RESEARCH REPORT

IDENTIFYING THE POTENTIAL OF HORTICULTURE EXPORTS TO CHINA FROM PAKISTAN, TAJIKISTAN, KYRGYZSTAN, AND UZBEKISTAN

Tehseen Ahmed Qureshi

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by

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Central Asia Regional Economic Cooperation (CAREC) Institute
No. 376 Nanchang Road, Urumqi, Xinjiang, the PRC, Postcode: 830000
f: +86-991-8891151
LinkedIn
km@carecinstitute.org
www.carecinstitute.org

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1. Introduction

The global market for fruit and vegetables is estimated to be USD100 billion with an average annual growth rate of 3 percent.[1] Fruit exports alone are growing at an annual rate of 7 percent. Around 9 percent of all fruit produced globally is exported and 80 percent sold as fresh fruit. The global market for fresh fruit is on the rise while demand for preserved fruit is decreasing, especially in Europe and North America. The largest horticulture importers are the United States, China, and Germany.

Agriculture is also one of the major sectors in the Central Asia Regional Economic Cooperation (CAREC) economies, having a significant share in gross domestic product (GDP), employment, and exports. On average, agriculture accounts for 15 percent of GDP in the CAREC economies.[2] The share of agriculture in the exports of Pakistan, Tajikistan, Kyrgyzstan, and Uzbekistan is 22 percent, 15.6 percent, 14.7 percent, and 13.5 percent respectively.[3] This is significantly higher than the world average of 1.4 percent.[4] The CAREC economies are largely missing out from this global market, despite enjoying comparative advantages over some fruit and vegetables.

China is among the top 10 fruit importers in the world; it imported USD2.5 billion of grapes, plums, apricots, and cherries in 2020. Tajikistan, Kyrgyzstan, and Uzbekistan have significant competitive advantage in these fruits but their access to China's horticulture market remains restricted. These three states combined have a 0.01 percent share in Chinese imports of these fruits. Existing horticulture exports from Tajikistan, Kyrgyzstan, and Uzbekistan to China account for less than USD500 million per annum. Even in this meager share, Uzbekistan captures 96 percent of the total market.[5]

Similarly, China imported USD1.2 billion worth of citrus and mangoes from the world in 2019. Pakistan enjoys significant comparative advantage in these three fruits but its share in China's imports is only 0.01 percent. Possible reasons for this lower than potential export figure include sanitary and phytosanitary (SPS) measures, and tariff and non-tariff measures (NTMs). This study estimates the potential of horticulture exports of the Central Asian countries to China, identifies the bottlenecks, and proposes feasible policy solutions to overcome them.

1.1. Research Objectives

The major objectives of this study are as follows:

- Identifying the gap between the actual and potential exports of Pakistan, Kyrgyzstan, Uzbekistan, and Tajikistan to China in selected horticulture commodities.
- Identifying the governance and infrastructure barriers that have hampered exports from achieving their full potential in the region.

[1] International Labor Organization. (2018). Assessment of Select Horticultural Sectors in Kyrgyzstan, and Their Market Access Potential.
[2] Lazaro et al. (2021). 'Expanding Agri-Trade in Central Asia through the Use of Electronic Certificates,' ADB Knowledge Briefs, No. 184.
[3] Ibid.
[4] World Bank. World Development Indicators, Agricultural raw materials exports (percentage of merchandise exports).
[5] World Bank. (2020). Capitalizing on New Export Opportunities in Chinese and Russian Markets.

- Highlighting some policy recommendations that could enable the CAREC countries to steer their trade towards its full potential.

Overall, the overarching objective of this study is to understand the potential of boosting intra-CAREC trade in fruits.

1.2. Policy Relevance

This research is very pertinent at this time; it can help policymakers identify the potential for commodities to have an attractive market in each CAREC state. Horticulture exports have great potential to boost economic activity, especially in the CAREC region. It can increase income by generating employment for people in rural areas as it requires two times more labor than cereals.

Commodities with a larger gap between actual and potential exports in this study can boost exports. Government support can boost production and exports on a domestic level, providing multiple benefits such as employment creation, higher income, reduced income inequalities, and improved trade balance.

This research aims to contribute to the CAREC 2030 theme of 'promoting trade and FDI to increase regional trade flows and participation in regional and global value chains.' This research fills this gap by identifying products at country level, enabling the design of target-based interventions by policymakers. Similarly, no research exists on the potential of horticulture exports in Central Asian economies for a particular trading partner. To the best of our knowledge, this report is first to estimate the potential horticulture exports of the CAREC economies to China.

2. Existing Horticulture Trade Structure of China, Kyrgyzstan, Tajikistan, Uzbekistan, and Pakistan

Horticulture exports have great potential to boost economic growth, generating jobs and creating income. This is especially true for rural households as it provides opportunities for the inclusion of small farmers in the global value chain. Increased horticulture production is also linked with a relatively greater multiplier effect compared with that of other agriculture sectors. Fruit requires almost double the labor of cereal crops. Khidirov et al. (2015)[6] found that for each job created in horticulture, at least three jobs are created in other sectors. Similarly, the same study found that in Uzbekistan, the average number of farmers employed on one hectare of horticulture farmland was between 12 to 22, while the equivalent number was five for cotton and two for wheat. This shows how horticulture exports have immense potential to significantly increase employment in the CAREC economies, thereby raising their standard of living.

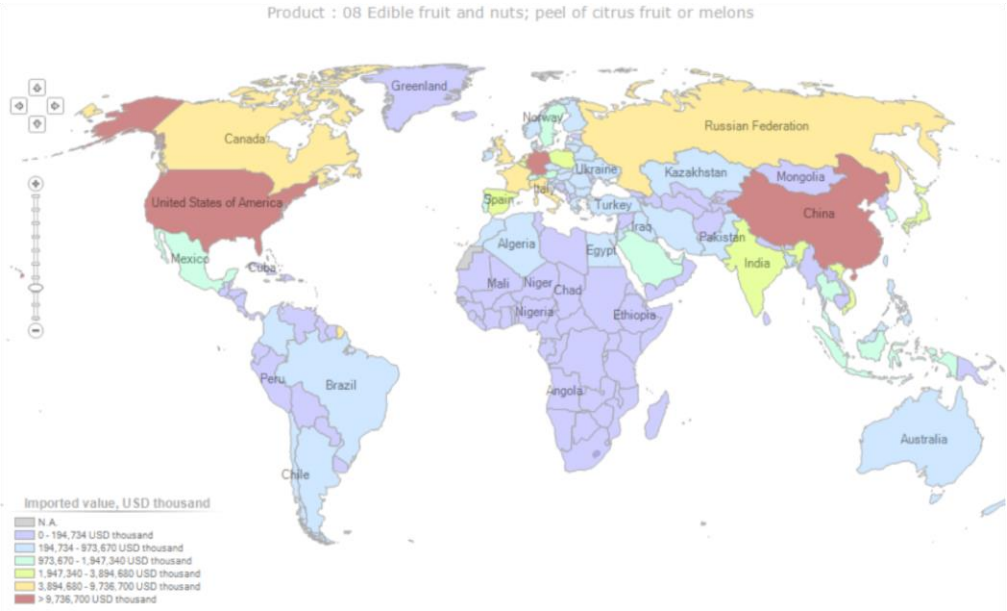
2.1. China as a Market for Horticulture Exports

China is the second largest food importer in the world after the United States, importing about USD12 billon of fruit in 2020 (see Figure 1). China has gained this position owing to the immense growth in per capita income that has driven consumerism in China. The demand for fruit is growing exponentially in China. Growth in Chinese fruit imports between 2016 and 2020 has been 23 percent—third highest in the world after the United States and Germany (see Figure 2).

However, huge opportunities to enter the Chinese fruit market remain untapped by the CAREC countries. The Chinese market requires consistency in the volume and quality of fresh fruit along with complex quality checks and logistics for ensuring that fruit is grown and transported according to the desired safety standards. The major import origins for fruit in China are Thailand and Chile, with respective shares in total fruit imports of 33 percent and 18 percent (see Figure 3).

[6] Khidirov, D., Larson, D.F., and Schuman, I., 2015. 'Uzbekistan—Strengthening the Horticulture Value Chain.' Uzbekistan Vision 2030. Background Paper Series No. 94281, World Bank.

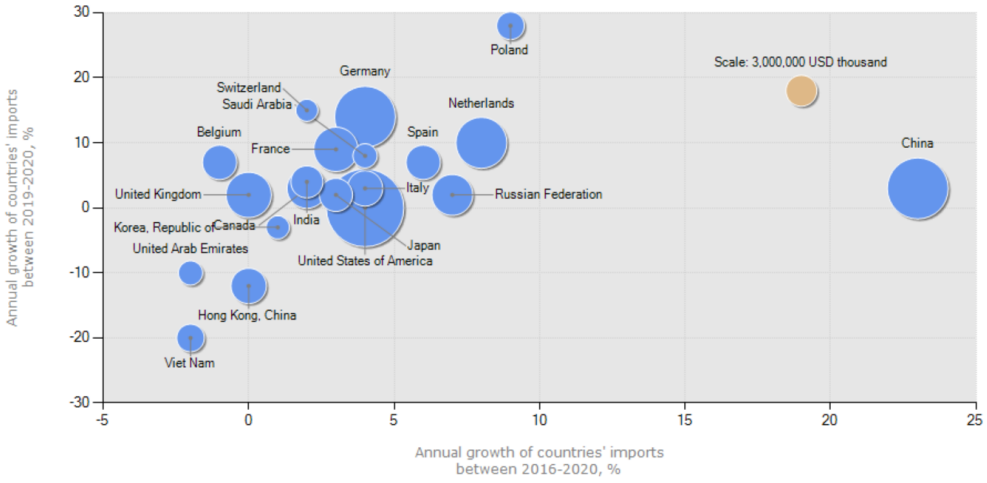
Figure 1. Top World Fruit Importers, 2020



Source: International Trade Centre (2021)

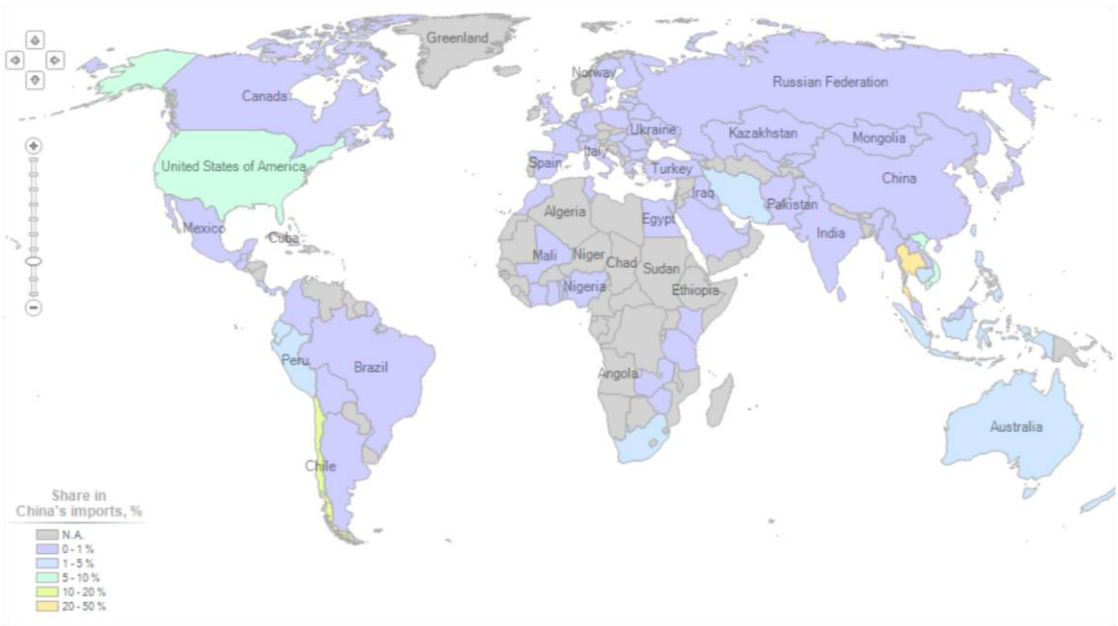
A large chunk of fruit producers in Tajikistan, Kyrgyzstan, Uzbekistan, and Pakistan are small-scale farmers who have limited know-how and access to technology. This shortfall in knowledge as well as their financial constraints limit the farmers' attainment of consistency in quality and supply. Small farmers have been able to trade domestically through their local traders' network; however, entering international markets requires a completely different set of conformity and bureaucratic procedures for which these farmers lack capacity.

