

# World Apple Review

2018 Edition



## The Drive for Quality

**A Publication of Belrose, Inc.,  
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### FOREWORD

Welcome to the twenty-second edition of the World Apple Review. It has now become a cliché that rapid changes will have taken place in the environment for the fruit business in the year between successive annual reviews.

This remains true. In the last year, the United States has pushed through long-awaited tax reforms that will affect businesses and governments in every other country. President Xi Jinping of China has consolidated most of the internal levers of power in his hands, and has been pushing an aggressive agenda for China's role in world culture and trade. The European Union is struggling to hold its six decades old, great unifying initiative together. Trade sanctions continue to hamper normal relations between Russia and many of its trade partners. More positively, synchronized recovery is now occurring throughout the world economy after many years of setbacks since the Great Recession of 2008-09.

The retail food business has seen continued turmoil. For the first time, millennials now outnumber the boomer generation. Their habits and preferences are reshaping demand for many products. Online giant Amazon gained a major stake in bricks and mortar retailing with its takeover of the iconic, upscale chain, Whole Foods. In response, Walmart and other major food retailers have increased their efforts online. Discount chains, such as Aldi and Lidl, have continued to increase their share of retail food sales. In processed foods, major brands have struggled to retain customers, while in fresh foods, established varieties have come under assault from newer, especially club, varieties.

This Review examines how such major changes are likely to affect demand for fresh apples and apple products, and how operators might exploit these changes to increase the profitability and sustainability of their firms. Sincerely,

Desmond O'Rourke  
*President, Belrose, Inc.*

# World Apple Review

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## The Drive for Quality

Many progressive growers, packers and marketers of fresh apples believe that the future of the industry lies in improving quality. However, there is little agreement on what constitutes quality, on the organizational changes that will be needed to assure quality, and on the trade-offs that will have to be made between increased costs of quality enhancements and potential increased returns.

In a product like the fresh apple that is eaten directly by consumers, it would appear obvious that the definition of quality, and the parameters of quality, should be specified by those same consumers. However, few consumers are able to vocalize what they consider to be quality. In any specific situation, consumers can tell you which products they like, and which they dislike, but few can offer precise explanations of why they like a particular apple.

In a simpler past era, consumers could identify their apple preferences by color or shape. Apples were either red or yellow or green, or they were round, conic (narrower towards the end), oblate (broader than tall), or oblong (taller than broad). Consumers could, for example, associate the round, green Granny Smith with its distinctive firm, acidic taste. In the 1990s, bi-colored apples became popular. However, with the passage of time, newer strains of these bi-colored apples became redder. In the last decade, most of the newer apple varieties have been round with a reddish tint, and thus difficult to identify visually. Consumers can no longer get useful cues as to internal taste and texture from the external appearance of most apple varieties now being produced in commercial quantities.

This situation is not unique to apples or other produce items. The late Steve Jobs, CEO of the Apple Computer company, famously said that “it isn’t the consumers’ job to know what they want.” Consumers cannot tell what bundle of characteristics they will want in a new product. It is up to the product developer to envision a bundle of characteristics that will enthrall the eventual consumer.

In an increasingly crowded marketplace, the intrinsic qualities of a product will not be sufficient to woo consumers away from existing products. New products will have to encompass extrinsic (manufactured) qualities. Some of the early pioneers of managed new varieties, such as Pink Lady and Jazz, have led the way in creating such values. Pink Lady positioned itself as the apple for progressive, active young

females. Its visual presentations hint at love and romance. Jazz exploited the fun, risqué mood of the jazz music scene. More recently, Kiku Fuji has built a strong association with outdoor sports. Opal has exploited its image of sustainability with a strong, anti-GMO stance. The challenge for each new, emerging apple variety will be to build unique associations with lifestyle choices that will appeal to a substantial segment of potential customers. There are many lifestyle choices that appeal to very narrow segments of society. However, such narrow segments will rarely be able to win sufficient space on retail shelves, or enjoy broad enough sales appeal, to sustain the management, packaging, and promotion of a new variety.

Even before any apple variety enters the marketplace, practices in the orchard and in the packing house have a major influence on intrinsic qualities, and to some extent, in matching the extrinsic qualities developed by their marketers. For example, among intrinsic qualities, it is generally assumed that each variety should have a uniform appearance, and be free of external blemishes, if it is to continue to be acceptable to retailers and consumers. It is also generally assumed that mid-size ranges will be most popular and higher priced, so the producer needs to maximize the share of production that is in that range. Different markets have different concepts of what apples are mid-sized, but in most markets, the very smallest and very largest sizes tend to sell at a discount.

Size control begins with the choice of orchard site and is strongly influenced by soil preparation, the intrinsic characteristics of the rootstock chosen, the variety grown, the density of plantings, support systems, and other factors not easily changed after the initial planting. If any of these factors are problematic in a planting, the producer can spend much money and effort trying to offset their negative effects later in the block's growth and maturation.

What might appear to be fairly simple tasks of maintaining uniform appearance and minimizing external blemishes may be quite complicated in practice. They may require control of many different kinds of pests and diseases. This will involve multiple decisions about which chemical sprays to use, and how often, with each additional spray adding to the cost of ensuring quality, and with each additional spray creating the possibility of offsetting effects. Depending on the location of the orchard, a grower may feel that more permanent protective measures, like hail netting, are needed for additional quality control.

In consistently achieving the highest possible share of mid-sizes, the producer must try to outwit Mother Nature, which tends to offer a different mix of weather challenges each season. During the growing season, a prediction must be made about how the current crop load will evolve. If it appears that the fruit at harvest will be too small, a judgment must be made about how much thinning needs to be done. If the fruit at harvest is predicted to be too large, adjustments may be needed in irrigation or fertilization. Each additional activity adds to the cost of producing a quality crop.

Another set of crucial decisions about quality control must be made at harvest. The first choice is about when to start harvest on each individual variety. The second choice involves how many passes through the orchard should be made by pickers to ensure that each apple is picked at the optimal time. A third decision may be needed about which blocks not to harvest or which fruit to leave on the tree because they are unlikely to meet quality standards. These choices will be heavily influenced by the sales and storage options available to each specific variety. Apples may be targeted for immediate sale, for intermediate term storage, or for late season storage. They may be targeted for sale in the domestic market, or in foreign markets with different climatic conditions and distribution systems. Once again, the producer must try to forecast how to juggle harvest decisions to ensure the optimal quality of the apple at the time each different consumer finally bites into it. There are now various storage treatments available to improve postharvest quality, but the added cost has to be set against the possible gains in quality.

Every producer now has three or more external “partners” that influence internal operations of the orchard. The first one is government at every level, that regulates how key resources of land, water, energy and waste are employed, and how all inputs and outputs are to be taxed. The second is major retail buyers, who intrude on various orchard practices, both through general protocols like GlobalGap, and by their own specific preferences. The third is what are known in polite circles as “activists.” These seek to gain the moral high ground for their demands, by arguing that their only goal is that of improving society. They are expert at molding public opinion to their causes. While the ultimate goals of activists are often self-serving, producers have learned that challenging them is unlikely to divert them from their goals, and is more likely to lead them to make even more intrusive demands.

A similar situation prevails at the packing house. The initial layout of the packing house, and the type of equipment employed in each major function, sets the initial limits on the quality controls that can be applied. It also bears much of the fixed costs that have to be recovered over time. Most major packing house functions now involve a combination of mechanical, electronic and software elements. Only the software element can be easily adjusted to provide additional quality controls.

The manager of the packing plant can decide how he or she wishes to segregate the apples dumped on the packing line. After eliminating unsaleable product, the manager has wide discretion on the number of sizes that will be packed. Apples must also be separated by minimum grade standards acceptable in each state, province or country. However, most packing houses now go far beyond these minimum grades and segregate fruit by characteristics demanded by customers or specified by their marketing partners seeking a competitive advantage in the retail marketplace.

While the majority of apples continue to be packed in bulk cartons of 10 to 18 kilograms, an increasing proportion is now packed in bags, clamshells or other consumer packs of varying count or weight. Increasingly, also, packaging (both bulk and consumer pack) has brightly printed surfaces that can be used in store displays or as an extension of the marketing and promotional message. Decisions on the type of consumer packs to be used must be closely coordinated with the firm's marketing team.

While packing houses have considerable control over most of these decisions, they must pay obeisance to the same "partners" as do their producers, namely, government, retailers and activists. The new food safety law in the United States is an example of how governments seek to influence packing house operations. The assumption is that individual packing houses cannot be trusted to look after the health and safety of those who consume their products. Major retail customers also demand evidence that the packing house is meeting ever higher standards for sanitation, waste disposal, food safety and worker health. Under pressure from activists, many retailers also require that the packing house demonstrate sustainability in its use of water and energy. In many cases, meeting these demands detracts from the time and effort that would otherwise be devoted to controlling product quality.

However, the ultimate test of whether product quality meets the specifications of the consumer depends on the interactions between marketers and their retailer customers. While marketers must deliver products that meet the standards set by governments, retailers and activists, their success, and that of their supplying producers and packing houses, depends above all on delivering satisfaction to a substantial segment of final consumers.

It is at the marketing level that extrinsic qualities have become increasingly more important. Extrinsic qualities refer to those qualities that are “created” for a particular product. These include the popular name, as distinct from the scientific name, the company or product brand, the product story and the product image.

An entire area of marketing science has developed around choosing an appropriate name for a new product. For food products like apples, it is generally believed that the name should reflect natural attributes and convey something about the product’s taste. For example, the name “Honeycrisp” suggests an apple that is both sweet and crunchy. However, other apples with Honeycrisp parentage, such as “Evercrisp” and “Cosmic Crisp”, provide the consumer with less information about the taste. For some of the more prominent newer varieties, such as “Envy” or “Kanzi”, the name provides the consumer with no clues about the potential taste.

Where the name is not descriptive, the product “story” becomes more important in building a connection with consumers. The product story may be either positive or negative, or some combination thereof, depending on the leanings of the consumer. An example of a positive story is the evidence of nature’s bounty as reflected in the chance discovery of a superb new apple, like Ambrosia. A negative story might emphasize that the apple is not genetically modified. Some qualifiers, like “organic” can convey both positive and negative images. One positive message is that the organic production method is good for the environment. The negative message is that the product has not been treated with synthetic chemicals. The key is that the attributes be of concern to targeted consumers.

Other created values feed the consumer’s desire to be socially responsible, or insinuate that consumption of the product confers status on potential users. Concerns about social responsibility are almost limitless, depending on the imagination of a multitude of activist organizations. For example, many consumers

want to be associated with a product that is good for the environment, has a smaller carbon footprint, protects the welfare of workers, wildlife and consumers, contributes charitably to local, regional and national causes, or satisfies other “hot-button” issues.

