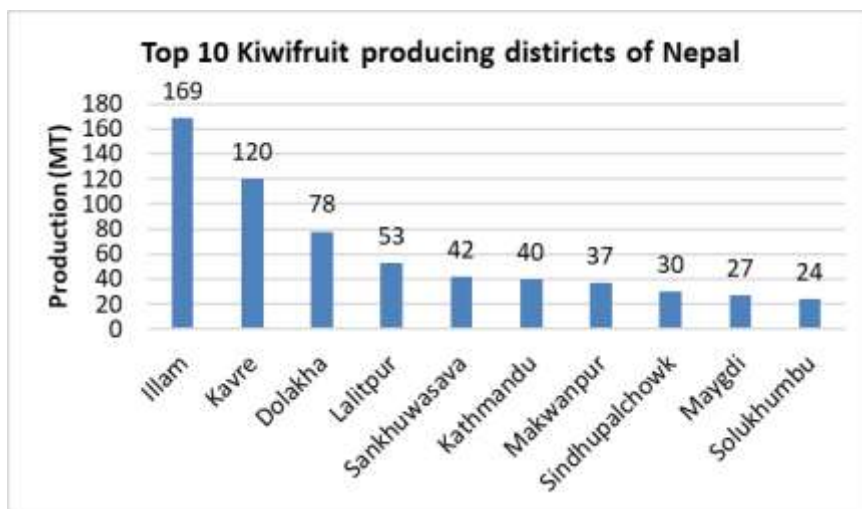


Fig. 6: Top 10 Kiwifruit producing districts of Nepal Source: Statistical Information In Nepalese Agriculture 2016/17

In 2006, The Federation of Nepalese Chamber of Commerce and Industry (FNCCI) selected Makwanpur and Illam district for its One Village One Product (OVOP). Commercial cultivation of kiwifruit was started in Illam since 2007. Illam is the leading district in kiwifruit production producing 169 Mt kiwifruit (MOAD, 2016/2017). However, the productivity is too low 2Mt/ha. Surya Organic Farm located at Patlekhet, Kavre has most diversity of kiwifruit cultivar. Red kiwi, Hayward, Bruno, Monty, Abbot, Allison and ICIMOD Oblong were planted at Surya Organic Farm in 2005 (Gautam & Gotame, 2020).

**Marketing and Trade**

**Global trends of Kiwifruit Export and Import**

According to Mani, Kundra and Haque (2018), Kiwifruit is one of the most traded fresh fruit with 104 exporting and 118 importing countries. In 2017, the global export of kiwifruit was 1.50 million Mt. worth USD 2712.50 million. New Zealand was the largest exporter in terms of quantity

as well as value. The export of Kiwifruit in New Zealand is managed by a single desk exporter called Zespri that supplies Kiwifruit to 55 countries (Westroop, 2015). Other than New Zealand, Italy, Chile, Greece and Belgium occupies place in top 5 kiwifruit exporting countries. While large export of Kiwifruit is done by few countries, import have larger regional spread. Despite being largest producer, China imports Kiwifruit in large quantity and almost produced fruit is sold in domestic market with minimal export. Chinese kiwifruit industry is facing problem to compete at international market as the commercially cultivated varieties in China are not very popular. The global import of kiwifruit during 2017 was 1.58 million Mt. with import value USD 2934.35 million. While China was the largest importer of Kiwifruit in terms of value, Spain was the largest importer in terms of quantity followed by Belgium and China in 2017.

**Export and Import of Kiwifruit in Nepal**

Unlike the other fruits, there is inconsistency in trade of kiwifruit in Nepal. According to TEPC, Nepal has imported Kiwifruit from neighbouring countries India and China in recent years. The increase in knowledge on nutritive and medicinal value of kiwifruit among consumers has resulted increase in demand. The domestic production do not fulfill demand during off-season due to lack of storage facility. Hence, Kiwifruit is imported in Nepal and sold at much higher price. But, the export practice of Kiwifruit is insignificant. However, with the aim of promoting kiwifruit industry Nepal has exported small quantity of fruit. In 2016, Nepal exported 1325 kg of kiwifruit to India, Bhutan and Pakistan and 65 Kg in 2017 to Bhutan (Table 1).