Figure 2. Growth in Fruit Imports, 2016-2020 (Percent)



Source: International Trade Centre (2021)

Figure 3. Composition of Chinese Fruit Imports by Origin, 2020



Source: International Trade Centre (2021)

2.2. Kyrgyzstan's Horticulture Exports

Kyrgyzstan exported USD38 million worth of fruit and nuts in 2020, having a share of just 2 percent in the country's total exports. While exports to the United Kingdom account for half of the country's total exports, 70 percent of fruit and nut exports go to Russia. Apples, grapes, apricots, and cherries are the top fruit exports of Kyrgyzstan. However, Kyrgyzstan has a significant comparative advantage in walnuts, apricots, cherries, and plums under the category of horticulture.

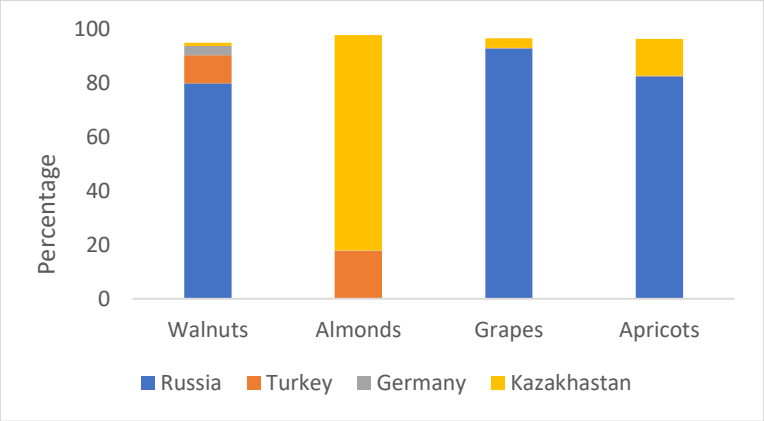
Kyrgyzstan is among the major world exporters of walnuts. Its walnut sector is differentiated because it has the world's largest natural walnut forests in the Jalal-Abad region. Walnuts are available all year round and are mainly utilized by the export sector.

Apricots are also cultivated mainly in the Jalal-Abad region of Kyrgyzstan led by small-scale farming, which accounts for 95 percent of total apricots farmed. Of the farm workers, 70 percent are women.[7] Technology and innovation remain limited in this sector and Russia remains the major market for Kyrgyz apricots. Cherries are also an emerging export and, until recently, all the Kyrgyz cherry exports went to Russia; however, exports to China started in 2015. Although the cherry is a fruit with a major comparative advantage, it cannot be analyzed in this study owing to limited data. Further, as seen in Figure 4, 80 percent of exported shelled walnuts go to Russia, followed by 10 percent to Turkey. China's share in total walnut exports is less than 1 percent.

[7] ILO. (2018). 'Assessment of Select Horticultural Sectors in Kyrgyzstan, and their Market Access Potential.'

Almost all Kyrgyzstan's horticulture exports are limited to very few partners—that is, Russia, Turkey, Kazakhstan, and Germany (see Figure 4). More than 95 percent of almond, apricot, grape, and walnut exports go to one of these partners. This shows very little diversification and exports remain limited to bordering or neighboring countries.

Figure 4. Share of Kyrgyzstan's World Walnut Exports, 2020



Source: UN Comtrade

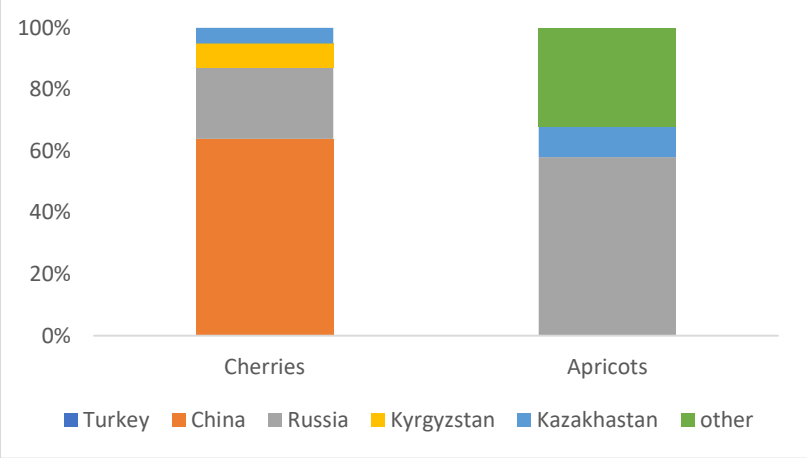
2.3. Tajikistan's Horticulture Exports

Tajikistan's horticulture exports amounted to USD10.9 million in 2020, only 0.5 percent of the country's total exports. Pistachios, apricots, and grapes are the major fruit export of Tajikistan. About 45 percent of fruit exports go to Russia, followed by Kazakhstan and Iraq. Tajikistan has a significant comparative advantage in apricots, plums, and grapes[8]; however, as plum and grape exports have been limited to China, this study could not include analysis of these two fruits. This study analyzes other fruits with comparative advantage and export potential—namely, cherries and apricots.

Similar to Kyrgyzstan, Tajikistan's horticulture exports are also not very diversified. As shown in Figure 5, apricots are exported mainly to Turkey and Kazakhstan, but 64 percent of cherries are exported to China. This shows that the Tajik cherry market is expanding in China.

[8] World Bank. (2020). 'Capitalizing on New Export Opportunities in Chinese and Russian Markets.'

Figure 5. Share of Tajikistan's World Horticulture Exports, 2019



Source: Ministry of Economic Development and Trade, Republic of Tajikistan

2.4. Uzbekistan's Share of World Horticulture Exports

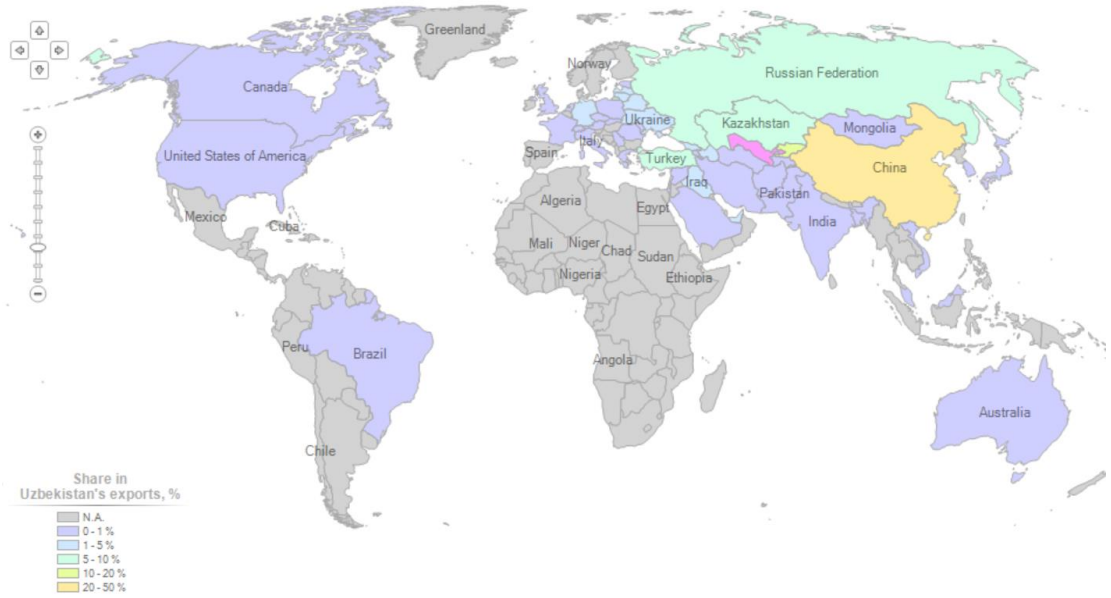
Uzbekistan is the biggest producer of fresh fruit and vegetables in Central Asia and the third largest world producer of cherries.[9] However, the export volume remains low with only 60 trading partners for fruits and vegetables. The majority of Uzbek fruit and vegetables are exported to Russia.

Uzbekistan has a large and diversified basket of export goods and exported USD577 million worth of horticulture products during 2020. Total horticulture exports account for about 4.5 percent of the country's total exports. Horticulture exports are dominated by grapes, apricots, cherries, and walnuts. Uzbekistan also enjoys a relative comparative advantage in cherries, fresh and dry apricots, and walnuts.[10]

Uzbekistan is the 14th largest world grape exporter, with a 1.5 percent share in the global grape market. In Uzbekistan, grapes are cultivated on an area of 90,000 hectares and more than 900,000 people are employed on these farms. The yield remains about one and a half to two times lower than that of other regional countries. Further, more than 90 percent of the grapes grown in Uzbekistan are seeded. The President of Uzbekistan has also instructed banks to allocate USD100 million for the development of vineyards—an initiative that will boost grape production in the country.[11] As shown in Figure 6, Uzbekistan's dried grape exports are highly diversified, and China remains the biggest partner. About 28 percent of exports go to China, 15 percent to Kyrgyzstan, and 10 percent to Turkey. Overall, Uzbek dried grapes have a market in more than 20 countries with nominal shares in other markets.

[9] UN Comtrade database.
[10] World Bank. (2020). 'Capitalizing on New Export Opportunities in Chinese and Russian Markets.'
[11] The Tribune. (2021). 'Uzbekistan to invest USD100 million to boost grape production, vineyard development,' available at https://www.thetribune.com/uzbekistan-to-invest-100-million-to-boost-grape-production-increase-vineyards/

Figure 6. Share of Uzbekistan's World Grape Exports, 2020



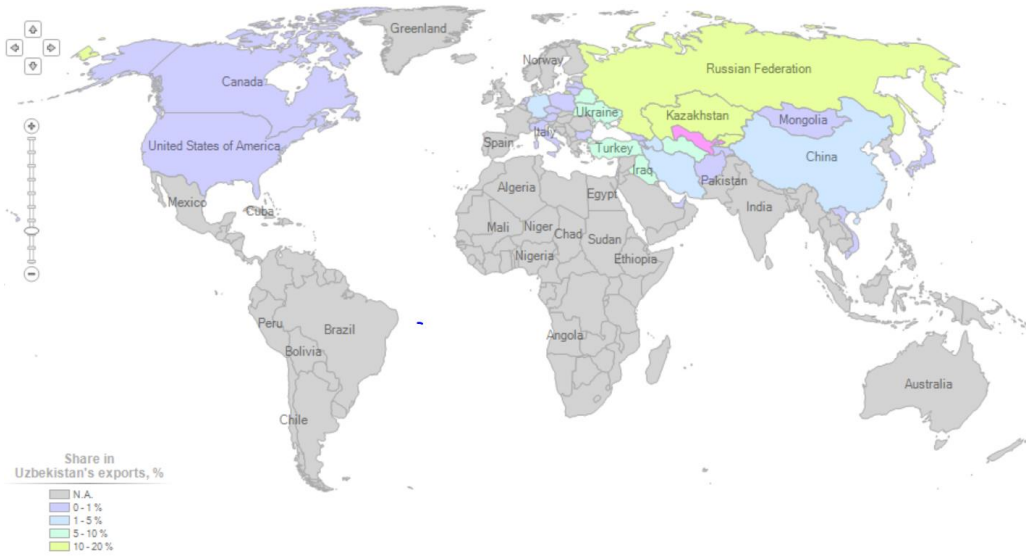
Source: The State Committee of Republic of Uzbekistan on statistics

Uzbekistan is the third largest exporter of dried apricots after Turkey and Afghanistan. Its apricot exports increased from 23,000 tons in 2017 to 58,000 tons in 2019,[12] showing phenomenal growth. However, owing to frosts, much of the Uzbek apricot produce was damaged in 2021.