Many consumers are concerned that their purchasing choices give them increased status in the eyes of their family, relatives or neighbors. They will want to be associated with products that their peers will think of highly. In his 1899 book, “The Theory of the Leisure Class”, Norwegian economist Thorstein Veblen called this behavior, “conspicuous consumption”. In today’s popular jargon it is known as “keeping up with the Joneses.” Over a century later, in his 2006 book, “The Undercover Economist”, Tim Harford noted how supermarkets and restaurants continue to exploit the same human foibles with “price targeting”, that is, setting different prices for minor variations of the same item with consumers in different socio-economic categories or living situations. For example, retailers can charge higher prices for the same item with a “fair trade” or organic label. For many consumers, higher prices are seen as a proxy for higher status or better value, so consumers self-select what they think they are worth.

Newer apple varieties have been forced to follow the path of product differentiation and price discrimination that consumer products have been following for more than a century. At the core of such a strategy is establishing a brand, associating that brand with distinctive intrinsic and extrinsic attributes, and reinforcing that brand with a suitable product name, product image, packaging, and promotional themes or story lines that repeat a uniform message to consumers.

Until recently, in the apple industry, the variety name acted as a brand, and was the center of the entire marketing and promotional package. In the European Union, selected producing regions have used PDOs (protective designation of origin) to distinguish apples from a limited geographic region. Elsewhere, apple marketing firms, such as Enza or Stemilt, have begun to promote umbrella brands. The assumption is that the reputation of a company or collective brand can be carried forward to a sequence of new apple varieties. That strategy can backfire if one or more new varieties is a failure in the marketplace. The reputation of the umbrella brand can be tarnished. On the other hand, the more new apple varieties that can be successfully introduced under an umbrella brand, the more easily that umbrella brand can withstand the failure of any single new variety.

This essay argues that quality in any new apple variety must include numerous intrinsic attributes that a competent producer or packer would seek, in addition to a continually expanding list of extrinsic attributes. These may be either demanded by governments, major retailers or activist groups, or be necessary to differentiate the new product in the current competitive marketing environment.

The qualities envisaged by the breeder, or pursued by the producer or packer, must complement the name, image, story and brand developed by the sponsors and marketers of the new variety. This has become a much more challenging process since the entire package of intrinsic and extrinsic qualities must be beneficial for breeders, producers, packers, marketers, retailers and consumers and be able to avoid the censure of governments and activists.

In the remainder of this edition of the World Apple Review, many other issues will be addressed that relate to the cost, quality or profitability of the global apple industry. Among the broad aspects discussed are:

1. Past apple production for each country and the world.
2. Future production, in total, and by variety.
3. International trade in fresh apples.
4. Consumption of fresh apples.
5. Prices and marketing margins.
6. The processed apple sector, and
7. Other critical issues for the world apple industry.

Each section presents and interprets the latest, crucial data on world, national and district developments. In addition, the links between these different aspects of the global apple industry are explored. A detailed table of contents, lists of tables and charts, and a country index are provided to help readers find information of most relevance to them.

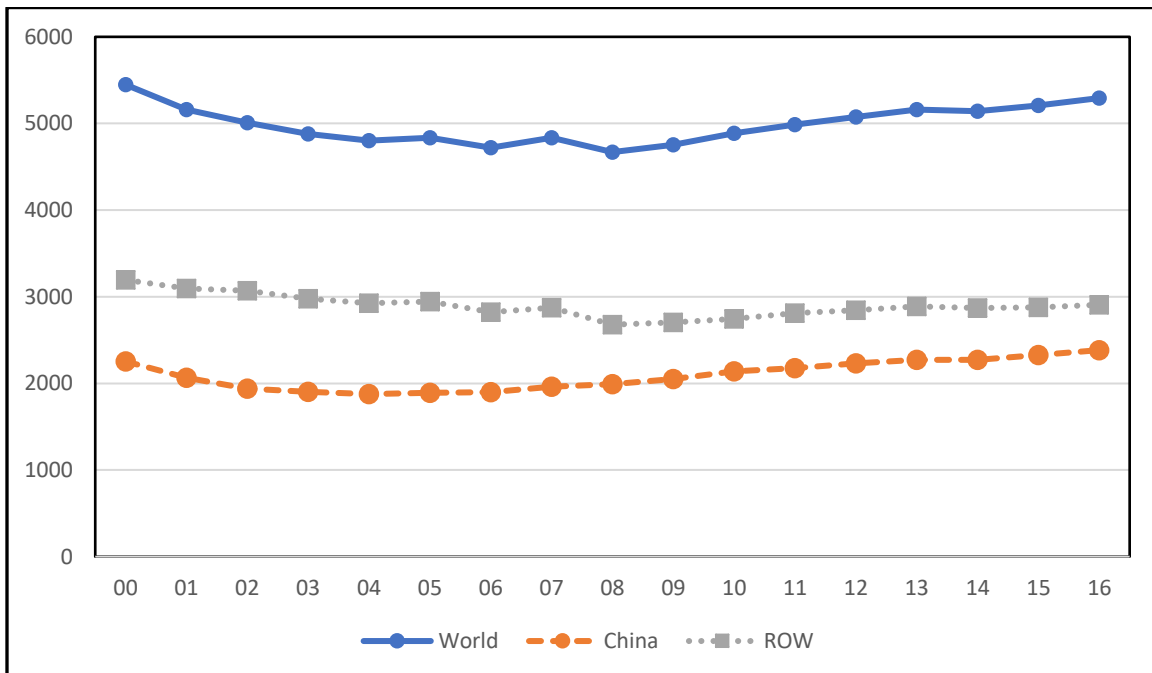
We apologize in advance for any errors or omissions. We hope that readers will bring these to our attention so they can be corrected in future editions.

# 1. Past World Apple Production

## Apple Area Rebound Continues

World production of apples continued its long upward climb in 2016 before suffering a setback in 2017 due to adverse weather, especially in Europe. Several factors have contributed to growth. First is the rebound in the area planted and harvested to apples. UN,FAO reports only area harvested, but area planted is likely to have moved in the same direction. Area harvested in China bottomed out in the years between 2003 and 2006, and moved up steadily at an average rate of about 2 percent per year for the next ten years. Area harvested in the rest of the world (ROW) was still falling through 2008, but has moved up slowly since then at an average growth rate of about one percent per year. Total world area of apples harvested also began its turnaround after 2008. By 2016, UN,FAO estimated that area harvested had recovered close to the level obtaining in the year 2000.

**World: Area of Apples Harvested, 2000-2016**  
(thousand hectares)



The single, major reason for the turnaround in apple area has been the dramatic improvement in the economic returns from apple production. China escaped much of the negative effects of the Great Recession, and its middle class continued to expand very rapidly in recent years. Apples were both available and economical compared to many other fruits.

Apple profitability in the rest of the world had been hit hard by the Asian financial crisis of the late 1990s, and its aftermath. Many smaller producers were forced out of production, and the surviving producers removed much of their least productive orchards. The process of replacement was not uniform across major producing countries, as operators varied in their ability to accumulate the capital needed for renewal or replacement of orchards. In general, these newer orchards had higher densities and the latest productivity-increasing technologies. That thrust has strengthened over time and ensured earlier bearing and ever higher average yields.

### **Effect of Rising Yields**

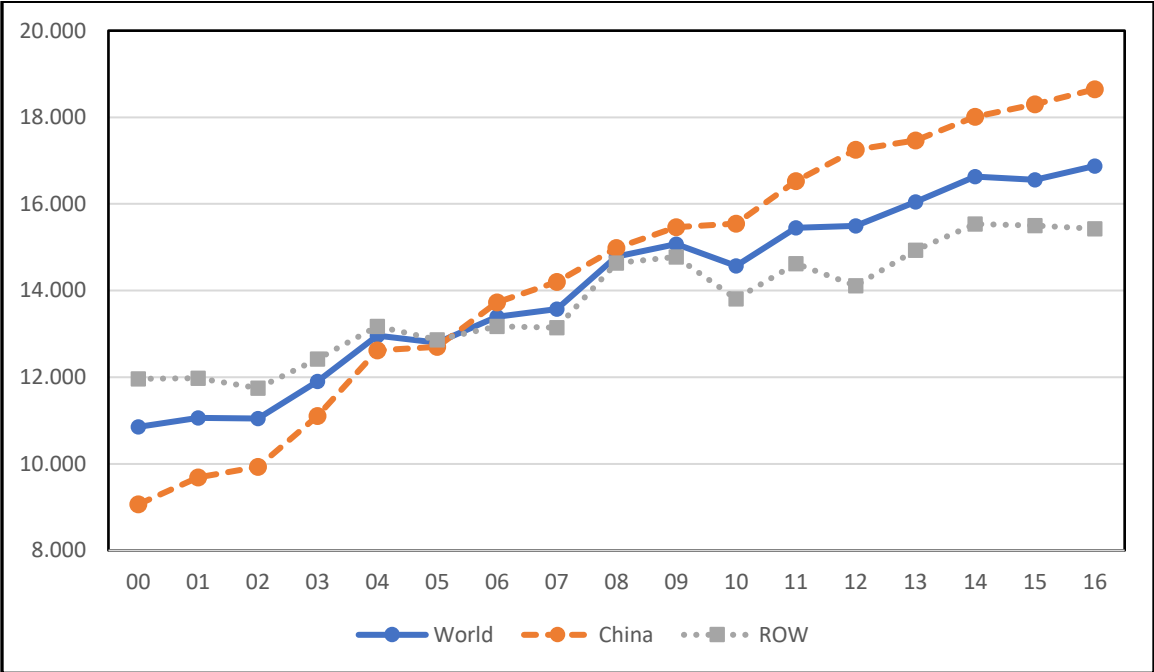
The chart below, derived from UN,FAO data, shows the powerful upward trend in average yields during the entire period between 2000 and 2016. Worldwide average yields rose from 10.9 metric tons per hectare in 2000 to 16.9 metric tons in 2016, an increase of over 55 percent. This equals a staggering annual average rate of increase of almost 3 percent per year over the entire period.

Average yields of apples per hectare in China rose even faster, by over 105 percent for the entire period, or an average annual rate of increase of over 4 percent. China continued to move production to more favorable sites and to employ higher density plantings. In 2000, average yields in China were 16.5 percent below the world average. Chinese yields caught up with the world average in 2006, and gradually increased their advantage thereafter. By 2016, average Chinese yields were more than 10 percent above the world average.

Average yields in the rest of the world increased more slowly than in China, but still averaged annual gains of about 1.7 percent. The average gain was pulled down by the large number of legacy orchards, and old acreage, that remained in production in countries whose economies were not able to generate the capital needed for orchard renewal.

In contrast, in more developed countries, such as the United States, New Zealand and Chile, large, integrated operators were able to generate the capital needed for orchard renewal. Where possible, they planted new orchards in areas where the climate, terrain and water supplies made intensive production more effective. They were able to invest in more productive rootstocks and cultivars, improved tree architecture, and in technologies, such as automated sprinkler systems and protective canopies, that facilitated earlier production and higher, long-term yields.