According to MOAD (2016/2017), Nepal has imported 2918 Kg fresh kiwifruit worth Rs.84000 and exported 1265 Kg fresh Kiwi worth Rs. 475000. Nepal possesses high possibilities to export kiwifruit to the neighbouring countries. In India import accounts for 75% of its domestic

demand (Mani et al., 2018) and China is the largest importer in terms of value. To export Kiwifruit to the global market, we need to meet very high quality standards. But, kiwifruit produced in Nepal has several problems with their quality. They are not of uniform size or not of same variety and too small in size. Hence, to compete in global market more concern should be given towards quality improvement practices.

**SWOT Analysis**

A SWOT (Strength, Weakness, Opportunity and Threat) analysis was conducted associated with production and marketing of kiwifruit, presented as in Table 2.

**Major Issues and Challenges of kiwifruit in Nepal**

There accounts several issues and challenges that are hindering the kiwifruit production and development in Nepal. Among many, some of the majors are shortlisted in Table 3. The possible strategies to boost up the kiwifruit production by overcoming those issues and challenges are also suggested.

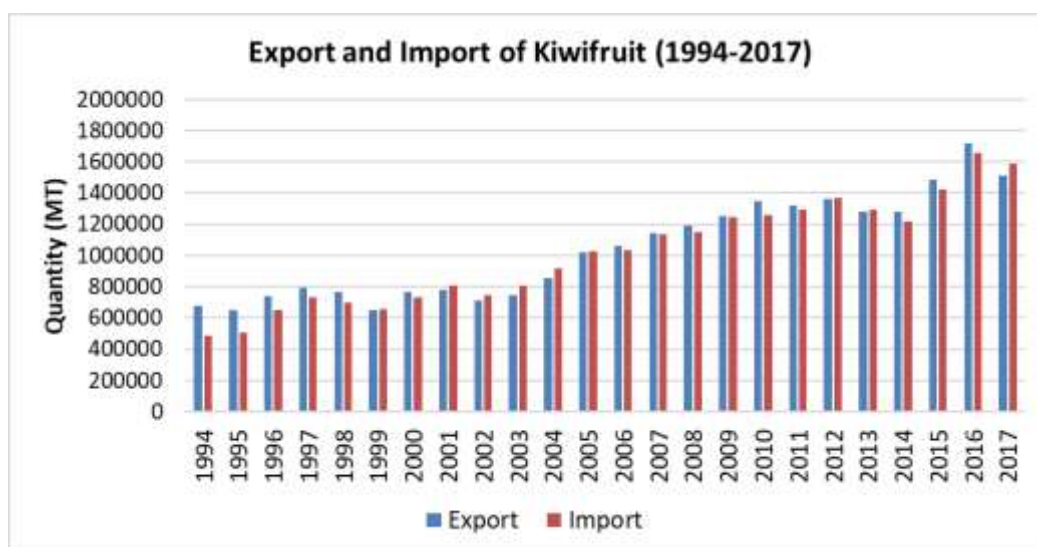


Fig. 7: Export and Import of Kiwifruit (1994-2017) (Source: FAOSTAT, 2018)

Table 1: Export and Import of Kiwifruit in Nepal

Year	Import		Export	
	Quantity (Kg)	Value (Rs)	Quantity (Kg)	Value (Rs)
2009	260	6683	-	-
2010	-	-	-	-
2011	2697	52536	-	-
2012	-	-	-	-
2013	10	1705	-	-
2014	3050	86,950	-	-
2015	2365	76,396	-	-
2016	2560	69341	1325	196999
2017	738	62861	65	3,00,000
2018	3490	12082797	-	-
2019	47650	21279138	-	-

Source: (TEPC, 2019)