Dried apricot exports of Uzbekistan also have a diversified market when compared with Kyrgyzstan and Tajikistan; however, it is less diversified than the country's grape market. As seen in Figure 7, about 40 percent is exported to Russia and another 40 percent to Kazakhstan. China is still not a major market for Uzbek apricots: exports to China account for less than 0.1 percent of Uzbek apricot exports.

[12] ITC Trade Map.

Figure 7. Share of Uzbekistan's World Dried Apricot Exports, 2020



Source: The State Committee of Republic of Uzbekistan on statistics

Uzbekistan is the eighth largest producer of walnuts with a good potential for increasing walnut production owing to favorable climatic conditions. The production of walnuts is on a rise since 2012 because of better yields and greater planting area. In 2017, the Uzbek President established an association for walnut producers and exporters in which he allocated USD50 million and an additional 10,000 hectares land for boosting production. However, the results of this association are yet to be seen.[13]

In terms of walnut exports, Uzbekistan also has a diversified market and exports to around 20 partners. The major market is Kyrgyzstan and Russia; exports to China account for less than 0.1 percent of total walnut exports. Overall, Uzbek horticulture exports are generally condensed around its neighboring countries and concentrated mainly around Central Asia and Europe.

[13] Sangirova, U et al. (2020). 'Properties and potential of walnut growing in Uzbekistan.' Novateur Publications, 6 (5)

Figure 8. Share of Uzbekistan's World Walnut Exports, 2020

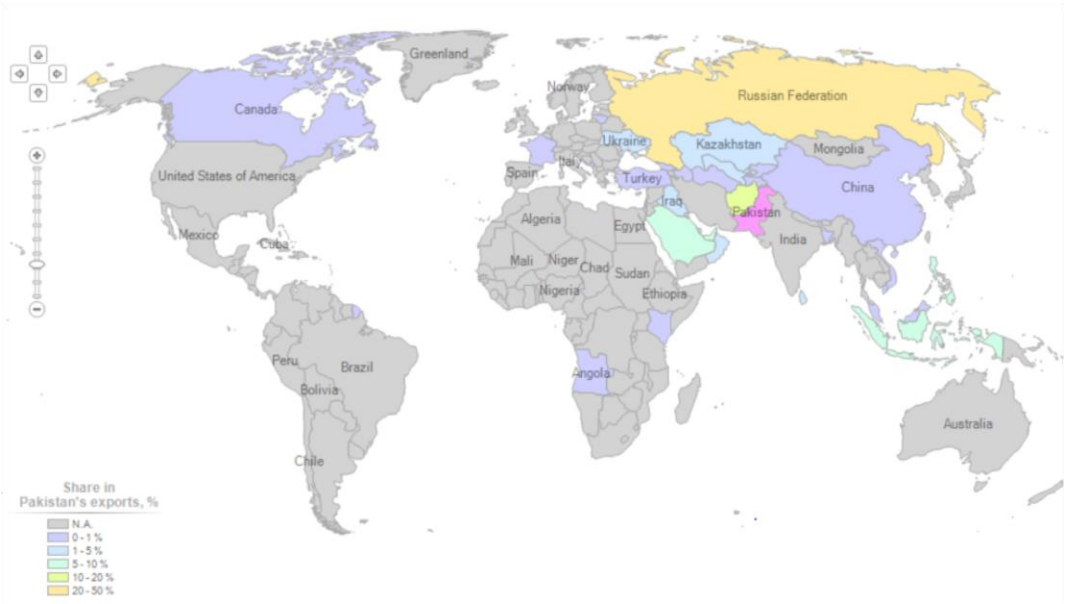
Source: The State Committee of Republic of Uzbekistan on statistics

2.5. Pakistan's Share of World Horticulture Exports

Citrus fruit is a major sector that accounts for 40 percent of total fruit production in Pakistan. Citrus is the top fruit export of Pakistan, fetching USD205 million by exporting 536,000 tons in 2021.[14] Pakistan exports around 17 percent of total citrus produced and exports are growing at an annual average rate of 10 percent.[15] About 27 percent of the citrus exports go to Afghanistan, while 23 percent are exported to Russia. However, Pakistan's citrus exports to China amounted to only 80 tonnes in 2020. Pakistan has been working on ensuring the sanitary measures required by China and expecting to export 15 to 20 containers of citrus to China in 2022 to tap the potential citrus market.

[14] ITC Trade Map.
[15] Planning Commission of Pakistan (2020). 'Citrus Cluster Report.'

Figure 9. Share of Pakistan's World Citrus Exports, 2020

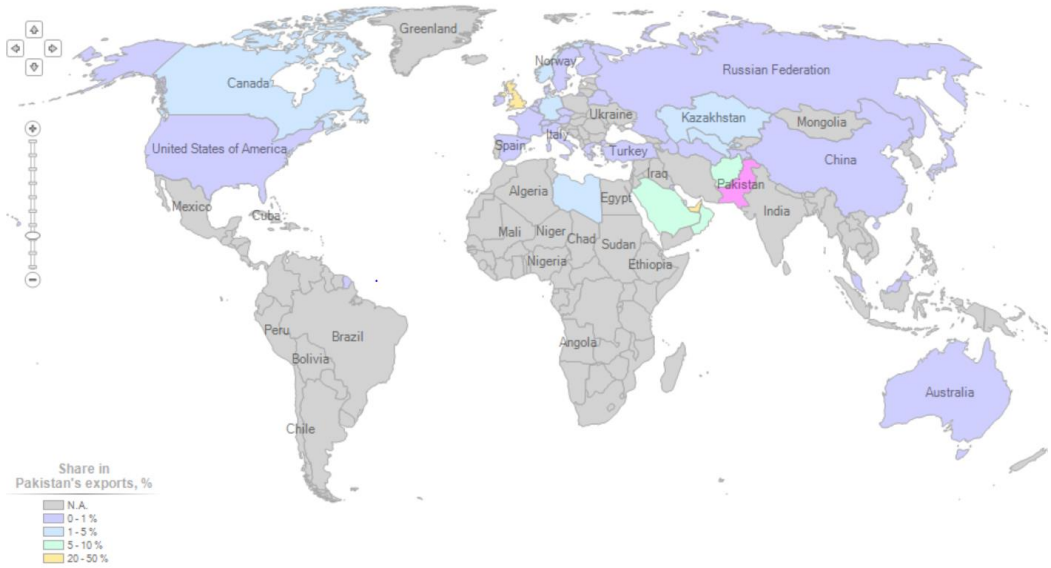


Source: UN Comtrade

Pakistan produces more than 1.7 million tonnes of mangoes annually, with an annual average growth rate of 4.4 percent.[16] Pakistan exported USD104 million of mangoes in 2020—of which, 23 percent were exported to the United Arab Emirates, followed by the United Kingdom, and Afghanistan. Mango exports to China form less than 0.5 percent of total Pakistani mango exports and represent only 0.3 percent of the Chinese 10,500 tonnes mango imports in 2020.[17] Pakistan exported only 37 tonnes of mangoes to China in 2020, showing a large void that can be filled by Pakistani exporters. Pakistan also enjoys free trade agreement (FTA) with China and has the advantage of lower tariff market access in China. Pakistani *Sindhri* mangoes were priced at Yuan 40/kg compared with Australian mangoes priced at Yuan 80/kg. This implies that Pakistani mangoes have a price advantage in China; however, quality is the major barrier.

[16] Planning commission of Pakistan (2020). Mango Cluster Report.
[17] UN Comtrade database.

Figure 10 Share of Pakistan's World Mango Exports, 2020



Source: UN Comtrade

It is also important to understand that the commodities selected for this research are not based on choice; rather, they are the few commodities that have a demand in China. Furthermore, these commodities—almonds, grapes, walnuts, apricots—are also among the few (if not the only) horticulture commodities produced in the selected Central Asian states. Hence, the selection of commodities for this paper was not a matter of choice, rather a matter of the limited production capacities of exporters and the demand of importers.

3. Data and Methodology

3.1. Data

The horticulture commodities for this study are selected based on their export share to China and on availability of data. The major horticulture products in which each country had higher RCA are not necessarily exported to China. Therefore, those horticulture commodities were selected that were being exported to China and where data was sufficiently available. Table 1 shows the list of commodities investigated in this study for their actual and potential exports at 6-digit HS code level.

Moreover, the export data for Kyrgyzstan, Uzbekistan, and Tajikistan has been taken from 2000 to 2019 as no bilateral export data exists for these countries prior to 2000. Whereas, for Pakistan, the export data to China is taken from 1995 to 2019 as no data prior to 1995 is available. The limitation of this study is that the sample size is small for an econometric estimation. One possible solution could have been estimating a panel model; however, there is no common horticulture commodity that is exported by all the countries to China. Therefore, panel data estimations for individual commodities are also not possible. Therefore, in light of the data limitation, this study performed the analysis with a relatively small sample size.

Table 1. Selected Horticulture Commodities for Estimating Potential Exports to China

Country	Commodity	6 Digit HS Code
Pakistan	Mangoes	080450
	Citrus fruit	080520
Kyrgyzstan	Apricots (fresh or dried)	081310/080910
	Walnuts (shelled)	080232
	Grapes (dried)	080620
	Almonds (shelled)	080212
Uzbekistan	Grapes (dried)	080620
	Apricots (dried)	081310
	Walnuts (shelled)	080232
Tajikistan	Apricots (dry)	081310
	Cherries (fresh)	080920

3.2. Econometric Methodology

This paper uses an extended gravity model framework to analyze the export potential of Pakistan, Tajikistan, Kyrgyzstan, and Uzbekistan to China. A gravity model has been used largely to estimate the impact of geographic factors on the trade flows between countries (Head and Mayer, 2014). In a similar way, the gravity model can be extended to determine the export potential of a country.

The study uses Poisson pseudo maximum likelihood (PPML) for estimating the gravity model as it is suitable when there is a zero trade flow in certain commodities. Generally, a log-log OLS model is used in the reference literature to estimate a gravity model. However, Silva and Tenreyro (2006) highlights two major issues in using OLS for estimating a standard gravity model. First, taking a logarithm drops the observations in which the trade flow was zero. This is a major issue given that zero values are very common in bilateral trade data, especially at 6 digit level. Secondly, OLS estimates are inconsistent if the disturbance is heteroskedastic, and its variance is dependent upon more than one regressor. This inconsistency appears because trade data has more variation for smaller values that result in a higher variance for error term. In such cases, PPML is a solution to both of these problems as it incorporates zero trade values and provides a robust covariance matrix (Silva and Tenreyro, 2011).

In addition to standard gravity variables, this study employs a remoteness variable for exporter and importer. The remoteness variable enables a forecast of the true export potential of a country (Fally, 2012; Bachetta, 2012; Mulabdiq and Yasar, 2021). Remoteness is determined through physical factors such as the distance between the two trading partners as well as policy factors such as the tariff and non-tariff barriers.