**World: Trends in Average Apple Yields, 2000-2016**  
(metric tons per hectare)



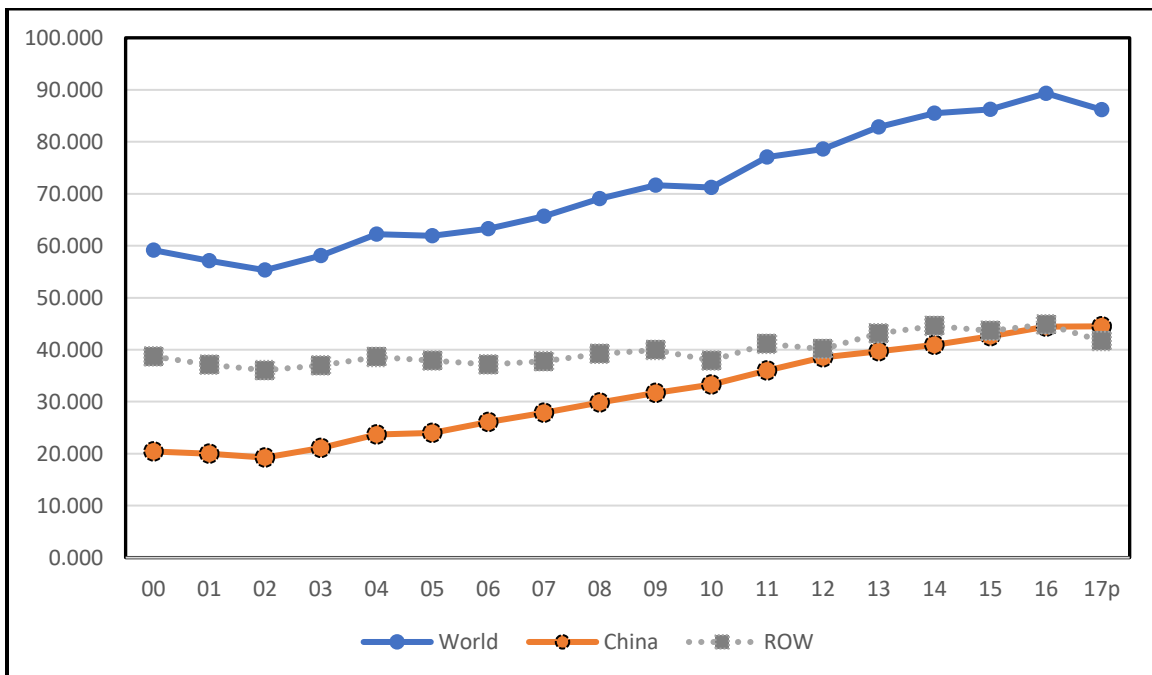
Despite the steady increase in average yields per hectare, there remain wide discrepancies in average apple yields in major producing regions and countries. In the 2014-16 period, average yields in Western Europe, North America, and major Southern Hemisphere apple orchards were 30 metric tons per hectare or greater. In contrast, average yields in the former Soviet countries of Eastern Europe and Western Asia were below 10 metric tons per hectare. Yields in China were about half way between those extremes. Average yields in the same period were 15.5 metric tons in Turkey and 18.7 metric tons in Poland, both far below those prevalent in Western Europe.

## World Apple Production Set New Record in 2016

Given the trends in area harvested and average yields noted above, it is no surprise that world apple production has been on a long upward trend since 2002. However, the latest revised estimates from UN,FAO indicate that world apple production in 2016 set a new record, exceeding 89 million metric tons. This was 25 million metric tons (almost 40 percent) greater than world apple production a decade earlier.

The major contributor to the increase in world production was China. Its production of 44.4 million metric tons in 2016 was about 18.4 million metric tons (70.5 percent) greater than a decade earlier. In contrast, apple production in the rest of the world stagnated between 37 and 40 million metric tons from 2000 to 2010. It only moved above 40 million metric tons for the first time in 2011, but reached 44.9 million metric tons by 2016, a 9 percent increase over the 2011 level. In 2016, about half of world production came from China, and half from all other producing countries combined.

### World: Trends in Apple Production, 2000-2017 (million metric tons)



The marketing implications of these production increases are different for China and for the rest of the world. Until recently, most of the increases in China's apple production were absorbed by increased fresh demand in the domestic market. Only 2 to 3 percent of Chinese apple production entered world fresh export markets. A larger proportion was processed into apple juice concentrate, primarily for export, but that volume had not been growing. In contrast, in the rest of the world, domestic demand for fresh or processed apples has not been growing. As a result, much of the increase in production was aimed at third country export markets. This strategy was made more difficult by the Russian embargo on imports from many major exporters, now in its fourth season. Any further production increases are likely to intensify the battle for export markets.

### **Apples in the Global Fruit Complex**

While world apple production has continued on its impressive growth path, that growth has been matched, and sometimes surpassed, by other major fruits. The table on the next page compares production of major fruit groups for three three-year periods, 1994-96, 2004-06 and 2014-16. While apple production in 2014-16 had risen to over 87 million metric tons, UN,FAO data show that production of all major fruits was almost 700 million metric tons. This was about 300 million metric tons greater than two decades earlier, a very significant increase in the volume available for fresh use and for processing. Not included in the fruit totals are other items, like melons and watermelons, that are often considered as alternatives to fruit. Their combined melon volume in 2014-16 was almost 145 million metric tons.

Between 1994-96 and 2014-16, world apple production increased by 68.3 percent. However, world production of all major fruits rose even faster in the same period, by 71.7 percent. The volume of all fruits grew in the two decades by almost eight times the volume of apples.

Production of other deciduous fruits (such as pears and sweet cherries), other citrus fruits (such as lemons and tangerines), and bananas, all more than doubled in the two-decade span. Of the other four categories shown in the table, the slowest growth was for oranges, at close to 25 percent. Bananas have remained the most important single fruit, followed by apples, grapes and oranges.

There have also been small, but significant, changes in the share of the fruit complex accounted for by the major fruit groups. The apple share has remained relatively static, fluctuating around 12 percent. The shares for oranges and for grapes/kiwifruit have fallen in both periods. The grape volume tends to be dominated by wine grapes, whose production has fallen as demand for wine has fallen. The largest gainers have been bananas, other citrus fruits and other deciduous fruits. However, bananas have been the only single fruit that has accounted for more than 16 percent of total fruit production. Its share of the total increased by almost 3 percentage points between 1994-96 and 2004-06, but the rate of growth slowed in the most recent decade. Overall, these tables show that diverse fruits contributed to the large increases in total world fruit production.

### **World: Major Fruit Groups, Volume and Share of Production, Selected Years, 1994-96, 2004-06 and 2014-16**

Fruit Group	Unit	1994-96	2004-06	2014-16
Apples	1,000 mt	51,701	62,465	87,017
	<i>Share (%)</i>	<i>12.70</i>	<i>11.54</i>	<i>12.45</i>
Other Deciduous	1,000 mt	38,345	58,290	76,669
	<i>Share (%)</i>	<i>9.41</i>	<i>10.77</i>	<i>10.96</i>
Oranges	1,000 mt	58,425	64,501	72,780
	<i>Share (%)</i>	<i>14.35</i>	<i>11.92</i>	<i>10.41</i>
Other Citrus	1,000 mt	33,610	49,868	71,137
	<i>Share (%)</i>	<i>8.25</i>	<i>9.21</i>	<i>10.18</i>
Bananas	1,000 mt	55,675	83,908	113,277
	<i>Share (%)</i>	<i>13.67</i>	<i>15.50</i>	<i>16.20</i>
Other Tropical	1,000 mt	87,208	118,796	152,934
	<i>Share (%)</i>	<i>21.41</i>	<i>21.95</i>	<i>21.88</i>
Grapes/kiwifruit	1,000 mt	57,440	69,441	80,206
	<i>Share (%)</i>	<i>14.11</i>	<i>12.83</i>	<i>11.47</i>
All Other	1,000 mt	24,807	34,064	45,100
	<i>Share (%)</i>	<i>6.10</i>	<i>6.28</i>	<i>6.45</i>
TOTAL	1,000 mt	407,211	541,333	699,120
	<i>Share (%)</i>	<i>100.00</i>	<i>100.00</i>	<i>100.00</i>

World population increased by over 1.6 billion people (28.4 percent) between 1994-96 and 2014-16. Changes in per capita availability of major fruits is one

indicator of the competitive pressures that can result if world supplies grow faster than world population. The table below shows per capita supplies of the major fruits for the same three-year periods. Per capita supplies of all major fruits rose by over one third in the two decades, while per capita supplies of melons (including watermelons) almost doubled.

Increases in per capita supplies were notable for almost all fruit groups except for grapes and oranges, which suffered declines. Per capita supplies of all other major fruit groups increased by at least 30 percent in the two decades. In the case of apples, per capita supplies increased by only 6.2 percent between 1994-96 and 2004-06, but the rate of growth speeded up in the most recent decade, increasing by 23.5 percent.

### **World: Major Fruit Groups, Per Capita Supplies, Selected Years, 1994-96, 2004-06 and 2014-16**

Fruit Group	1994-96	2004-06	2014-16	2014-16 v 1994-96
	(kg)	(kg)	(kg)	(% change)
Apples	8.99	9.55	11.79	+ 31.1
Other Deciduous	6.67	8.91	10.38	+ 55.6
Oranges	10.16	9.86	9.86	- 3.0
Other Citrus	5.84	7.62	9.63	+ 64.9
Bananas	9.71	12.83	15.34	+ 58.0
Other Tropical	15.16	18.15	20.72	+ 36.7
Grapes/kiwifruit	9.99	10.61	10.86	+ 8.7
Berries	0.97	1.29	1.66	+ 71.1
Other Fruit	3.36	3.92	4.45	+ 32.4
TOTAL	70.81	82.74	94.69	+ 33.7
Melons/watermelons	10.14	13.50	19.60	+ 93.3

The table above also separately identifies the contribution of berries to the total fruit complex. While the volume of berries has remained small compared to that of other major fruits, the rate of growth in per capita supplies of berries has led all fruit groups. Berries have also become a major competitor for retail shelf space because of their relatively high prices and large retail markups.

## **Factors Affecting World Fruit and Berry Production**

Factors on both the demand and supply sides have contributed, and will continue to contribute, to the rapid growth of world fruit and berry production. Clearly, a major influence has been the willingness of consumers to purchase and enjoy an increasing array of fruit choices at any time of the year. Many economic studies have shown that as their incomes increase, consumers are willing to purchase a greater number of different kinds of fruit, and also greater diversity within each fruit group. Whether they live in the tropics, semi-tropics or temperate climatic zones, consumers have embraced the opportunity to try products from other climatic zones. As consumers enter higher income classes, they also appear to be more willing to try new fruits, or newer variants of existing fruits.

Medical and educational authorities have almost unanimously supported increased consumption of fruits as contributing to improved health. Food editors and their food writers have welcomed the opportunity to feature many different kinds of fruits, and have shown consumers how to store, handle and serve fruits that were once rare or exotic. For many years, retailers have built bigger and bigger stores and have been willing to allot more shelf space to fresh fruits and other produce items. Although the era of ever-increasing store size is coming to an end, retailers continue to be receptive to maintaining shelf space for established fresh fruit, and to allotting space to newer fruit items.