**Table 2:** SWOT analysis of kiwifruit

<b>Strength</b>	<b>Weakness</b>
<p>Production</p> <ul style="list-style-type: none"> <li>• Congeal topography and agro-climatic condition.</li> <li>• Kiwi venture easily adopted by Nepalese youths in comparison to any other ventures.</li> <li>• Environmental friendly crop.</li> </ul>	<p>Production</p> <ul style="list-style-type: none"> <li>• Lack of critical mass of well-trained kiwi technicians and growers.</li> <li>• Lack of proper technical knowledge on kiwi enterprise.</li> </ul>
<p>Marketing</p> <ul style="list-style-type: none"> <li>• Huge potential for local and global markets.</li> </ul>	<p>Marketing</p> <ul style="list-style-type: none"> <li>• Lack of well-organized market channels distribution network.</li> <li>• Inadequate market information system.</li> </ul>
<p><b>Opportunity</b></p> <p>Production</p> <ul style="list-style-type: none"> <li>• Increase in domestic demand</li> <li>• Increasing supply and demand gap in the world</li> </ul> <p>Marketing</p> <ul style="list-style-type: none"> <li>• Growing numbers of health-conscious consumers.</li> <li>• Demand for healthy and quality organic products.</li> </ul>	<p><b>Threats</b></p> <p>Production</p> <ul style="list-style-type: none"> <li>• Migration of youths to abroad</li> <li>• Rising input prices.</li> <li>• Limited financial capability</li> </ul> <p>Marketing</p> <ul style="list-style-type: none"> <li>• Fierce competition from neighboring countries.</li> <li>• Inconsistent import-export policy.</li> </ul>

**Table 3:** Major issues and challenges of kiwifruit production in Nepal.

<b>Issues and Challenges</b>	<b>Action to be taken</b>
<ul style="list-style-type: none"> <li>• Lack of genetically superior planting material</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of quality planting material</li> </ul>
<ul style="list-style-type: none"> <li>• Lack of adequate knowledge on production technologies and poor farm management practices</li> </ul>	<ul style="list-style-type: none"> <li>• Improving grower's knowledge and skills through extension programs</li> </ul>
<ul style="list-style-type: none"> <li>• Insufficient investment on kiwi production</li> </ul>	<ul style="list-style-type: none"> <li>• Adequate investment according to the strategic location and needs to be done</li> </ul>
<ul style="list-style-type: none"> <li>• Inadequate scientific research on kiwi</li> </ul>	<ul style="list-style-type: none"> <li>• Increment in investment in Research and extension program</li> </ul>
<ul style="list-style-type: none"> <li>• Unestablished market and inadequate promotion and marketing activities</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of market and promotion of marketing activities through mass media such as T.V, Radio, poster etc.</li> </ul>
<ul style="list-style-type: none"> <li>• Lack of storage facility and processing centers</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of storage and processing centers</li> </ul>
<ul style="list-style-type: none"> <li>• Lack of appropriate laws and policies on kiwifruit production and marketing</li> </ul>	<ul style="list-style-type: none"> <li>• Scientific policies regarding grading, trading and quality standards to be made</li> <li>• Fixing minimum support price</li> </ul>
<ul style="list-style-type: none"> <li>• Unstable prices and profit margins</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of separate units for quality control mechanism</li> </ul>
<ul style="list-style-type: none"> <li>• Absence of quality control and certification</li> </ul>	

## Conclusion

Area occupied and the total production of kiwifruit in the country is in increasing trend with the expansion of kiwi-cultivating lands from different regions of the country. The kiwifruit production is gradually taking root in Nepal but the pace is rather slow because of insufficient scientific research and discourse. The increasing growth of kiwi production and consumption in Nepal seems a viable and attractive option. Kiwifruit, a great source of Vitamin-C and other major nutrients needs more publicity as it deserves. Kiwifruit shows no serious pests and disease attack; thus, it has a better scope to become commercial eco-friendly fruit crop. The main obstacles lie at the high initial costs due to the provision of expensive structure for its cultivation. The shortage of quality planting material, proper irrigation supplies and poor marketing and promotion activities accounts other major problems. Thus, there is an urgent need of establishment of production planning committee along with the adequate, efficient, and effective extension services to the kiwi growers for improving their cultivation and management practices. Subsidy on the management practices of kiwi plays a vital role for encouraging farmers to grow kiwi. With the increasing competitiveness in the international market, Nepal has to establish excellent market channels at local and global level for constructing long-term partnership with international market agents. Kiwi subsector should be mechanized with introducing innovative and advance improved technology, tools, and equipment that would boost up the kiwi production and attract number of farmers in this sector.

## Authors' Contribution

All authors contributed equally in designing the research plan, collection of the required data and analysing the data. Similarly, all authors approved the final form of manuscript.

## Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript

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