Remoteness controls the multilateral resistance terms and is used as a proxy for multilateral resistance. Head (2003) defines the remoteness equation as follows:

$$Remoteness_i = \sum_i^n \frac{Distance_{ij}}{GDP_i/GDP_W} \text{ (i)}$$

$$Remoteness_j = \sum_j^n \frac{Distance_{ij}}{GDP_J/GDP_W} \text{ (ii)}$$

Here in (i), the remoteness variable measures the exporter country *i*'s average weighted distance from its bilateral trading partner *j*. The weight is defined is the exporter country's share in the world GDP (denoted by GDP_w). Similarly, in (ii) remoteness measures the importer country *j*'s average weighted distance from its bilateral trading partner *i*.

As per the reference literature (Mulabdiq and Yasar, 2021; Anderson and Wincoop, 2003; Head and Mayer, 2003), the standard gravity model that this paper employs using the PPML estimator is:

$$Exports_{\ it} = \beta_0 + \beta_1 ln(GDP_{\ it}) + \beta_2 ln(GDP_{\ jt}) + \beta_3 ln(Rem_{\ it}) + \beta_4 ln(Rem_{\ jt}) +$$

$$\beta_5 ln(Dist_{ij}) + \beta_6 Colony_{ij} + \beta_7 Border_{ij}) + \beta_8 Language_{ij} + \mu_{ijt} \text{ (iii)}$$

Here, Rem_i and Rem_j reflect the remoteness for exporter and importer respectively. $Dist_{ij}$ is the distance between country *i* and *j* while $colony_{ij}$ is a dummy variable that is one if both trading partners are ruled by the same colonial power. $Border_{ij}$ is also a dummy variable that is one if both countries share a border and $language_{ij}$ is another dummy variable that is one if both countries speak the same language. However, as this study is a time–series study, the dummy variables (distance, border, language, and colony) are excluded from the model because of perfect multicollinearity. Standard dummy variables for gravity models can be estimated only under a panel model. Therefore, the final reduced form of the linear-log model used for estimating the results is as follows:

$$Exports_{\ it} = \beta_0 + \beta_1 ln(GDP_{\ it}) + \beta_2 ln\left(GDP_{jt}\right) + \beta_3 ln(Rem_{\ it}) + \beta_4 ln\left(Rem_{\ jt}\right) + \mu_{ijt}\ (iv)$$

The dependent variable $Exports_{it}$ is taken in linear form because applying the logarithm to exports would drop the zero trade flow observation (Mulabdiq and Yasar, 2021). Further, a positive remoteness coefficient would indicate that more remote and large countries trade intensively between each other. While a negative remoteness coefficient would suggest that as a country becomes less remote and integrates with the world, its trade with remote partners decreases.

The untapped potential exports are calculated by estimating the difference between actual and fitted values of exports. After the betas are obtained from the econometric model, fitted values are estimated and then subtracted from the actual export value to identify the untapped potential exports. It is also possible for the actual exports to be greater than the potential exports because this study compared a 20-year average of potential exports with the actual exports in each given year. However, if we compare actual exports with potential exports in each given year, potential exports are always higher than actual exports. In case the actual exports are greater than the potential exports, untapped potential becomes zero (Decreux and Spies, 2016).

4. Results and Discussion

This section estimates the extended gravity model results to benchmark the horticulture exports of Kyrgyzstan, Tajikistan, Uzbekistan, and Pakistan. First, the extended gravity model results are shown in Table 2. A separate regression was estimated for each commodity and, hence, 12 regression results are shown.

The results show that the more remote countries tend to trade intensively with each other. The coefficient of remoteness for the exporter is positive in most models—implying a positive association between remoteness and trade within the region. While on the other hand, the coefficient of remoteness for the importer is negative in the majority of the models—suggesting that the less remote country—China—trades more intensively outside the region.

The remoteness results suggest that, owing to their remoteness, the Central Asian states are lacking in terms of connectivity, productivity, and capacity as compared with other big producers such as the United States, Chile, and the European Union. As implied by the results, remoteness is the inability of countries to expand their trading relations with far away countries as they have limited capacity and ability to do so. For this reason, they are more comfortable trading with other nearby remote countries such as their border countries. This is also the case with the Central Asian states whose largest trading partners are their border countries, especially Russia, and as a result, they are unable to fully capture China's large coastal megalopolises.

Similarly, the size of the economy is positively related with exports. The coefficient of GDP is positive in the majority of models for both exporter and importer, suggesting that as the economy grows, a country's exports also increase.

Table 2. Extended Gravity Model Results

Exports	Tajikistan		Kyrgyzstan					Uzbekistan			Pakistan	
	I Apricots	II Cherries	IIII Grapes	IV Walnuts	V Almonds (Shelled)	VI Almonds (Fresh)	VII Apricots	VIII Grapes	IX Walnuts	X Apricots	XI Mangoes	XII Citrus
LGDP importer	181.30	48.45	9.10	10.18	-7.66	-37.66	83.13	-1.17	-69.95	-37.97	11.44	-14.2
LGDP exporter	-96.91	-2.10	-1.42	-8.84	47.53	47.53	-34.33	6.89	167.43	296.69	3.14	19.54
LRem importer	163.90	25.87	22.82	7.09	-8.47	-28.47	69.67	-12.19	-13.69	-80.20	12.19	-13.7
LRem exporter	-13.40	-5.11	-18.30	-76.20	47.49	47.49	16.60	3.87	141.24	319.21	4.02	13.19

Source: Author estimations

To check the significance of the variables, a joint hypothesis significance was estimated for each commodity in each country. The joint significance is used in which we test the null hypothesis that all the coefficients (B1+B2+B3+B4) are jointly equal to zero. A significant chi square coefficient implies the rejection of null hypothesis and implies that the contribution of all the coefficients in the model in determining the exports is not equal to zero.

The joint hypothesis significance of all the models are found to be statistically significant at 1 percent, 5 percent, or 10 percent significance level. The results of the joint significance test are shown in Table 3 for all the commodities in each country. Thus, the results suggest that the models are a good predictor for the dependent variable. After checking for significance, the potential exports are estimated and shown in the following sections.

Table 3. Joint Hypothesis Significance Test Results

Chi Square	Kyrgyzstan	Tajikistan	Uzbekistan	Pakistan
Apricots	73.38***	25.58***	556.16***	-
Walnuts (fresh)	7.57*	113.24***	19.80***	-
Almonds (shelled)	3.59	-	-	-
Almonds (fresh)	11.91***	-	-	-
Cherries	-	28.10***	-	-
Grapes (fresh)	34.54***	-	-	-
Grapes (dried)	-	-	106.05***	-
Mangoes	-	-	-	50.71***
Citrus	-	-	-	13.45***

Note: *, **, *** indicates significance at 10 percent, 5 percent and 1 percent levels respectively

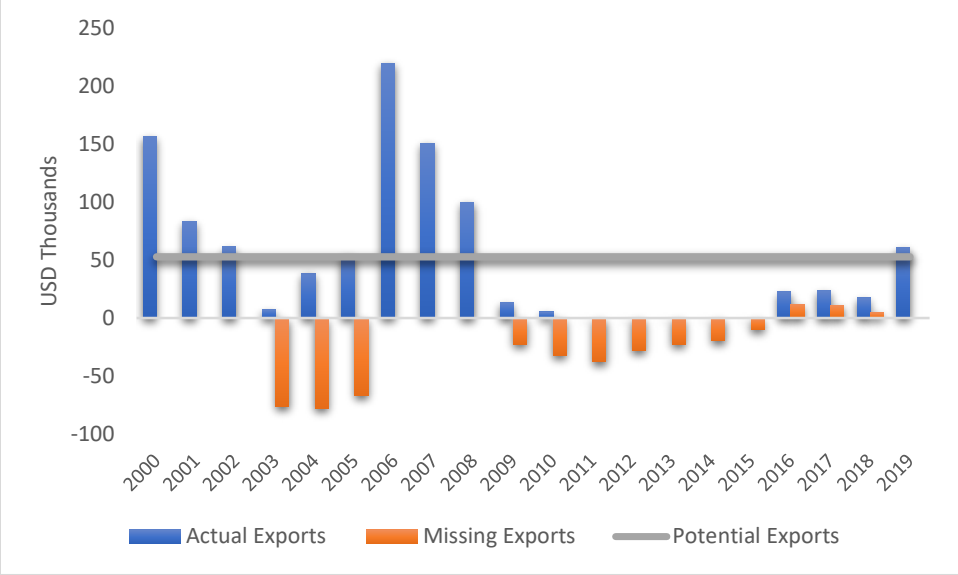
4.1. Kyrgyzstan's Potential Exports to China

Horticulture is an important sector in the agriculture economy of Kyrgyzstan, with exports accounting for a 6.2 percent share in the country's total exports.[18] Kyrgyzstan's actual and estimated missing exports for fresh almonds are shown in Figure 11. The estimates predict the potential of almond exports to China at USD53,000 per year. However, annual almond exports to China currently average at USD51,000. This shows that, on average, the untapped potential is zero in the case of almond exports. Further, between 2006 and 2008, the actual exports were higher than the potential exports with almond

[18] International Labor Organization. (2018). 'Assessment of Select Horticultural Sectors in Kyrgyzstan, and their Market Access Potential.'

exports reaching USD220,000. However, the gap has swelled since then, with USD61 million exports in 2020. China imports USD845 million of grapes annually, out of which about half are imported from Hong Kong and more than one third from Chile and Australia. China is currently importing grapes from far-flung markets, while Kyrgyzstan has an added advantage of being in proximity with China—thus, the transportation costs are lower.

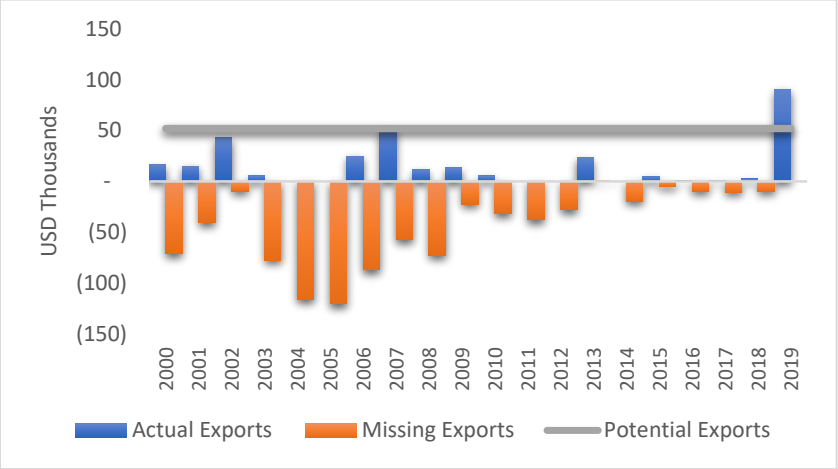
Figure 11. Kyrgyzstan's Potential Exports to China—Almonds (Fresh)



Source: Author estimations

Unlike fresh almonds, shelled almond exports to China are found to be significantly below their potential. The annual average shelled almond exports to China are USD15,000, while the estimated average annual potential exports are USD52,000 (Figure 12). This shows around USD37,000 as the average annual untapped potential exports of almonds; existing exports are just 30 percent of the potential exports. China's shelled walnut imports in 2019 were recorded at USD235 million in which all the almonds are virtually imported from Australia and the United States. Kyrgyzstan lags far behind in tapping the neighboring market of China.