On the supply side, several factors have helped world fruit production to expand. Many of the pioneers in introducing newer fruits, and in expanding their sales to other countries, have earned substantial profits which they have been willing to re-invest in further expansion. Many successful producers have integrated forward into packing, processing, marketing or exporting of fruits. The margins available in these forward activities have tended to be more stable than those for production alone. As integrated firms have captured more of the revenue from expanded global sales, they have been able to increase their investments in the fruit industry.

Governments, and national and international development agencies, have also realized that intensive fruit production can generate much greater revenue, and more added value, in rural areas than investment in field crops like wheat or sorghum. In many cases, government-funded irrigation schemes can only be justified economically if intensive crops like fruits or vegetables are produced. The

higher value of output also makes it easier for development agencies to justify expenditure on needed export infrastructure such as storage units, roads, railways, ports, telecommunications and extension services.

Where climatic conditions are favorable, apples are a favorite of development agencies. Commercial production can be achieved more rapidly than for many competing tree fruits or nuts. The product is more durable than many other fruits in harvesting, handling, long-term storage and long-distance shipment. World markets are accustomed to handling apples from many different sources. Wholesale markets remain willing to handle small lots, and when volume grows, retailers are willing to try new suppliers. However, further expansion of world fruit production could be derailed by reverses in the current favorable demand and supply factors.

### **Imports as an Indicator of Changing Fruit Preferences**

Data on consumer purchases or on retail sales of different fruits are rarely available to the public. However, most countries publish monthly data on products entering or leaving their country. In the case of fresh fruit, this information is valuable because so much fruit is shipped across international borders from different climatic zones. Thus, trade is an excellent indicator of how consumer preferences for different fruits are changing. Because most global apple production is aimed at the fresh market, our focus here is primarily on the fresh fruit trade. The following three tables show trends in imports of the major categories of fresh fruit in three of the world's largest consumer markets, the EU-15 (the 15 richest members of the 28-member European Union), the United States, and China, which is thought to have the potential to become the world's largest market for imported fresh fruit.

The first table shows the EU-15 imports of fresh fruits for five-year intervals between 2000 and 2010, and annually since 2013. This allows us to identify both long-term and more recent trends. The fruit categories are those defined under the 4-digit harmonized system. They include both products like bananas, little of which can be grown domestically, and products like apples and pears that are imported to complement large domestic production. It also includes products like table grapes or stone fruit, that serve narrow market windows in their own hemisphere, and that can be supplemented by off-season imports. Because of the banana's relative importance, data for bananas are given special attention.

## EU-15: Imports of Selected Fruits, 2000-2017 (1,000 metric tons)

Fruit Group	2000 (1,000 mt)	2005 (1,000 mt)	2010 (1,000 mt)	2013 (1,000 mt)	2014 (1,000 mt)	2015 (1,000 mt)	2016 (1,000 mt)	2017 (1,000 mt)
Bananas	5,057	5,093	6,198	6,719	6,879	7,041	7,302	7,909
Melons/Watermelons	1,124	1,445	1,662	1,727	1,801	1,994	2,104	2,228
Dates, Figs, Pineapples	973	1,661	2,171	2,194	2,448	2,395	2,686	2,863
Grapes	1,474	1,724	1,719	1,708	1,679	1,706	1,694	1,759
Citrus Fruits, Fresh	5,017	5,304	5,451	5,616	5,262	5,699	5,885	5,976
Fruits, NES, Fresh	1,085	1,366	1,425	1,499	1,509	1,642	1,769	1,898
Apples/Pears	3,383	4,082	3,540	3,585	3,260	3,279	3,197	3,428
Stone Fruit	1,210	1,354	1,284	1,428	1,390	1,474	1,475	1,534
<b>TOTAL FRESH FRUIT</b>	<b>17,996</b>	<b>22,029</b>	<b>23,441</b>	<b>24,476</b>	<b>24,228</b>	<b>25,230</b>	<b>26,112</b>	<b>27,595</b>
Total, exc. Bananas	12,939	16,936	17,243	17,757	17,349	18,189	18,810	19,686

The EU-15 remains the largest global market for fresh fruit imports despite the number of economic setbacks the region has sustained in the last decade. Banana imports increased by 22.6 percent between 2000 and 2010, while imports of other fresh fruits increased by over 33 percent. Imports of bananas continued to increase between 2010 and 2017, by almost 28 percent, while imports of all other fresh fruit grew by over 14 percent. As by far the cheapest fresh fruit, sales of bananas would be expected to flourish during hard times. In contrast, sales of more expensive fruits would be expected to be sluggish. However, in general, the more exotic fruits had faster sales growth than those available from domestic sources.

Total imports of fresh fruits in the United States remained less than half the volume imported by the EU-15. U.S. imports of bananas grew little between 2000 and 2010, but jumped by almost 20 percent between 2010 and 2017. In contrast, imports of all other fruit rose by 26.6 percent between 2000 and 2010, and by a further 48.3 percent between 2010 and 2017. As expected, imports of grapes, apples and pears, and stone fruit either stagnated or declined after 2010. The fastest rate of growth was for the tropical and exotic fruits included in three categories, “Dates, Figs, Pineapples”, “Citrus Fruits, Fresh” and “Fruits, NES, Fresh”. Imports of these three categories rose by over 70 percent in seven years, reflecting the strong demand for non-competitive fruits by U.S. consumers.

## United States: Imports of Selected Fruits, 2000-2017 (1,000 metric tons)

Fruit Group	2000	2005	2010	2013	2014	2015	2016	2017
	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)
Bananas	4,246	4,089	4,361	4,868	4,892	4,960	4,952	5,196
Melons/Watermelons	963	1,028	1,226	1,381	1,426	1,531	1,674	1,590
Dates, Figs, Pineapples	645	1,120	1,505	2,014	2,202	2,361	2,441	2,593
Grapes	484	636	611	579	511	595	571	613
Citrus Fruits, Fresh	362	522	652	799	835	984	1,046	1,196
Fruits, NES, Fresh	188	265	428	609	653	708	774	780
Apples/Pears	258	201	254	280	290	243	276	239
Stone Fruit	72	123	99	78	51	77	89	74
<b>TOTAL FRESH FRUIT</b>	<b>7,218</b>	<b>7,984</b>	<b>9,136</b>	<b>10,608</b>	<b>10,860</b>	<b>11,459</b>	<b>11,823</b>	<b>12,281</b>
Total, exc. Bananas	2,972	3,895	4,779	5,740	5,968	6,499	6,871	7,085

Global producers and exporters of fresh apples and many other fresh fruits have expected unbounded growth in imports by China because of that country's huge population, rapidly rising income levels, and gradual reduction of barriers to imports. While imports of bananas grew by only 12 percent between 2000 and 2010, imports of other fresh fruits grew 243 percent, admittedly from a very low base. Despite rapid growth in imports after 2010, imports of bananas, all other fresh fruit, and total fresh fruit peaked in 2014, and have remained well below that peak through 2017. The biggest rise, and subsequent decline, was in "Fruits, NES, Fresh", a category that included record quantities of tropical fruits like dragon fruit, longans and durian, primarily from Southeast Asia. Imports of kiwifruit, and of stone fruit, especially sweet cherries, have remained strong. In contrast, imports of melons and watermelons, and of apples and pears, where China has marketable exports, have languished.

The unfortunate reality is that Chinese officials still have various policy tools for impeding any imports they deem undesirable, either because domestic producers have been calling for greater protection, or because the Chinese government is engaged in a political dispute with one or more exporting countries. This trend towards managed imports is likely to persist under the authoritarian regime of President Xi Jinping. The Trump administration has recognized the problem, but finding remedies, either through the WTO or bilaterally, will not occur rapidly.

## China: Imports of Selected Fruits, 2000-2017 (1,000 metric tons)

Fruit Group	2000 (1,000 mt)	2005 (1,000 mt)	2010 (1,000 mt)	2013 (1,000 mt)	2014 (1,000 mt)	2015 (1,000 mt)	2016 (1,000 mt)	2017 (1,000 mt)
Bananas	593	356	665	515	1,127	1,074	887	1,039
Melons/Watermelons	6	132	334	277	215	201	204	188
Dates, Figs, Pineapples	7	8	28	51	94	95	112	155
Grapes	52	57	82	185	211	216	252	234
Citrus Fruits, Fresh	57	62	105	129	162	218	74	467
Fruits, NES, Fresh	68	102	115	1,476	4,145	1,598	1,508	1,516
Apples/Pears	26	33	67	55	59	96	67	76
Stone Fruit	5	9	28	64	82	123	154	151
TOTAL FRESH FRUIT	814	759	1,424	2,752	6,095	3,421	3,258	3,826
Total, exc. Bananas	221	403	759	2,237	4,968	2,347	2,371	2,787

### Fresh Apple Role in Snack Foods and Drinks

While fresh apples compete with many other kinds of fresh fruit for shelf space in the grocery store and for the attention of consumers, fresh apples must also compete with many other foods, especially snack foods. This has become more relevant as consumers accommodate increasingly busy lifestyles by forgoing fixed meals (such as breakfast, lunch or dinner) in favor of more frequent snacking occasions. Since these snacking occasions may arise in one's car, on public transportation, at one's office desk, or at a sporting occasion, the nature of the snacks that are appropriate continues to change.

A wide array of food manufacturers, from large multiproduct, multinational corporations to small, single-product, start-up companies cater to the snack market. The former usually have large research laboratories, substantial marketing budgets and access to retailers of every size. In contrast, many smaller firms develop out of home kitchens using old family recipes. However, both have the ability to make rapid changes in product formulations. At the same time, food fads come and go. As a result, the snack food segment is in continual flux and the challenges to fresh apple consumption come from many different directions.

The table below shows the value of U.S. shipments of major snack food and drink categories for selected years between 2002 and 2016. The data reflect some of the changes in demand that have taken place over the fourteen-year period. The breakfast cereal category grew by 18.5 percent between 2002 and 2010. The value of shipments peaked in 2013, and had fallen by 11.6 percent by 2016. This reflects both the decline in the youth population and the reduced popularity of breakfast as a formal meal. Confectionery shipments (both chocolate and non-chocolate), rose by 16.2 percent between 2002 and 2010, and have continued to rise by about 5 percent per year since 2010. The yogurt category, while still relatively small, has grown dramatically. It more than doubled between 2002 and 2010, and rose by more than 35 percent between 2010 and 2014, but growth has slowed since. Shipments of ice cream/pies/cakes and of cookies and crackers rose modestly between 2002 and 2010, but growth has remained slow for the former category, and fallen back for cookies and crackers after 2014. Shipments of other snack foods rose by over 50 percent between 2002 and 2010, and by a further 40 percent between 2010 and 2016. A major contributor to that growth has been increased shipments of roasted nuts, whose value has tripled since 2002. Overall shipments of major snack foods have grown by over 50 percent between 2002 and 2016.

### **United States: Value of Shipments of Selected Snack Foods and Drinks, 2002-2016** (\$ million)

Item	2002	2010	2011	2012	2013	2014	2015	2016
	(\$m)	(\$m)	(\$m)	(\$m)	(\$m)	(\$m)	(\$m)	(\$m)
Breakfast Cereals	7,833	9,286	9,455	9,560	9,794	9,124	8,836	8,659
Confectionery	18,216	21,172	21,987	24,065	24,579	25,542	27,249	28,521
Yogurt	2,163	4,581	4,780	5,420	6,057	6,200	6,236	6,237
Ice cream/Pies/Cakes	14,481	15,334	15,394	15,064	15,866	16,592	16,354	17,123
Cookies and Crackers	9,380	10,785	10,934	11,151	10,632	11,882	10,985	10,551
Other Snack Foods	17,428	26,369	28,773	30,940	31,983	35,076	36,033	37,244
Total snack foods	69,501	87,527	91,323	96,200	98,911	104,416	105,693	108,335
Soft Drinks	29,174	32,599	34,679	36,701	36,684	38,162	38,925	35,464
Breweries	17,789	25,119	26,178	27,864	31,327	30,296	30,308	30,519
Wineries	9,026	14,299	14,982	14,699	14,986	16,982	18,756	20,420
Total Snack Drinks	55,989	72,017	75,839	79,264	82,997	85,440	87,989	86,403
Bottled Water	n.a.	6,422	6,446	7,118	7,322	6,791	6,727	6,880

There have been equally significant changes in the value of shipments of the major drinks categories. Shipments of soft drinks rose by almost 12 percent between 2002 and 2010, and by a further 19 percent between 2010 and 2015. However, they recorded their first decrease of almost 9 percent in 2016. Shipments by the two alcoholic drinks categories, breweries and wineries, grew by 41 percent and 58 percent between 2002 and 2010. However, shipments by breweries peaked in 2013, while those by wineries grew by a further 43 percent between 2010 and 2016. Data for shipments of bottled water are shown separately because data were not available until 2009. Conventional wisdom held that many consumers were substituting bottled water for carbonated soft drinks. However, the value of bottled water shipments peaked in 2013 when shipments of soft drinks were still rising.

In total, the value of shipments of the major snack foods and drinks in the United States exceeded \$200 billion in 2016, compared to about \$166 billion in 2010, an increase of over 20 percent. The equivalent value of fresh bananas would be the landed value of imports, which was approximately \$2.1 billion in 2016. For fresh apples, the equivalent would have been at wholesale, which was approximately \$4 billion in 2016. Thus, the combined value of shipments of fresh apples and fresh bananas in the United States was about 3 percent that of manufactured snack foods and drinks.

A pertinent question is determining likely future trends in shipments of manufactured snack foods and drinks, and how those trends might impact competition for fresh apples. A key advantage for fresh apples is that they are seen as being a healthy food, and concerns about the links between foods consumed and healthfulness have been rising. Also, leading medical and educational authorities continue to stress the importance of fresh fruits in a healthy diet, and an increasing proportion of younger, higher-income consumers echo that belief.

However, even on the health front, the benefits to fresh apples may be limited. There is often divergence between what consumers say they plan to do and what they actually do. Most diet regimens are quickly abandoned. At the same time, snack manufacturers have been making heroic efforts to reformulate their products so they contain less fat, salt, sugar, or total calories, and deliver more dietary fiber, vitamins and other ingredients thought to contribute to health. Many of these reformulations have not been able to recreate the original taste, and had mixed success in the marketplace, so the battle for consumers' favor continues.

Many of the trends shown in the shipments table above have been related to health concerns. For example, expansion of sales of bottled water was driven by the theory that many consumers did not keep adequately hydrated and that they needed to have a bottle of water on hand at all times. Shipments of yogurt were supported by the belief that yogurt promoted the ingestion of beneficial bacteria that contributed to gut health. In contrast, the slowdown in shipments of soft drinks has been a reaction to the widespread criticism of such drinks as containing empty calories or contributing to obesity, especially among children. It is impossible to predict what the next food fad may be, or how it might affect consumption of fresh apples.

The other major battleground for fresh snacks is over convenience. Many products are formulated, sized and packaged to suit today's active lifestyles. Products like candy bars and cookies are designed to draw the minimum of attention from those around you at work, at play or in transit, and to cause the least waste. In contrast, products like whole fresh apples, fresh pears or fresh peaches lack those advantages. The fruit industry has attempted to fight back by introducing sliced apples, or fruit mixes, but their share of the market remains small.

The ultimate in convenience is in the so-called "super foods" where a small volume of product promises to deliver a substantial level of nutrition or other health benefits. This claim has helped promote consumption of products like blueberries, almonds or other nuts. However, it has now been extended to products like salmon that often require preparation, so the level of convenience has been eroded.

Status remains an important influence on consumption choices. The rise in the status of wine drinking, and the fall in the status of beer drinking, may have contributed to the increase in the sales of wineries and the decline in the sales of breweries. The former was buttressed by the proliferation of local wineries. However, the beer industry is fighting back with a proliferation of microbreweries offering many different types of beer. Status is also at play in the fresh apple business. Undoubtedly, the increase in the demand for premium apple varieties is linked to status.

Clearly, changes in the overall food environment will continue to affect the competition faced by fresh apples.

## Trends among Major Producing Countries

A previous chart showed the large increase that has occurred in total world apple production in the last two decades. However, different major apple producing countries have experienced different rates of growth. The table below uses updated data from UN,FAO through the year 2016. It shows the volume of production among the top ten apple producing countries in 2016 compared to that a decade earlier in 2006, and for the seven most recent seasons, 2010 to 2016.

### Top Ten Apple Producing Countries: Volume of Production, Selected Years, 2006 to 2016 (1,000 metric tons)

Country	2006	2010	2011	2012	2013	2014	2015	2016	2016 v 2006
	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(1,000 mt)	(% change)
China	26,059	33,263	35,985	38,491	39,683	40,923	42,613	44,448	+ 70.6
United States	4,459	4,210	4,282	4,079	4,732	5,359	4,538	4,649	+ 4.3
Poland	2,305	1,878	2,493	2,877	3,085	3,195	3,169	3,604	+ 56.4
Turkey	2,002	2,600	2,680	2,889	3,128	2,480	2,570	2,926	+ 46.2
India	1,814	1,777	2,891	2,203	1,915	2,498	2,134	2,872	+ 58.3
Iran	2,307	2,904	3,113	3,104	3,035	2,412	2,500	2,799	+ 21.3
Italy	2,131	2,205	2,411	1,991	2,217	2,474	2,474	2,456	+ 15.3
Russia	1,626	992	1,198	1,403	1,573	1,624	1,613	1,844	+ 13.4
France	1,679	1,751	1,763	1,306	1,688	1,848	1,969	1,820	+ 8.4
Chile	1,350	1,624	1,588	1,623	1,729	1,752	1,736	1,759	+ 30.3
TOP TEN	45,732	53,204	58,404	59,966	62,785	64,565	65,316	69,177	+ 51.3
WORLD	63,249	71,192	77,072	78,626	82,821	85,500	86,223	89,329	+ 41.2
TOP TEN %	72.3	74.7	75.8	76.3	75.8	75.5	75.8	77.4	n.a.

Total world production of apples increased by 41.2 percent between 2006 and 2016. In contrast, combined production of the top ten producing countries in 2016 increased by 51.3 percent. As a result, the share of the top ten producing countries rose by five percentage points between 2006 and 2016, to a record 77.4 percent in 2016. While China made the largest percentage gains, at over 70 percent, two other countries, Poland and India, had gains of over 50 percent, Turkey had a gain of 46.2 percent, and Chile had an increase of over 30 percent. The two laggards among the top ten, France and the United States, still eked out small percentage gains in the decade. All but Iran had increased production between 2010 and 2016.

A small number of countries continue to dominate world apple production. China increased its share of world production from 41.8 percent in 2006 to 49.8 percent in 2016. However, China's rise has not intimidated other leading producing countries from continuing to expand production, and all indicators point to further increases in production due to more intensive production practices. The major impediment to consistent production increases appears to have been the weather. This has been particularly notable in Poland, Turkey, India, Iran and Russia. Such variations increase the difficulty of planning long-term marketing campaigns.

Such variations also appear to have affected changes in rankings among major producing countries from year to year and over the decade. For example, Iran was ranked third in 2006, just ahead of Poland, but had slipped to seventh place in 2014. Russia fell out of the top ten in 2010 and 2011, but bounced back in 2012. Many other factors have affected production trends in individual countries. Some are unique to each country. Others are common to many countries, but have unique effects in individual countries. Such factors are discussed in the next section.

### **Common Factors Affecting Key Apple Producing Countries**

The common factors that affect apple production are widely shared, but not immutable over time. Through the application of scientific knowledge from both within and outside the apple industry, the impact of common factors can be either reduced, or enhanced, as desired. A few leading factors are discussed below.

#### **Quality of the Natural Environment**

Several common factors affect the success of the apple business in major producing countries. The existence and growth of the apple business in any producing district has been strongly influenced by the suitability of the natural environment for production of apples relative to other possible, alternative crops. Over time, the preferred growing areas have been discovered by a process of trial and error. In new production areas, sites have often been chosen because of the similarity of their natural environment to that existing in established apple growing districts. Key factors include the soil quality and orientation, air movement, the length of the growing season, the number of frost free days, the rate of accumulation of cooling or heating units, ample water supply, and low pressures from pests and diseases.

No single producing area has the perfect mix of these natural advantages. Over time, orchardists have found ways to improve natural conditions, for example, by adding supplementary irrigation. Breeders have also affected the most desirable growing environments both by adapting existing apple varieties to better withstand prevailing natural conditions, and by creating new varieties that flourish in different natural environments.

### **Enhancing or Combating Nature**

Orchardists devote much of their time, talent and investment in trying to find better ways to either work with nature, or to combat the vagaries of nature in apple production. Much of their effort involves compensating for inadequacies in the natural environment for apple production. For example, some growing areas may be subject to occasional winter freezes. The orchardist must make a decision whether to take a chance that untimely freezes will not occur, or install protective systems, like wind machines or other devices, to reduce the risk of damage.

The list of possible challenges faced by producers is long, and constantly evolving. Mitigation techniques may solve only part of the problem. However, regardless of their effectiveness, mitigation techniques inevitably add to the overall costs of production. The grower must weigh the potential benefits in improved yield and quality against the assured costs. The wider the range of challenges that any producer faces, the more difficult it will be to sustain a profitable operation in competition against producers that have fewer challenges.

### **Capital Availability**

The costs of establishing an orchard, maintaining it over its useful life, and implementing the best growing techniques, is becoming increasingly complicated and demanding. Even at today's low interest rates, the establishment of a hectare of apples can cost US\$150,000 per hectare (\$50,000 per acre). The cumulative costs for much of the equipment and many of the techniques now used to ensure early and heavy production continue to rise. Funding can come from retained earnings in the existing business, from private borrowings, or from public funds. Large, more profitable, existing orchards are most likely to be able to generate retained earnings and to borrow from financial agencies. Smaller orchards are often dependent on public funds, but in many countries, such funds are limited. Increasingly, the availability of capital at relatively low interest rates will determine which firms and producing districts flourish and which struggle.