Figure 12. Kyrgyzstan's Potential Exports to China—Almonds (Shelled)

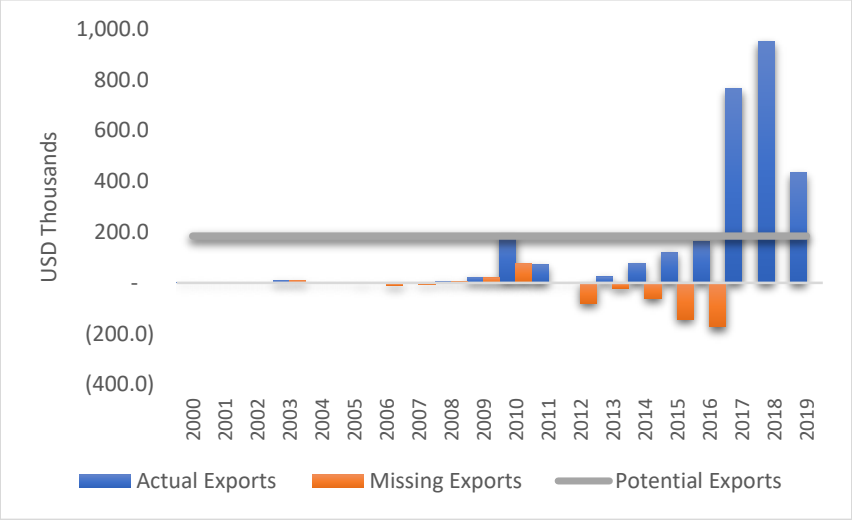


Source: Author estimations

Apricot exports to China have reached and in fact overtaken the potential exports since 2017. The estimates of potential exports of apricots to China are shown in Figure 13. The results suggest that the average potential apricot exports to China are USD184,000 per annum, while the actual average annual exports are USD141,000. This implies untapped potential exports of USD43,000 per year—showing that the actual exports are 77 percent of the potential exports.

China has an apricot market of more than USD9 million and Kyrgyzstan's apricot share of Chinese imports stood at 4.67 percent—making Kyrgyzstan the fourth largest partner of China after Turkey, Afghanistan, and Uzbekistan. While the share is low, the rank implies that Kyrgyzstan has a significant comparative advantage in capturing China's apricot market as it enjoys close proximity and good relations with China.

Figure 13. Kyrgyzstan's Potential Exports to China—Apricots

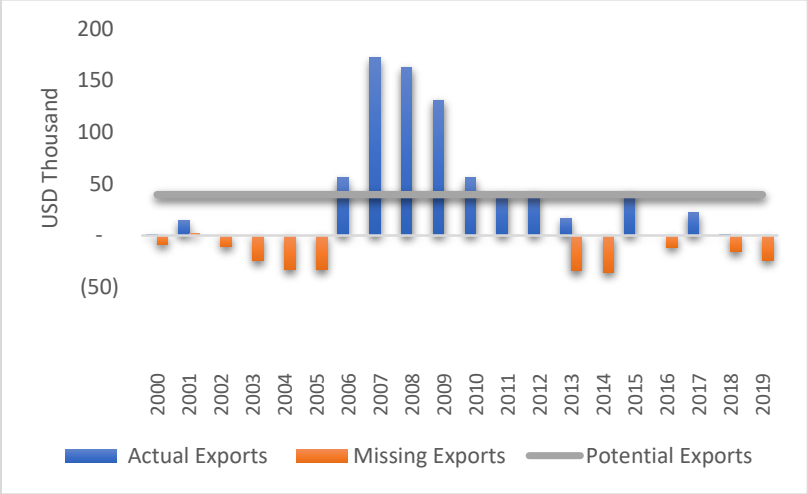


Source: Author estimations

This study finds grape exports to China do not have any untapped potential exports—showing exceptional performance by the sector. As seen in Figure 14, the results suggest that starting from 2006, the actual exports have been far higher than the potential exports. The estimates find the potential grape exports to China to be USD24,000 per annum, whereas the average annual grape exports to China are around USD378,000—implying that the actual exports are 1,546 percent more than the potential exports.

The results show that grapes are the only fruit in our sample showing tremendous performance and these are exported at a much higher number than its potential. China has a USD64 million dried grape market and Uzbekistan is the largest trade partner. Although Kyrgyzstan exports much higher than its potential, its share in Chinese grape imports is still under one percent. Therefore, there is still potential to expand the exports and capture the large market of China.

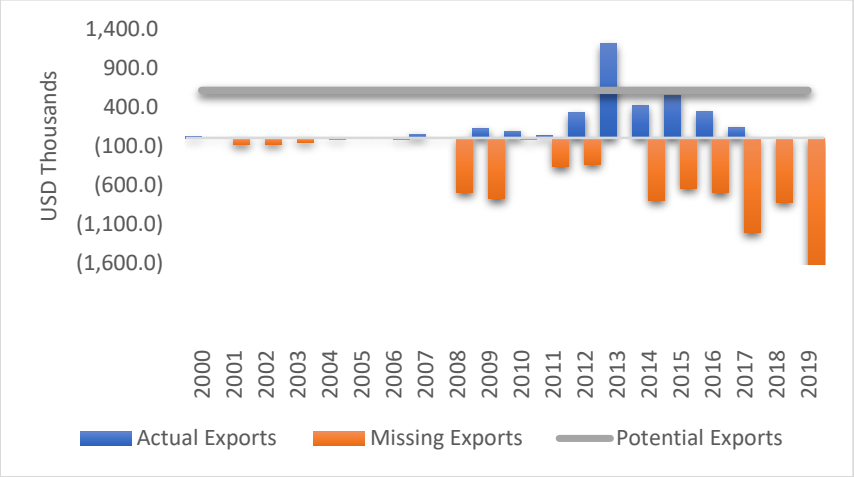
Figure 14. Kyrgyzstan's Potential Exports to China—Grapes (Dried)



Source: Author estimations

This study finds that the untapped potential of Kyrgyzstan's walnut exports to China is huge. Kyrgyzstan enjoys significant comparative advantage in walnuts and is already one of the largest walnut exporters globally; however, the untapped potential to China remains significantly high. China has a USD13.5 million market for shelled walnuts, with imports from the United States comprising 80 percent of total walnut imports. Figure 15 shows that the average actual walnut exports to China were USD165,000 compared with the average annual potential exports of USD611,000. This is only 27 percent of the potential exports, implying that Kyrgyzstan is very far from tapping its potential in the walnut market.

Figure 15. Kyrgyzstan's Potential Exports to China—Walnuts (Shelled)



Source: Author estimations

Kyrgyz exporters receive higher prices for their horticulture produce in China compared with the traditional markets. Kyrgyzstan currently relies heavily on two partners—Russia and Kazakhstan; these form 95 percent of the total fruit and vegetables export market in Kyrgyzstan. Excessive dependence on these two markets also makes Kyrgyzstan vulnerable to the external political and economic shocks that affect these countries.

4.1.1. Barriers to Increasing Kyrgyzstan's Horticulture Exports to China

A low fruit yield is a major impediment hindering exports from reaching their potential. The average apricot yield is approximately 3.1 tons/hectare compared with the average global yield of 7.7 tons/hectare. This shows that the yield is not even half the global average and 1.5 times lower than that in France—12 tonnes/hectare. Increasing the yield is essential to boost exports.

Underdeveloped cold storage systems result in post-harvest losses for fruit and greater seasonality in exports. The lack of treatment equipment and storage facilities, such as refrigerators, generally result in 25 percent post-harvest losses. Further, delays that occur in searching for the buyer also results in a higher spoilage rate.[19]

Kyrgyzstan's railway system is compatible with that of the other Central Asian states and Russia, but not with the neighboring country of China. Kyrgyzstan's railway networks are based on the Russian

[19] Japan International Cooperation Agency, Hokkaido Intellect Tank, and Overseas Merchandise Inspection Co., Ltd. (2013). 'Data Collection Survey on Export Promotion of Agriculture Products and Strengthening of Farm Management of Kyrgyz Republic.'

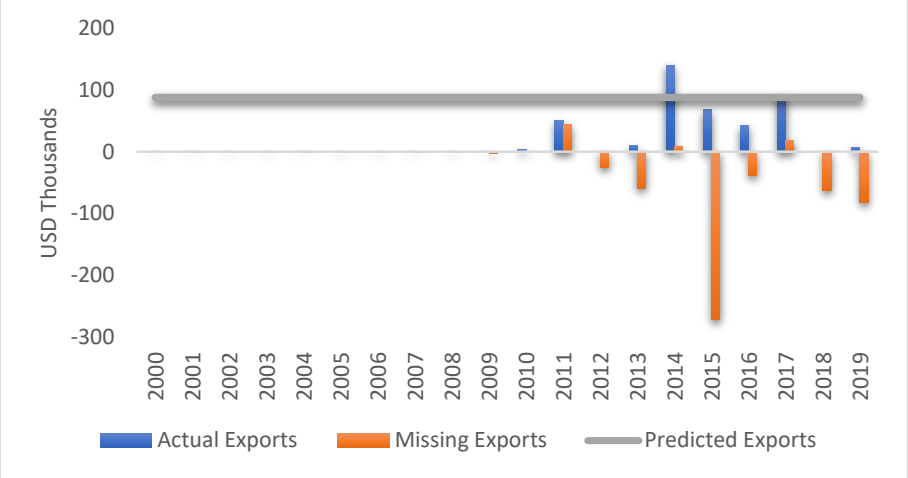
system and are split into south and north sections.[20] The unavailability of an effective transport infrastructure hinders the growth of the international trade of goods to and from China.

Fulfilling packaging requirements, finding buyers in China, and low production volumes are the main barriers associated with exporting fruit and vegetables to China. With reference to fruit exports, a recent World Bank (2020) study[21] mentioned that Kyrgyzstan lacks low-priced high quality packaging material and that using expensive packaging would increase the cost of production—thus making their produce less competitive in China.

4.2. Tajikistan's Potential Exports to China

Tajikistan horticulture exports to China remain far below their potential, with dried apricot exports forming only 47 percent of potential exports. As shown in Figure 16, the actual dried apricot exports have averaged USD42,000 over the years, while the estimated average annual potential export is USD88,000. On average, Tajikistan's untapped exports of dried apricots to China are estimated to be USD46,000 per annum, showing a good opportunity that is not exploited to the full. China has a USD9 million market for dried apricots; if Tajikistan exports to its full potential, it will be able to capture a good share of the apricot market.

Figure 16. Tajikistan's Potential Exports to China—Apricots (Dried)



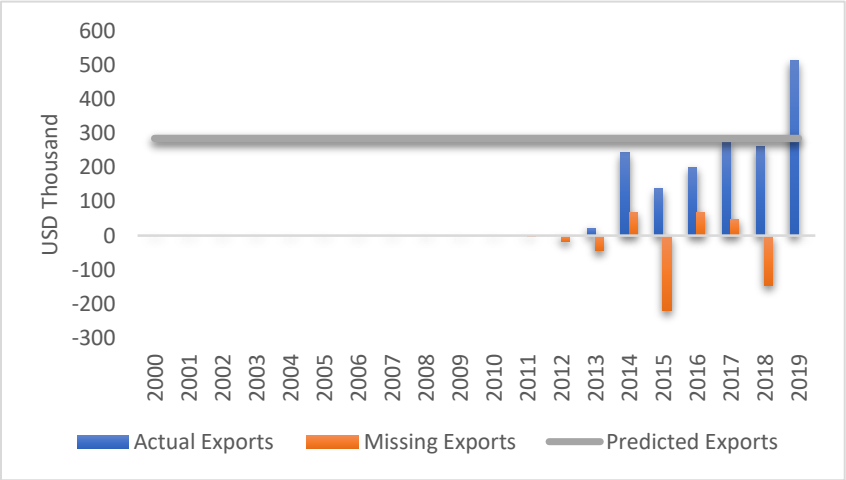
Source: Author estimations

Fresh cherry exports to China, although remaining below potential, gradually crossed their potential in 2019, showing an inspiring performance by the sector. As shown in Figure 17, after remaining far below potential for years, Tajikistan's fresh cherry exports to China reached USD513,000 in 2019,

[20] CAREC (2021). 'Railway Sector Assessment for the Kyrgyz Republic.'
[21] World Bank. (2020). 'Capitalizing on New Export Opportunities in Chinese and Russian Markets.'

outnumbering the estimated average potential of USD285,000. However, over the past 20 years, Tajikistan has on average been able to exploit 83 percent of its fresh cherries export potential. The average annual untapped potential export of fresh cherries to China is estimated to be USD50,000. China has a relatively large fresh cherries market and imports USD2.3 billion of fresh cherries, mainly from Chile, Hong Kong, and the United States. Tajikistan has been able to increase its share as the US share is gradually shrinking. There is still huge opportunity to tap China's multi-billion dollar fresh cherries market through prudent measures.