## **Labor Availability**

The availability of a sufficient pool of suitable labor has become the biggest headache for firms of every size in apple production around the world. The work is both physically demanding and mentally challenging because of the need to protect the quality of the apples handled. In the past, orchards relied on excess labor in rural areas, or on workers residing in nearby low-wage countries. Such workers were willing to relocate temporarily because the wages in apple orchards were many times what they could receive in their home countries.

However, these pools of labor are drying up. There are few unemployed workers left in rural areas as many have moved to the cities in search of year-round jobs, health care, unemployment compensation, or other benefits. The pool of workers from low-wage countries has shrunk due to falling birth rates, greater job creation, and rising wage levels in their rural areas. Even when apple producers have increased wages and improved working conditions, it has not generated enough workers. This situation is not likely to reverse in the foreseeable future.

A further problem has been the increased political opposition to even temporary immigration of unskilled foreign workers. That opposition has been triggered by fears of immigrants taking jobs from citizens, of importing terrorism, or of encouraging a flood of refugees, as has occurred recently in Europe. It has led to clamp downs on workers attempting to cross international borders illegally. One solution has been to develop tightly-controlled legal mechanisms for bringing in “guest workers” to carry out specific tasks for a limited period and under strict regulations. However, because of the bureaucratic requirements and high costs, these programs are usually only feasible for larger operators.

Like other fruit industries, the apple industry faces a number of stark choices. One is to leave marginal orchard blocks unharvested for lack of labor, and to refrain from adding new plantings. Such tactics could affect the profitability of existing blocks and severely curtail expansion of individual orchards. Another, which the apple industry has pursued vigorously, has been to speed up development of mechanical harvesting of apples in place of hand labor. Moving platforms have been developed to reduce the time spent climbing ladders or physically hauling fruit. The race is on to develop robotic pickers that can identify and pick mature fruit so gently that fruit quality is not affected. Several robotic contenders have emerged, but no one so far has found the ideal robotic solution.

Even if, or when, a robotic picker is developed, it will add to the need for capital, discussed in the previous segment. Larger, better-financed operations will be better able to afford such additional capital investment. It is possible that smaller growers could share machine time, but that will be difficult when harvest times of different growers overlap. So, labor will remain a critical factor in the future of the apple industry in any district or country.

### **Role of Public Infrastructure**

Another factor that plays a critical role in the effectiveness of the apple industry in any country is the level of infrastructure that is provided by the public sector. This includes local roads, trunk roads, railroads, pipelines, dams, energy grids, communications facilities, ports and other infrastructure required to bring in needed inputs and bring out final products. It includes the maintenance needed to keep this infrastructure in working order. For example, breaks in electricity generation, or congestion at ports, can disrupt the efficient working of the industry.

The effectiveness of the public infrastructure can be handicapped by lack of government funds, by competing demands for those funds, and by corruption, all of which problems arise frequently in developing countries. The fruit industry needs to have an effective lobbying effort that can win priority for the industry's infrastructure needs. In developed countries, some of these infrastructure needs can be met on a profit-making basis by the private sector, or by burden-sharing between the public sector and the fruit industry. What is critical for the fruit industry is that infrastructure is operating at optimal capacity.

Increasingly, critical infrastructure includes not just physical assets like dams and highways, but also intellectual assets, like plant variety protection and supporting research and extension systems, Wi-Fi connections, information systems, etc. Such non-physical infrastructure will become more important in the future. Richer countries will again have an advantage in providing these services.

### **Advancing Technology**

Underlying much of the innovation in the apple industry is advances in technology. Usually developed outside the apple industry, sponsors of the technologies seek economies of scale by making their breakthroughs available to as many industries and firms as possible. These technologies are altering the traditional ways of doing business in every industry, and demand new skills from managers and employees.

## **Purchased Inputs**

Nowhere is the influence of changing technology more apparent in the apple business than in the types of purchased inputs used. Particularly in the production and packing operations, the number and complexity of purchased inputs needed to retain a competitive edge has been exploding. Even in traditional purchased inputs, such as chemicals, fertilizers, lumber and steel, concerns about the environment, worker health, food safety, etc., have led to greater complexity. For example, as broad-spectrum chemicals have been withdrawn from the market, producers have been forced to use sophisticated combinations of less hazardous chemicals to control pests and diseases.

Most profitable orchards now also require wind machines, hail netting, automated irrigation systems and use of reflective material. More and more activities are managed and controlled by mobile computers or smartphones, usually linked remotely to centralized control systems. To exploit all the additional data generated, sophisticated analytical systems are required. Many of the more advanced producers have adopted precision agriculture techniques. Support services are needed to keep these devices and precision systems working. Such systems and services are only sustainable where there is a critical mass of profitable growers that can afford them. This provides another competitive advantage to large firms in developed countries that are able to attain sufficient economies of scale, can afford employees specialized in the new technologies, and have ready access to plentiful and cheap capital.

## **Handling Facilities**

Unlike much infrastructure, handling facilities, such as hauling, storage, packing and processing, are usually provided by the private sector. In the past, small producers independently provided these facilities for their own fruit. However, because of economies of scale, most apples are now consigned to larger storage, packing or processing facilities. In some cases, these larger facilities are cooperatively owned by producers, but in most cases, they are owned by independent, for profit, companies that handle the products of many producers for a fixed fee. Their increased size makes them able to afford the newer technologies to increase efficiency or improve quality. More recently, an increasing share of apple volume is handled by firms that provide all four functions of growing, storing, packing and marketing their own and other producers' fruit.

With their increasing size and technical sophistication, these large, integrated operators are now able to more precisely control and monitor their operations and final products, and to meet the increasingly sophisticated demands of their major retail customers, government regulators and activist groups for quality assurances of various kinds. In a sense, the entire apple industry has been caught in a vicious cycle where their increased technological capabilities have increased the demands from other institutions for ever more sophisticated quality controls.

### **Marketing Infrastructure**

Different districts and countries vary in the kinds of marketing infrastructures available. These range from direct markets for local customers to sophisticated systems that can deliver product year-round anywhere in the world. Ultimately, the kind of marketing infrastructure that will be effective is one that meets the needs of major customers. Increasingly, for the apple industry, those customers are a small number of multinational retailers, such as Walmart, Tesco, Carrefour, Aldi, Costco, etc., each with its own unique store formats and competitive strategies.

In the future, the marketing infrastructure that will satisfy these major customers will depend on a wide mix of apple varieties, sophisticated packing support, and the ability to provide retailers with merchandising, promotion and packaging options that blend seamlessly with the retailer's goals. The marketing infrastructures that can best meet those evolving needs will prosper, and districts and countries without such systems will lose competitively.

### **Managed or Club Varieties**

While major marketers must supply large volumes of mass market apples to meet the needs of their major customers, they are increasingly attempting to differentiate themselves competitively by having exclusive access to premium varieties, either managed or club. The sponsors of managed varieties control the volume to be planted, but allow producers and marketers considerable leeway on how their product will be packed and marketed. In contrast, sponsors of club varieties set strict conditions on the volume of plantings, and on how their varieties will be packed, promoted and marketed. Many clubs are international in scope. Even though individual firms may have exclusive franchises in different country markets, the sponsors seek to establish worldwide standards on visual appearance, packaging and promotion for all their franchisees. There are now a large, and growing, number of international networks for managed and club varieties.

The common goal of managed and club varieties is to maintain price premiums by “induced scarcity”, that is, keeping supply less than demand in any period. If demand can be expanded at a faster rate than supply, that strategy can work. However, given the vagaries of weather, and the inherent growing pains involved with any new variety, achieving the desired level of induced scarcity can be difficult.

The proliferation of managed and club varieties raises additional concerns about the cumulative effects of this strategy. As more new varieties crowd into the premium niche, it will become more difficult to differentiate each new variety from its rivals. Secondly, while individual sponsors can manage the supply of their own new variety, they cannot control the aggregate supply of all new varieties. As the aggregate supply of premium varieties rises, the goal of induced scarcity will become more elusive, and price premiums may disappear for many new varieties.

### **Role of Food Activists**

In general, food activists tend to be organized in non-profit organizations. Each organization has its own agenda for how agriculture could be improved. Since funding depends on their success in winning support for their agenda, these organizations have become masters of hype, often exaggerating the disaster that one agricultural activity may cause, or the boon to society that might follow regulation of a different agricultural activity. They also use direct tactics, such as organizing protests, bringing lawsuits, or lobbying legislatures for changes in regulations. Agricultural organizations get little warning about which of their activities will next be challenged, and are usually ill-prepared to defend themselves.

The food activists have also worked closely with government regulatory agencies, and even secured government grants, to support their activities. However, in the United States, the Trump administration came into office in January 2017 with a specific goal of rolling back many regulations and limiting the number and scope of new regulations. Accordingly, in the United States, activist groups will face a less accommodating environment. They also face restrictions in authoritarian regimes like China and Russia. However, their influence in the European Union, and in many other jurisdictions, has not been diminished. It remains to be seen how the United Kingdom’s separation from the EU will affect the UK regulatory environment, but any changes in the UK are likely to come slowly. In response, the food activists can be expected to adjust their tactics in pursuing the same agendas.

## **Retailers, Agents of Stress**

Retailers have been the traditional gatekeepers between suppliers and consumers. As retailers have become larger through internal growth, mergers and acquisitions, a few major retail buyers have gained substantial control over which products shall have access to consumers. They have many options over what they will stock. The array of retailers also continues to change as firms enter or withdraw from different market segments, such as discounting, mainstream, upscale or online. The processes of consolidation and change show no sign of slowing. In response, the marketing of apples has become concentrated in the hands of fewer, larger marketers. However, since typical large retailers are many times the size of the largest apple marketer, the power imbalance between seller and buyer remains.

Retailers place many demands on their suppliers. Some, such as those enshrined in GlobalGAP, are common to many retailers. However, each major retailer has its own, individual requirements for its suppliers. Retailers headquartered in different countries or continents often have conflicting requirements, which place excessive burdens on exporters that supply different countries. Marketers have made major changes in their modes of operation to meet diverging retailer demands.

If apples are to retain a prominent place on retail shelves, marketers are forced to work very closely with their retail partners, both to get their products onto retail shelves and to help the retailer move products off their shelves. The top apple marketers have become close partners with their retailers in both these activities. Increasingly, apple marketers provide logistics services, demonstrations, promotions (including through social media), and packaging tailored to the retailers' preferences. Their affiliated growers and packers, and their international networks are also expected to play their role in meeting the marketers' goals.

## **Government as Partner**

In the last century, as governments have reached into more segments of society, their influence on all businesses has grown. Government decisions on taxing, spending and borrowing affect every business. In addition, government laws and regulations can affect the specific activities of apple businesses. Governments can affect the use of land, water, labor and other resources. They can regulate competition or cooperation between firms. They have the power to inspect, evaluate, fine or shutter all or parts of a business. In general, government actions can affect the costs, revenues and profitability of businesses.