Figure 17. Tajikistan's Potential Exports to China—Cherries (Fresh)



Source: Author estimations

4.2.1. Barriers to Increasing Tajikistan's Horticulture Exports to China

Agriculture is the backbone of Tajikistan, with a 20 percent contribution to GDP; it provides direct or indirect employment to 70 percent of the population residing in rural areas. Tajikistan horticulture products are famous worldwide and in demand for their taste and variety. Tajikistan has potential to increase its agriculture and horticulture produce because of the competitive advantages it enjoys in the form of weather, soil, and water conditions. The early season is one of the major characteristics that can improve the competitiveness of Tajik fruit. The low costs of electricity and labor are another major advantage, along with long growing periods and a great number of sunny days in every season.

Increasing the production volume is the first step to reaching the potential export volumes followed by diversification. With low production volumes, little is left for export. As the fruit and vegetables exports remain low in number, the packaging and food processing industry remains underdeveloped. Similarly, Tajikistan needs to diversify its export markets and lower its reliance on Russia, Kyrgyzstan, and Kazakhstan. China has the potential to become a major trade partner as there is a large ethnic Tajik diaspora settled in the Xinjiang region of China. The expatriates could help identify markets for Tajik fruit exporters and connect them with Chinese merchants. Agri-business enterprises are poorly placed and

operate in the new potential markets of China, Afghanistan, Pakistan, and Turkey.[22] This makes it difficult for exporters to connect with potential merchants in emerging markets.

More than 85 percent of apricots are produced by small-scale farmers who face constraints in marketing and supply chains.[23] Tajik small farmers do not have the ability to integrate with the global supply chain and large farmers have a meager share in horticulture. Small farmers need assistance in strengthening and developing their businesses and conforming to international standards and certifications. Further, small farmers also have difficulties gaining access to finance, which hinders the expansion of their produce.[24]

Owing to the involvement of a high number of intermediaries in the horticulture sector, farmers are left with little profit margins and have no incentive to improve their yield. Improving yield requires multiple pre- and post-harvest interventions that a small Tajik farmer may not be able to afford—such as, the trees have become old and new plantation is expensive. Similarly, above 90 percent of farmers do not train their trees annually and this results in a poor yield. The average fresh cherry yield in Tajikistan is around 3 hectares/ton compared with Uzbekistan's 11.4 hectares/tonne.[25]

4.3. Uzbekistan's Potential Exports to China

Uzbekistan enjoys a significant relative comparative advantage in apricots, walnuts, and grapes; however, it has not been able to exploit its competitiveness in apricots and walnuts. The Uzbek horticulture has immense potential to become competitive in international markets and the national government is also trying to boost the production and exports of major fruit. One such step is the creation of The Association of Walnut Producers and Exporters.

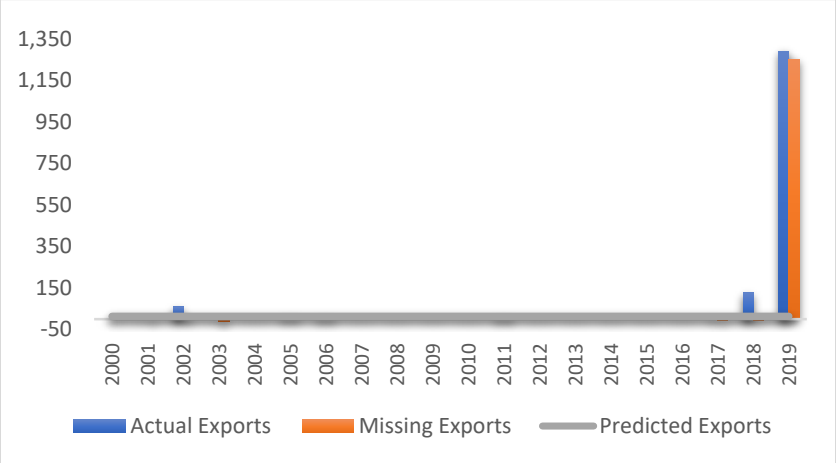
This study estimates zero untapped potential for Uzbekistan dried apricot exports to China. Average actual apricot exports to China amounted to USD12,000 per annum, whereas the average exports in the past 20 years have been USD75,000 (Figure 18). China has a USD9 million market for dried apricots out of which Turkey, Afghanistan, and Kyrgyzstan were the major import partners. On average, Uzbekistan apricot exports have been six times higher than the estimated potential. The findings reveal that, although actual exports are higher than the potential exports, they are still very low in comparison with demand from Chinese consumers.

Uzbekistan enjoys a massive comparative advantage in the production of dried apricots with a production cost of only USD0.11/kg. The Uzbek dried apricots are sold at around USD0.8/kg in Russia, USD1.1/kg in the United States, and USD1.0/kg in the European Union. Compared with this, the price for dried apricots from the largest dried fruit exporter—Turkey—are USD2.4/kg in Russia, USD3.3/kg in the United States, and USD1.7/kg in the European Union. Similarly, in Russia the price of Kyrgyz and Tajik

[22] US Government. (2017). 'Tajikistan—Food Processing and Packaging,' Available at https://www.export.gov/apex/article2?id=Tajikistan-Food-Processing-and-Packaging
[23] Microfinance Centre. 2011. 'Research on Agricultural Value Chains in Tajikistan.' Available at: http://mfc.org.pl/wp-content/uploads/2016/04/Value-Chains-research-report-Tajikistan-final.pdf
[24] US Government. (2017). 'Tajikistan—Food Processing and Packaging.' Available at https://www.export.gov/apex/article2?id=Tajikistan-Food-Processing-and-Packaging
[25] World Bank. (2020). 'Capitalizing on New Export Opportunities in Chinese and Russian Markets.'

dried grapes is USD2.2/kg and USD2.5/kg—more than three times the price of Uzbek dried grapes.[26] While Uzbek apricots enjoy lower prices in international markets, it is also important they are marketed extensively and that quality control measures are adopted; only then can Uzbekistan raise its share in the Chinese as well as in other major markets.

Figure 18. Uzbekistan's Potential Exports to China—Apricots (Dried)

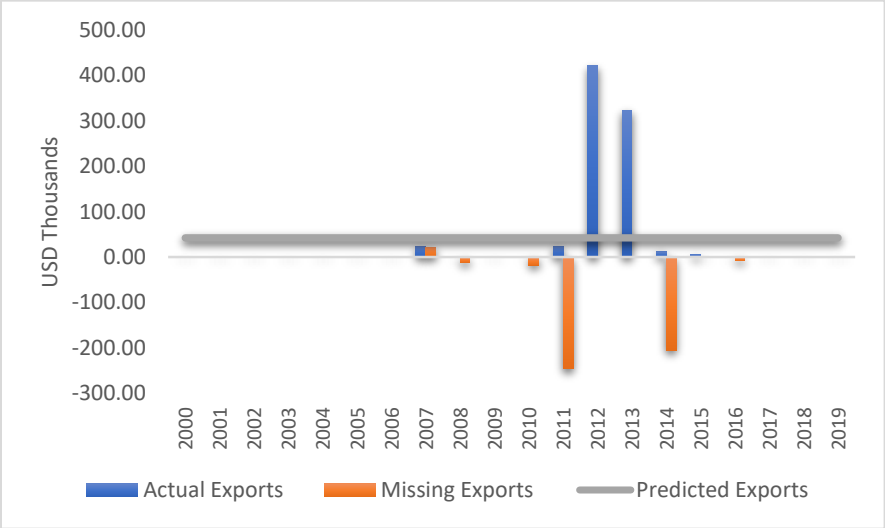


Source: Author estimations

Uzbekistan's walnut exports to China are almost equal to its potential exports. As seen in Figure 19, the estimated potential exports are USD43,000 against the average annual actual exports of USD40,000. This shows that, over time, actual exports have converged with potential exports. The analysis implies that Uzbekistan is far behind tapping the USD13 million walnut market of China; however, productivity and supply constraints do not allow growth after a certain threshold is reached. It also shows that the results of the creation of The Association of Walnut Producers and Exporters are now visible. More effort is required to exploit the comparative advantage in the walnut sector and in diversifying the market.

[26] These prices are taken from the presentation of Okhir. (2021). 'Assessment of the export potential of the dried fruit segment (grapes, plums, apricots, apples)' presented at Fostering Integration of the Dried Fruits Value Chain of Uzbekistan into Regional and Global Value Chains, Tashkent, Uzbekistan. The price of Uzbek grapes in China was not available.

Figure 19. Uzbekistan's Potential Exports to China—Walnuts (Shelled)



Source: Author estimations

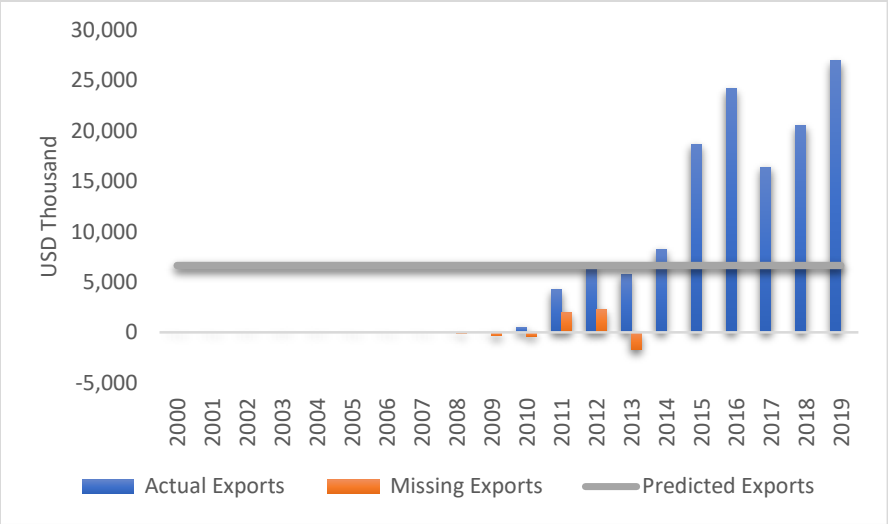
Uzbekistan has performed exceptionally well in grapes and its annual exports to China are equal to its estimated potential. As shown in Figure 20, this study found the Uzbek dried grapes export potential to be USD6.66 million for China, whereas the average annual exports have also been USD6.6 million. Owing to its good performance, Uzbekistan has been able to capture 42 percent of the Chinese dried grapes market share. It is also important to note that per capita consumption of dried grapes is increasing in China[27]—a plausible reason behind the increased exports.

Since 2017, Uzbekistan has been pushing to increase the volume of agriculture exports to China. As of 2021, Uzbekistan exports 14 varieties of fruit and vegetables to China—mainly cherries, grapes, melons, peanuts, and seeds. As per Uzbekistan's Ministry of Agriculture, the agriculture exports to China were recorded to be 55,000 tons in 2019, which later increased to 92,000 tonnes in 2020. The total revenue generated through agriculture exports to China was USD71.5 million in 2020. Further, around 500 Uzbek companies are exporting agriculture products to China as of 2021.[28]

[27] International Nut and Dried Fruit Council Foundation, 2020, *Nuts and Dried Fruits Statistical Yearbook 2019/2020*: 61.

[28] Producer Report. (2021). 'Uzbekistan Aims To Increase Produce Trade With China.' Available at https://www.producereport.com/article/uzbekistan-aims-increase-produce-trade-china

Figure 20. Uzbekistan's Potential Exports to China—Grapes (Dried)



Source: Author estimations

Dried grapes form an overwhelming 72 percent share in the Uzbek total dried fruit exports, fetching USD104.6 million in 2019—making Uzbekistan the sixth largest dried grapes exporter. Uzbekistan has been successful in significantly increasing its dried fruit exports to the world with a 46.8 percent growth during 2017 to 2019, when its dried fruit exports to the world increased from USD99 million to USD145.4 million. Exports of dried prunes and apricots have also increased during the same period and these three products now form a 90.5 percent share of Uzbek dried fruit exports.

Uzbekistan enjoys a significant comparative advantage in the production of dried grapes as its production costs are among the lowest in the world at USD0.11/kg. Uzbek dried grapes are priced lowest in the major global markets including the European Union. The price of 1kg of Uzbek dried grapes is around USD1.69 compared with USD3.69 of the United States, USD3.0 of Chile, and USD1.8 of Turkey.[29] This comparative advantage is one of the reasons that Uzbekistan has been able to become a global leader in dried grapes.

4.3.1. Barriers to Boosting Uzbekistan's Horticulture Exports to China

A major barrier faced by Uzbek horticulture exporters is the poor and dilapidated cold chain storage system, as 92 percent of farmers still use cardboards or bags for storing. The current cold chain storage capacity of Uzbekistan is around 4.5 million cubic meters, much lower than the market demand for the storage of fruit and vegetables.[30] The below optimal storage conditions are mainly responsible for post-

[29] These prices are taken from the presentation of Okhir. (2021). 'Assessment of the export potential of the dried fruit segment (grapes, plums, apricots, apples)' presented at Fostering Integration of the Dried Fruits Value Chain of Uzbekistan into Regional and Global Value Chains, Tashkent, Uzbekistan. The prices of Uzbek grapes in China were not available.

[30] Global Cold Chain Alliance. 2018. Available at: https://www.gcca.org/

harvest losses amounting to 40 percent. According to the UNCTAD (2021) survey, 92 percent of farmers use cardboards or bags for storing and only 5 percent use cold storage—all of these were large farm owners.[31] Although the Government of Uzbekistan is investing in improving the cold storage system, it still requires massive investment to bring it on a par with market demand.

Time-intensive and cumbersome custom processes result in the export time from Uzbekistan to China to be as high as 21 to 30 days. All the dried fruit from Uzbekistan is transported to China through the railway system. No fewer than 12 documents are required for custom clearance, yet there is no isonomy between Chinese and EU regulations.[32] This increases the export time and results in a reduced quality of the fruit. To remain competitive, the custom clearance time should be minimal, otherwise the fruit quality starts to deteriorate and the price drops. Similarly, the approval required by Uzagroexport and the Ministry of Foreign Trade is a duplication, as all the contract information is already entered in a single portal[33]—thus resulting in delays.

The drying process has a vital role in reducing post-harvest losses as well as in determining the quality of the dried fruit. In Uzbekistan, the apricots and grapes are dried by the traditional method of putting them in the sun, while a few farmers dry them in the shade. Farmers typically do not sort dried fruit by quality; the sorting is either performed by the exporters or the final shipment arriving at its destination has a mix of lower and high quality dried fruit.[34] Such issues result in lower demand from the destinations and can shrink export prices further.

Uzbekistan is not in compliance with the international sanitary and phytosanitary (SPS) requirements, with the maximum residue level (MRL) requirement being the most critical barrier for horticulture exports to reach their potential. Uzbekistan is among only 14 countries which are not signatories of the 'International Plant Protection Convention'—resulting in the low acceptability of Uzbek SPS certification.[35] Further, the existing horticulture procedures with respect to responding towards high MRLs is not clear in the export market. This has led to unexpected and sudden market closures for Uzbek fruit.[36] The overall lack of awareness regarding food safety and international standards combined with a lack of regulations create a bottleneck in reaching the export potential.

4.4. Pakistan's Potential Exports to China

Pakistan has a vast agriculture environment that enables the production of subtropical, temperate, and Mediterranean fruit and vegetables at various locations. At present, more than 6.6 million tons of fruit is produced annually on an area of 814,000 acres. Of this, 1.7 million tons comprises mangoes—the second largest fruit crop of Pakistan. Pakistan is also ranked as the sixth largest mango producer and

[31] UNCTAD. (2021). 'Uzbek Dry Fruit Exports: Prospects, Problems and Potential.'
[32] Ibid.
[33] Ibid.
[34] FAO, 2007, 'Dried fruit, instructional manual on primary processing of food commodities (e.g. cleaning, drying, milling, etc.).' Available at http:// www.fao.org/3/a-au111e.pdf
[35] IFC. (2018). 'The Uzbekistan Horticulture Sector: CPSD Deep Dive: Background Paper for the Uzbekistan CPSD.'
[36] Ibid.

eighth largest exporter in the world. Pakistan exported around USD100 million worth of mangoes in 2019, mainly to the United Arab Emirates, Afghanistan, and Oman.

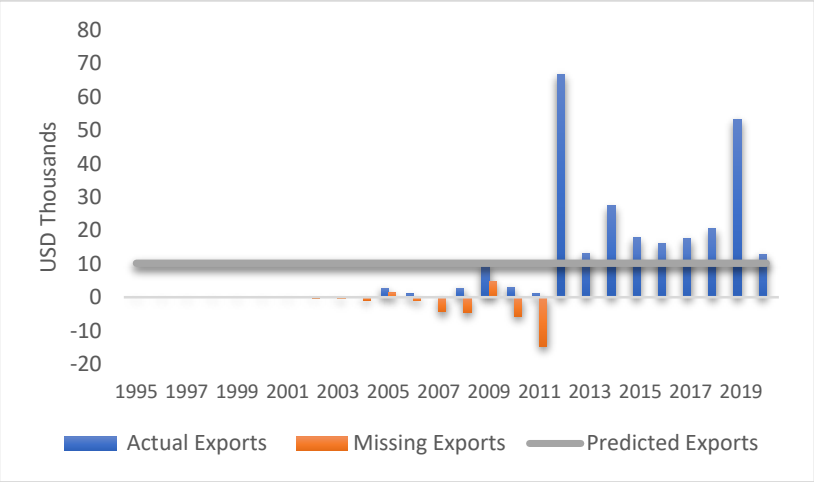
This study finds that Pakistan on average, exports USD10,000 worth of mangoes to China per annum, equal to its estimated potential. As shown in Figure 21, Pakistan was exporting much less than its estimated potential of USD10,000 per annum to China up until 2011. However, after 2011 Pakistan started to export above its potential level and even reached USD67,000 in 2012. As Pakistan has tapped its unrealized potential in the last few years, the implication is that if all the quality checks and certifications are regularly taken care of, Pakistan can fully exploit this potential. China has a USD807 million mango market, in which Thailand and Vietnam together take 87 percent of the share. Pakistan's average mango exports make up only 1.2 percent of Chinese mango imports.

Pakistan has a comparative advantage in terms of seasonality as the mangoes produced in Southeast Asia are off-market during May to September—that is, when Pakistani mangoes are in season. China consumes one-fifth of the world mangoes and Pakistani mangoes have a unique taste that has the potential to rapidly capture the Chinese market. Mangoes produced in the Hannan region of China as well as in other Southeast Asian countries are on the market during January to May. Whereas, the Pakistani mango season runs from May to September, giving them a perfect positioning with little competition at that time.

Pakistani mangoes are also competitively priced in China; however, quality is a major constraint. In 2021, Pakistani Sindhri mangoes cost USD5.80/kg in China, compared with Australian mangoes at USD12.21/kg.[37] Price is not an issue for Chinese fruit importers; Chinese consumers are ready to pay higher prices for good quality fruit.[38] The problem with the Pakistani mangoes is that their ripeness deteriorates by the time they arrive in the Chinese markets, and their color and shape becomes unattractive.

[37] Daily Times (2021). 'Pakistani mango exports to China increase by more than nine times.' Available at https://dailytimes.com.pk/840963/pakistani-mango-exports-to-china-increase-by-more-than-nine-times/
[38] Ibid.

Figure 21. Pakistan's Potential Exports to China—Mangoes



Source: Author estimations

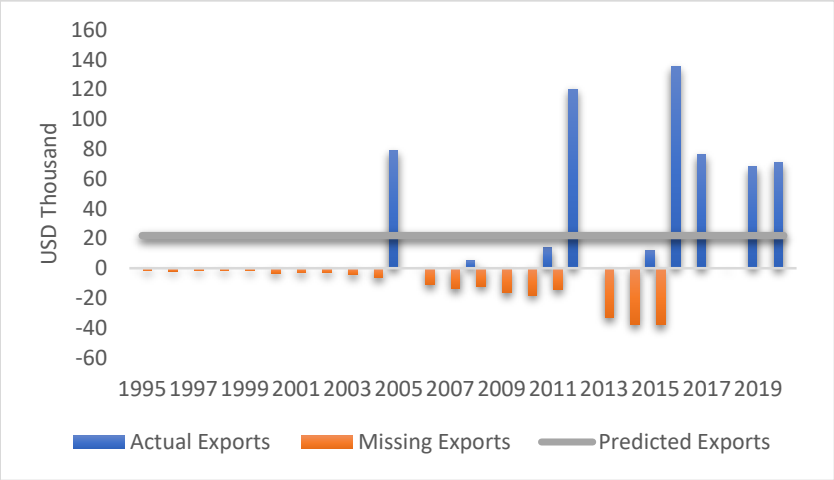
Pakistan's citrus exports to China are greater than their potential level; however, average annual untapped citrus exports are estimated to be USD12,000. This study finds that the annual average exports have been 165 percent of the potential USD22,000 exports. Pakistan has been exporting higher than its potential since 2012, peaking at USD135,000 in 2016.

Demand for Pakistan's citrus fruit is dwindling in developed markets owing to the increasing availability of seedless varieties. Pakistan exports USD196 million worth of citrus fruit to the world but has a non-existent share in the Chinese USD137 million citrus market. However, Pakistan's total citrus exports to developed countries form only a 2.6 percent share. This is because consumers in developed countries are now inclined toward seedless citrus varieties, which now represent 61 percent of global citrus exports.[39] China also largely imports citrus fruit from Australia, Hong Kong, and Peru—most of which are seedless varieties.

Pakistani farmers are working on superior orchard management practices, especially after Pakistan and China signed a sanitary requirement protocol in 2005; **since then, various new practices have been adopted by Pakistani farmers and exporters to reduce the risk of quality deterioration**. The standards pertaining to feeding, washing, drying, fungicide, and packaging are being met to maintain freshness during the transportation period ranging from 20 to 30 days.[40] Thus, it is expected that in 2021, Pakistan's citrus exports to China will be the highest ever. Pakistani citrus fruit is priced almost three times higher than the domestic market and high export can be very lucrative for farmers and exporters.[41]

[39] Gwadarpro. (2021). 'Pakistan looks to greater oranges export to China, PM's aide.' Available at https://www.gwadarpro.pk/1473925034975969281/more-pakistani-kinnows-expected-to-reach-china
[40] Mettis Global. (2021). 'Pakistan to export 15-20 kinnow containers to China.' Available at https://mettisglobal.news/pakistan-to-export-15-20-kinnow-containers-to-china/
[41] Ibid.