Because government powers and regulations have tended to expand over time, for many years there has been an ongoing debate about the benefits and costs of government actions. In the 1970s and 1980s, Presidents Carter and Reagan in the United States, Prime Minister Margaret Thatcher in the United Kingdom, and Finance Minister Roger Douglas in New Zealand, pioneered rolling back the accumulating tide of regulations. Despite strong opposition from government officials, unions and politicians, these efforts at deregulation had some influence on their own and other countries. However, after the terrorist attacks of Nine-eleven, government agencies found new justifications for expanding their activities. Further justifications arose in response to the Great Recession of 2007-2009, when governments, and their central banks, around the world launched hundreds of so-called “stimulus packages,” some still operational in 2018.

In the United States, activist government was reignited under President George W. Bush and expanded during the term of his successor Barack Obama. President Obama presided over a huge expansion of public health programs under the Affordable Care Act, widespread financial reform under the Dodd-Frank Act, and the Food Safety Modernization Act, which would affect every aspect of the apple industry in the United States and around the world. In the European Union, government regulations continued their expansionist creep. In Japan, Prime Minister Abe pushed new interventions to shake the Japanese economy out of its long-running malaise. In China, President Xi extended Communist Party and government control of almost every segment of Chinese society. Restrictions on the freedom of citizens also increased in countries like Russia, Poland and Hungary.

However, in the United States, Donald Trump campaigned for the presidency on the promise to roll back excessive regulation. In France, Emmanuel Macron sought the presidency with the promise to end many of the regulations that had suffocated the flexibility of the French economy. One factor in the United Kingdom vote to leave the European Union was the perception that EU regulations had become excessive. Both Trump and Macron won their respective presidencies, and, in the first year of their terms, had some victories in their deregulation efforts. However, both continued to use the power of government to further other agendas. They appeared committed to reining in the overall power of government primarily in areas where they deemed government intervention to be non-productive. For the produce industry, relief from excessive regulation may be both limited and temporary.

## **Multinational Influences**

Modern societies are influenced not just by their own individual governments, but also by decisions of multiple governments in the global management of finance, trade and climate change. As a major exporter, the apple industry is most directly affected by trade agreements, both global ones like the World Trade Organization (WTO), broad regional agreements like the TransPacific Partnership (TPP), and pacts like the North American Trade Agreement (NAFTA) involving few countries. The WTO had broad and long-term responsibilities. Under NAFTA, U.S. exports of apples and pears to Canada and Mexico had soared. The TPP appeared to offer opportunities to reduce trade frictions among twelve Pacific Rim countries.

However, both before his election, and in his first year in office, Donald Trump was highly critical of all three agreements. He withdrew the United States from the TPP, denigrated the WTO's performance, and threatened to walk away from NAFTA if major changes were not made. He also made it clear that under his leadership, the United States was prepared to abandon its 60-year-old commitment to the so-called "western consensus" of spreading democracy and promoting freer trade around the world. The United Kingdom electorate voted in June 2016 to leave the European Union, under whose auspices once warring countries voluntarily relinquished some of their sovereignty to enhance peace and prosperity across the continent. UK withdrawal and other threats from dissident provinces and countries have weakened the European Union and diverted its attention from promoting the "western consensus".

President Xi Xingping of China offered to take over the mantle of leadership in promoting world trade. However, under his vision, trade would be managed for the benefit of China, and freedoms of speech and commerce, and human rights would be subject to Chinese restrictions. Numerous other countries now have authoritarian governments that would prefer the Chinese approach, including such major countries as Russia, Egypt, Thailand and Iran. The collapse of the western consensus could have serious negative consequences for export-oriented industries like the apple industry. It is difficult to know how the industry might be affected if future trade regimes were developed under Chinese guidance. The progress of trade liberalization could certainly be halted, and might well be reversed. Such a reversal would reverberate throughout the industry. However, as this publication went to press, TPP participants decided to move ahead without the United States or China. Clearly, they see trade liberalization as still desirable.

## **Developments in Specific Apple Producing Countries**

The common factors described in the previous section are of concern in every apple producing country. However, their impact can be affected by the unique situation in each country. For example, laws on employment, wages and fringe benefits differ substantially among countries. In addition, most countries face unique factors that affect the development and prosperity of their apple industry. These factors are discussed in the next section.

### **China Importance Continuing**

As shown in earlier sections, China remains the largest apple producer in the world, and consistently accounts for about half of world production. The size and rising affluence of the Chinese population has stimulated further expansion of apple plantings. In addition, China has been able to improve orchard productivity more rapidly than the rest of the world, so total production has continued to set new records. Until recently, most of that increased production was easily absorbed in the growing domestic market. At the same time, China has consistently been among the world's leading exporters of fresh apples and of apple juice concentrate, but a relatively minor importer of apple products. Thus, the Chinese apple industry has continued to have a major influence on global trade in apple products, and to affect the profitability of many competing producing regions. A major impediment for the Chinese industry has been its failure, so far, to wean itself off dependence on a single cultivar, the Fuji.

However, the Chinese apple industry appears to be facing fresh disruptions in its long-running growth trajectory. The Chinese economy has struggled to maintain past rapid rates of growth, and has experienced slowing growth of its labor force, rising costs, and bursts of unemployment. To maintain growth, the Chinese government has placed greater emphasis on increasing exports of many products, including apples. In 2016, China's exports of fresh apples set a new record, while exports of apple juice concentrate rebounded to levels not seen since 2011. If Chinese apple production continues to increase, as expected, Chinese exports of fresh apples and apple products are likely to increase further, and to intensify international competition. However, rising political tensions between China and its Asian neighbors could bring fresh disruptions to international trade.

## **United States Restructuring Continues**

A major restructuring has taken place in the apple industry of the United States over the last two decades. Many smaller producers have left the industry. Much of the rest of the industry has coalesced around large, integrated grower-packer-marketers that are linked with networks of independent growers and packers. Many apple processors have withdrawn from the business in face of low-cost supplies from China.

More capital has entered the industry, both from retained earnings of the large, integrated operations and from external investors seeking to diversify away from non-agricultural operations. Much of that capital has been invested in new, high-density plantings outside traditional growing areas, in new or improved cultivars, and in technologically-advanced growing, packing and marketing systems. There has been an increased emphasis on producing apples for the fresh market. There has also been a rapid shift in the mix of fresh apples produced, with newer varieties gradually replacing traditional varieties on the retail shelves. Per capita consumption of fresh apples in the domestic market has been stagnant, so there has been a greater need to increase exports of fresh apples. However, export markets can be easily disrupted by geopolitical tensions or trade disputes.

Accordingly, the near-term prosperity of the U.S. apple industry will require favorable response to two key questions. First, in the domestic market, will the flood of newer varieties add to overall per capita consumption or cannibalize existing varieties? Second, will conditions in export markets become more favorable to expansion than they have been in the last five years?

## **Temporary Relief for European Union**

The apple industry among the 28 member countries of the European Union was thrown into confusion when the EU placed sanctions on leading Russian citizens after Russia forcefully seized the Crimea from the Ukraine, and Russia retaliated in August 2014 by banning imports of a wide range of perishable products from the EU, including fresh apples. That ban remains in place and shows no sign of being lifted soon. Hardest hit was Poland, the EU's largest fresh apple exporter, and the leading EU exporter of fresh apples to Russia. Although the ban has been enforced with varying rigor, and various subterfuges have been used to circumvent it, it has still had a pronounced effect on EU exports to Russia, and has stimulated EU searches for alternative markets, especially in Africa and Asia.

The decision by the United Kingdom in 2016 to withdraw from the EU has the potential to further disrupt the EU apple industry. The United Kingdom is the world's third largest importer of fresh apples, and has drawn most of those imports from other EU countries, especially France. So far, negotiations on the terms of the UK's withdrawal from the EU have been contentious, with little clarity about potential outcomes on key issues like trade. The options range from continued, unfettered trade, to a return to the trade barriers in force before the UK accession to the EU in 1973.

Another major issue is the fate of the EU's Common Agricultural Policy (CAP) in an independent UK. The CAP was based on high external tariffs and domestic subsidies to encourage self-sufficiency in agricultural products within the EU. The CAP also facilitated a wide range of programs to aid farmers, help rural areas, and, more recently, protect the rural environment. The UK could maintain an agricultural regime similar to the CAP, or it could revert to open markets like those that prevailed prior to its joining the EU in 1973. Initially, the UK government promised to pursue a raft of new trade agreements with countries outside the EU, but little progress has been made on that initiative.

The European Union received temporary relief for its apple industry when the size of the 2017 apple crop fell due to adverse weather in many member countries. Apple production was expected to be the lowest in a decade, and 21 percent below the level in 2016. Production in Poland, the country most vulnerable to the Russian embargo, was 27 percent lower than the average for 2014 to 2016. However, if, as expected, the EU apple crop bounces back to normal in 2018, many of the same problems of overcapacity will face member governments and the apple industry.

Like other advanced countries, the EU faces stagnant or declining per capita consumption of fresh apples. Little relief can be expected from population growth, which is either static or declining in many member countries. The CAP in its present form has limited tools to resolve the current problems. Various measures have been used to stimulate domestic consumption and promote exports, but the effects have been difficult to measure. Continuing disruptions in EU exports to either Russia or the UK could hurt the apple industry in other EU member countries, but could help exporters in third countries. In any case, it may be years before the full effects of these disruptions become clear.

### **Poland Straitened Giant**

By many measures, Poland could be considered one of the great success stories of the global apple industry. However, the Russian embargo has highlighted some of its greatest weaknesses. Production of apples has expanded far beyond the needs of its domestic market so it has been forced to rely heavily on diverting apples to processing or finding export markets for its fresh apples. In processed apple products, competition from China has kept downward pressure on prices. In addition, the Russian market primarily took low-value apple varieties, and the alternative market for such varieties is limited. As apple production was expanded, insufficient thought was given to the potential demand for the increased output or whether that demand would generate sufficient returns to renew and modernize the industry. Ultimately, the lack of capital has delayed needed restructuring.

Poland now finds itself with only limited supplies of the varieties and qualities of fresh apples that could capture higher-value markets in western Europe, the Middle East or Asia. It is only belatedly negotiating the protocols needed to gain access for its products to many of the more promising markets. Even if the Russian embargo suddenly ended, it will take years for Russian demand to achieve past levels. So, there is an urgent need for Poland to realign its apple industry with likely future demand. The industry had hoped that after Poland joined the European Union, plentiful EU funds would be available for such restructuring, but that has not happened. Given the tensions between the current Polish government and the EU Commission, the prospects for additional aid are slim.

### **Turkey Turns Truculent**

The recent history of the apple industry in Turkey has been one of steady gains in area, production and, more recently, exports. The industry was traditionally focused on meeting growing domestic demand in a highly protected market. It had little incentive to plant new varieties that were in demand in more lucrative export markets. However, in the last decade, the more progressive firms have begun the needed modernization. As the Turkish economy grew, and Turkey opened up its markets, many other countries sought improved relations.