Figure 22. Pakistan's Potential Exports to China—Citrus



Source: Author estimations

4.4.1. Barriers to Boosting Pakistan's Horticulture Exports to China

Lack of value chain infrastructure and insufficient processes for ensuring quality on a larger scale. Pakistan is unable to export high quality mangoes and citrus because of food safety, varying quality, certifications, marketing, and fruit fly infestation issues. Farmers and other stakeholders lack sufficient infrastructure and resources to produce and maintain the required quality of mango through the entire value chain.

A major issue in the mango value chain is the lack of well-defined standards and grades. Owing to a lack of standards and grades, it is difficult for Pakistani exporters to price their produce of varying quality in the Chinese markets. Because of this, Pakistani mangoes are priced low against competitors who sell the same quality produce but with grades and standards.

Despite being the largest mandarin producer, Pakistan has been unable to tap entry into China and many other markets owing to the excessive seed content in its citrus fruit and to quarantine requirements. Demand for Pakistani citrus fruit is dropping significantly to be replaced by seedless varieties such as clementines and tangerines from Turkey and Morocco.[42] The major bottleneck in citrus exports is not related to marketing or post-harvest losses—rather, it is about production techniques and a lack of innovation.

[42] Planning Commission of Pakistan. (2020). Cluster Report on Citrus.

5. Conclusion and Recommendations

Horticulture has great potential to transform lives, especially for people living in rural households. Horticulture is one of the fastest growing global sectors and employs a large part of the rural workforce in the CAREC countries. The CAREC economies are largely missing out from this global market of USD100 billion, despite enjoying comparative advantages over some fruit and vegetables.

While the governments of the CAREC countries are eager to enhance their share in the horticulture value chain, the sector struggles with a plethora of issues. These issues include, but are not limited to, capital availability, old harvesting techniques, poor cold chain storage, high post-harvest losses, packaging deficiencies, and disorganized logistics. Low production results in a lower volume of exports, while non-compliance with international standards and certifications further reduces the exportable volume and markets.

Kyrgyzstan, Tajikistan, and Uzbekistan are remote countries with 90 percent of their fruit and vegetables being exported to a handful of countries. Russia remains the largest importer of fruit and vegetables from Kyrgyzstan, Tajikistan, and Uzbekistan. Besides Russia, these three countries trade intensively between themselves, Kazakhstan, and Afghanistan. With the high interdependence of the Central Asian states, there remains a lack of interest in diversifying to big markets such as China.

This study estimates Kyrgyzstan's potential exports of grapes, walnuts, almonds, and apricots to China at USD2.4 million. The results suggest that while Kyrgyzstan has been able to reach its potential level in grapes and almonds, it still lags behind in walnuts and apricots. Even in grapes, Kyrgyzstan was exporting way more than its potential between 2006 and 2012; however, exports have been on a falling trend ever since.

Tajikistan's estimated potential exports in apricots and cherries to China is estimated to be USD700,000. While Tajikistan reached its potential level for cherries in 2019, it lags significantly behind its potential level for apricots, as its average annual apricot exports to China account for only 5 percent of potential exports.

The estimated potential exports of Uzbekistan in apricots, grapes, and walnuts to China is USD26 million. The results show that, while the performance of Uzbek walnuts and apricots remains bleak, Uzbek grapes have performed well and their exports to China can increase in the future if the pace is sustained.

Pakistan's potential exports of mangoes and citrus fruit to China is estimated to be USD53,000 in 2019—although inconsistency in exports remains high. The results suggest that while, in few years, the actual exports went above the potential level but on average, the exports remain nil or very low. The inconsistency in the exports pattern reflects the variety of governance and standards related issues which hinder export growth.

It is also pertinent to mention that the export opportunities of agricultural products to the Chinese market, including horticulture, are still quite narrow. China, despite its enormous population and growing consumerism, remains a net exporter of key types of agricultural and food products. Therefore, China acts as a competitor for countries in the Central Asian region, more than an export destination for horticulture and agriculture products. In this way, while the Chinese market is an opportunity for the Central Asian states to capture the growing consumerism, the competition from Chinese fruit exporters also acts as a barrier for the Central Asian states in terms of exploiting other global markets with huge horticulture demand.

The low amount of export volume from the Central Asian states also reflects the limited availability of land for cropping purposes and so future research needs to be done on improving the yield of horticulture commodities. In the Central Asian states, the availability of arid land is also a problem. Countries such as Kazakhstan, Kyrgyzstan, and Tajikistan face a tradeoff between planting exportable commodities such as horticulture products or cereals and commercial crops for the domestic market. From a policy perspective, the governments of these respective countries have to choose between earning foreign exchange by exporting lucrative horticulture products or ensuring food security by planting homegrown cereals. Therefore, increasing the amount of horticulture exports may also result in compromising on food security and would require future research on improving the yield of horticulture products so that the maximum can be gained from the limited amount of available land.

Another important area for future research is to estimate the potential of meat, dairy, wine, and value added fruit such as mango pulp exports to China. In recent times, owing to increased income, there is a significant boost in demand for meat, dairy products, and alcoholic products in China. These are the three niches in which Central Asian states have a comparative advantage and can find consumers in Chinese markets. Moreover, value added fruit, such as mango pulp and orange juice, have a higher shelf life and better market prices; their potential should also be estimated for higher export revenues. Thus, future research is required on estimating the potential of exporting these commodities to China.

5.1. Policy Recommendations

This section presents specific recommendations for creating an enabling and facilitating environment for farmers and exporters to boost their exports to China's multi-million dollar market.

To enter a major fruit market such as China, a consistent supply of large volume is required that can be achieved through the integration of small-scale farmers into the value chain. Entry into the Chinese market would require the Central Asian exporters to supply consistently large volumes of high quality fruits in a timely manner. Fruit markets are evolving and becoming highly concentrated where a few major players prefer to deal with only a few large suppliers. This reduces the transaction costs and ensures a sustainable supply all season round. At the moment, Tajikistan, Kyrgyzstan, Uzbekistan, and Pakistan supply low volumes and have exported inconsistent supplies every year. As most fruit production is concentrated in small landholdings, the governments of the CAREC countries can engage in activities aimed at cooperation between farmers and educating them through workshops and training about the benefits of knowledge-sharing and integrating into the value chain.

To become competitive in global and Chinese markets, farmers in the CAREC countries should be equipped with modern techniques and knowledge about the production and handling of fruit.

Horticulture remains a very knowledge-dependent sector. The lack of knowledge of modern techniques related to sowing, irrigation, plucking, packaging, and distribution results in the poor ripening, shape, and color of fruit. This, in turn, leads to low demand from Chinese consumers. The governments of the CAREC countries should invest in the human capital of farmers and distributors on disseminating best practices. The extension departments of each country need to initiate educational programs for small-scale farmers on high yield varieties, plant care, post-harvest handling of fruit, and the importance of fruit calibration. It is also imperative for the extension services to inform farmers about the disadvantages associated with the traditional techniques of fruit handling, as these result in lower international prices. Farmers should be aware of the financial incentives attached to using the latest techniques in the horticulture sector.

A sustainable and efficient cold chain storage system is imperative for ensuring a consistent and large volume of fruit. As discussed in this study, the lack of efficient cold storage systems is a major bottleneck common in all four countries. High post-harvest losses are mainly attributable to inefficient cold storage systems in these countries. While Uzbekistan has started to invest significantly in developing its cold storage systems, Tajikistan, Kyrgyzstan, and Pakistan still need to increase their investment in this area.

Simultaneously, while combating food insecurity, many agriculture products in Tajikistan, Uzbekistan, and Kyrgyzstan can find and serve niche branded markets around the world, at the same time as increasing farm incomes and thereby increasing capacity to grow and buy food. Products such as walnuts from the Jalal-Abad region of Kyrgyzstan, apricots from the Tajik Pamir region, Tajik cherries, and grapes from Uzbekistan's Samarkand and Fergana valleys, all are targets for export branding given their unique taste, and organic and area specific cultivation. Efficiencies in agriculture can surely be improved and productivity gains had; however, the future of agriculture in the CAREC countries appears to be in specialization, marketing, and branding, rather than in scale. The fact that almost 88 percent of Tajikistan's farmers are small-scale family farms validates this argument. With the growth in global consolidated commodity markets, the opportunities for CAREC agriculture exports rest in branding at farm level—as, otherwise, commodity markets have narrowed returns for farmers.

Case studies from the developing world show the potential rewards of branding and marketing as Chinese buyers are particularly unaware of the taste, quality, and nutritional value of Central Asian fruit. For instance, the branding of Barbados sugar captured over USD1 million in added value for producers in 2012 alone, while a Namibian beef brand delivers price premiums to farmers worth USD25 million per annum.[43] Chile is another success story, where the government helped in marketing and branding Chilean fruit; consequently, Chile is now among the top fruit exporters to China. Chinese buyers are particularly unaware of the taste, quality, and nutritional value of Central Asian fruit. It is therefore important to market the fruit based on product differentiation. Governments in the CAREC

[43] *Branding Agricultural Commodities: The development case for adding value through branding*. ISBN 978-1-84369-846-3. ©International Institute for Environment and Development/Sustainable Food Lab 2012.

countries need to prepare the private sector to help at small farm level by doing the following:

i. Conduct regional studies to identify possible farm-based or region-based agricultural brands
ii. Establish the required steps to establish these brands by:
    a. Developing brand personality
    b. Identifying the markets and value chains required to develop the brand
    c. Preparing feasibilities
    d. Sensing the 'uptake' among farmers, including understanding the form of organization required
    e. Identifying sources of finance

This requires the CAREC countries to adopt a non-classical approach towards export marketing of its possible 'brandable' agricultural (both on- and off-farm) commodities and start developing efforts towards intellectual property owned in the country of origin.

Fast tracking of SPS and quality protocols with partners especially China. In Pakistan, the government department oversees the inspection of orchards for issuance of SPS certification. The list of orchards is provided to the exporters who then decide to purchase from the given orchards for export purpose only. Given the limited capacity of the government department and the shortage of a trained workforce, the issuance of SPS certification remains slow and approval of new orchards is a highly time-intensive process.[44] In this regard, physical visits should be kept to a minimum and the use of technology for inspection may be preferred. Further, government can authorize a few private laboratories to issue such certifications under stringent rules and regulations. This would help to bring onboard a larger number of orchards and thus ensure large volumes of fruit for export.

Investing in seedless varieties of grapes and citrus fruit is unavoidable if Uzbekistan and Pakistan wish to capture the Chinese market. The global trend of consuming seedless grapes and citrus fruit continues to increase. Uzbekistan does not have a single seedless grape variety and Pakistan has no seedless citrus (Kinnow) variety. This makes both countries uncompetitive in global markets, especially the Chinese market where consumer preferences are changing along with rising incomes. Farmers should be informed about the bleak future of seeded varieties and R&D for producing seedless varieties should be prioritized in any upcoming horticulture policy.

[44] 'Understanding the Bottlenecks and Opportunities in Value-Added Exports of Fruits and Vegetables.' (2020). Pakistan Business Council Report.

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CAREC INSTITUTE

Central Aisa Regional Economic Cooperation (CAREC) Institute
No. 376 Nanchang Road, Sha Yi Ba Ke District, Urumqi, 830000
Xinjiang Uygur Autonomous Region, the People's Republic of China
f: +86.991.8891151 | www.carecinstitute.org
km@carecinstitute.org | www.carecinstitute.org