However, under President Erdogan, Turkey has become internally more authoritarian and externally more contentious. It has found itself at odds with its neighbor Syria, and off and on with its neighbor Russia. Its relations with the European Union and the United States has become strained, even though it

remains a key member of the NATO military alliance. Its economy has sputtered, and the possibility of EU membership has receded. These developments are likely to delay Turkey's gradual integration with the world economy, and to hinder the modernization effort in apple and other fruit industries.

### **India Tackles Restraints**

India faces many resource problems because of its size, population pressure, climate and terrain. For many years after independence, it favored anti-competitive policies both internally and with the outside world. After pressure from the WTO in the 1990s, India began to open its markets to imports. The domestic apple industry, which is mostly centered in the north in the foothills of the Himalayas, was shocked by the rapid growth in imports and by the prices Indian consumers were willing to pay. It gave the industry fresh impetus for renewal.

Successive Indian governments, at both the state and national level, have attempted to remove many of the legal and institutional barriers to economic liberalization, but the process has been slow. For example, opening the retail food sector to foreign investment has been frequently thwarted, even though modernization of food retailing would drive many other beneficial changes. Efforts have continued under the current Prime Minister, Narendra Modi, but India still has a large deficit in transportation, distribution and communication infrastructure. If renewal is to take place in apple variety selection, production, packing and marketing, substantial changes will still be needed.

### **Iran In or Out**

The apple industry in Iran has been relatively static in recent years. Its domestic market has been heavily protected. Under an Islamic regime, Iran's thorny relationship with the rest of the world has cost it access to foreign markets and impeded imports of needed inputs. Before he left office, U.S. President Obama had negotiated curbs on Iran's development of nuclear weapons that would have normalized Iran's commercial relations with the U.S. and its allies. However, Obama's successor, Donald Trump, has suspended approval of the existing agreement, partly in response to Iran's continuing support of terrorism in the Middle East. As a result, other countries have been reluctant to normalize their relations with Iran, so trade and investment with Iran continues to be impeded. The ruling regime in Iran has also remained inflexible, so the Iran economy and apple industry appear headed for further isolation from the rest of the world.

## **Italy Stable Growth**

Italy has consistently been the second largest producer and exporter of fresh apples in Europe after Poland. Unlike Poland, it has been able to meet the needs of higher income consumers in Western Europe and in other developed countries for mainstream varieties like Red Delicious, Golden Delicious and Gala. In recent years, Italy's apple industry has become centered in the northern Alto Adige region, which gives it a comparative advantage in accessing the lucrative German market. However, it is limited in its access to additional orchard land and in its ability to find modern varieties that will flourish in its mountain valleys.

While Italy has suffered little direct effect from the Russian embargo, it has faced indirect pressure from other EU exporters seeking to find alternatives to the Russian market. Italy has generally been successful in continuing to diversify its apple exports into Asia, Africa and North America. It will have to draw on its technological expertise and innovation to maintain its share of European and world markets.

## **Russian Federation Digs In**

Russia's status in the world took a beating after the collapse of communism in the early 1990s. Its status appeared to have been restored in the early years of the twenty-first century when the rapid rise in the prices of oil and other commodities boosted the Russian economy and helped Russia to become the world's largest importer of many fresh fruits, including fresh apples. However, under the leadership of Vladimir Putin, Russia sought to regain its status as a world power with aggressive foreign policy initiatives, including seizure of the Crimea in 2014. That triggered sanctions from the United States, the European Union, Australia, Canada and Norway. In response, Russia slapped a ban on imports of perishable products from those countries. In addition, it sought to reduce its dependence on produce imports by stimulating domestic production. That policy worked somewhat with open field and greenhouse vegetables, but has so far had limited success with tree fruits. Other foreign suppliers moved to fill the void left by the banned exporters, but a weaker Russian economy reduced overall import demand.

The Russian ban has been officially extended through August 2018, but the Crimean crisis remains unresolved, so that ban is likely to continue indefinitely. Domestic supplies of fresh apples remain erratic from year to year, so Russian imports will continue to fluctuate, but are unlikely to regain past peaks for years to come.

### **France Decline Persists**

Apple area in France has continued its slow decline over the last two decades. Increases in average yields have not been sufficient to maintain France's rank among major apple producing and exporting countries. Since similar declines have occurred across the entire French fruit sector, this suggests that there have been common contributing factors. These include competition for orchard land from urban uses, high taxes, wages and benefits, and the heavy burden of regulations. President Macron appears committed to measures to improve competitiveness.

In response, the French industry has consolidated into larger cooperative ventures that can provide growers with larger storage, packing and marketing facilities. It has sought to earn price premiums for its apples in domestic and export markets by tighter grade standards, use of geographic indicators and the introduction of newer varieties. For example, it is a key contributor to the European franchise for the Pink Lady apple from Australia. However, the Great Recession and its aftermath boosted the influence of discount retailers in its major markets. Buy local movements in the UK and Germany, and possible UK departure from the European Union, could provide additional challenges for French apple exports. Its best hope for relief may be renewed efforts to expand exports to the Middle East and Asia.

### **Chile Faces Stagnation**

The Chilean apple industry has a major natural advantage, namely, its many microclimates suitable for production of different varieties of apples. That has made it a preferred partner for Northern Hemisphere apple suppliers and importers. However, that natural advantage also makes it possible for Chile to produce a wide array of competing fruits and vegetables. As a result, Chilean fruit producers respond rapidly to changes in the comparative returns from different fruits, vegetables and nuts. Increased opportunities for sweet cherries, table grapes, soft fruits and berries have led to stagnation in plantings of apples and to little or no growth in apple production and exports.

The Chilean apple industry has state of the art facilities for storing, packing and exporting fresh apples. It has a diverse array of different types of exporters. Its government has been aggressive in opening up numerous export markets. The apple industry it shares a common export promotion program with other produce items under the auspices of the Chilean Exporters Association, better known by its Spanish initials as ASOEX.

A major challenge for Chile in the future will be the slowing of import demand for many varieties in the Northern Hemisphere because they can now be supplied domestically from storage. This is a dramatic contrast to sweet cherries, where demand in Asia for off-season Chilean sweet cherries has been soaring. At present, there is little evidence that resumption of the expansion of the Chilean apple industry will be justified.

### **Germany Modest Revival**

When the contribution of non-commercial orchards is included, Germany remains one of the major world producers of apples. However, it has also been consistently the second largest importer of fresh apples after Russia, so competition from imported apples remains intense. Historical UN,FAO data showed the area devoted to commercial apple production remaining stable over time despite competition from urban uses. Indeed, the German fruit tree census of 2017 showed an increase in apple planted area of almost 7 percent from 2012.

Despite climatic limitations, German producers have continued to replace older varieties like Golden Delicious and Gloster with newer varieties like Elstar, Pinova, Topaz, Kiku Fuji and Kanzi. This indicates that it remains profitable to supply the domestic market. German consumers and retailers continue to strongly support “Buy Local” campaigns. The main challenges for the German apple industry are the slow growth and aging of the German population and the strong tradition of discounting among German retailers.

### **Uzbekistan on the Rise**

The apple industry in Uzbekistan shrank in the first decade after that country separated from the Former Soviet Union, but apple area has expanded by over 50 percent in the most recent decade. Production has more than doubled in that period due to improving average yields. However, yields remain low by international standards.

The industry in Uzbekistan has received a fresh boost after 2014 from increased demand in the Russian Federation to replace supplies that otherwise would have come from Poland and other banned EU suppliers. As long as the Russian ban persists, producers in Uzbekistan will have an incentive to add acreage and to boost yields on existing acreage.

### **Brazil Hits Wall**

Apple area in Brazil experienced a period of rapid growth in the 1990s due to an influx of foreign investment, particularly in plantings of the Fuji variety. However, the growth in area and production has stalled in recent years. A substantial share of apple plantings in Brazil were in marginal areas for apple production and have not justified renewal. Most production is destined for the domestic market, but that market has been hurt by the slowdown in the Brazilian economy due to falling prices for its commodity exports. A series of corruption scandals have also reduced optimism about Brazil's future growth. While the Brazilian apple industry is second in Latin America only to Chile, it will continue to have difficulty in maintaining even its present size.

### **Argentina Tries to Halt Decline**

The apple industry in Argentina has been in long-term decline over at least two decades. Its natural advantages in production have been offset by damaging national economic policies that have triggered rapid inflation, led to rising wages and labor unrest, allowed key infrastructure to deteriorate, blocked the import of needed inputs and taxed agricultural exports. For many years, successive administrations penalized the productive sectors of the economy to fund populist programs. After the presidencies of the husband and wife team of Nestor and Cristina Kirchner, Argentine voters finally rebelled. In 2015, a new president, Mauricio Macri, was elected on a promise to end populist policies and encourage free markets.

While some of Mr Macri's initiatives have been implemented, reform has been slowed by opposition from the old guard that dominate the national legislature. Argentina's international credit worthiness has been restored and trade liberalized, but the annual rate of inflation remains above 20 percent. Many more changes will be required if the Argentine apple industry is to regain past levels of prosperity.

### **South Africa Multiple Woes**

The apple industry in South Africa has made steady progress in production, innovation and exports in the two decades since apartheid ended. However, that progress now faces at least two major threats. The first results from several years of drought that have curtailed needed water supplies, affected the quality of apples produced, and put many operators in financial jeopardy.

The second is a consequence of loss of confidence in the government of the ruling African National Congress and of its leader Jacob Zuma. The government has notably failed to curb inflation, end mass unemployment and solve the massive housing deficit. Activist pressure to make white ownership of most agricultural operations the scapegoats for the nation's problems has led to moves to change the constitution to allow land "expropriation without compensation". Ironically, South Africa's economic, social and political problems have led to sharp falls in the value of the rand and made exports of fresh apples and of apple products more competitive. The South African apple industry has remained remarkably resilient in the face of multiple threats, but its tolerance for pain may be near exhaustion.

### **Ukraine under Threat**

The Ukraine struggled with a multitude of economic and political problems after it regained its independence from Russia. However, when a new government appeared poised to increase the Ukraine's links with the European Union, Russia under president Putin took punitive action. In 2014, it seized the Ukrainian province of Crimea, and fomented insurrection in the eastern provinces closest to the Russian border. The Ukraine found itself in the middle of a great power dispute between Russia and the European Union and its allies, and in an expensive campaign to defend its territory. Its natural trade links with Russia were disrupted and it found itself on the brink of bankruptcy.

Before the 2014 crisis, the Ukraine had used the assistance of a World Bank project to modernize parts of its apple industry. However, the development process has been severely disrupted by its dispute with Russia. Aid from the EU or the United States has not been sufficient to end the economic, political or military challenges. Until some resolution is found, it will remain difficult to set the Ukrainian economy or the apple industry on a sustainable recovery path.

### **New Zealand the Innovator**

Because of its relatively small size, heavy export orientation and distance from major markets, the New Zealand apple industry has long relied heavily on innovation to provide it with an edge over major competitors. It was a leader in popularizing Gala and Fuji, developed the first national brand, ENZA, pioneered the first true club variety, Jazz, helped form a new organization, Prevar Limited, to develop new varieties, and has produced a stream of additional new varieties like Pacific Rose, Envy, Smitten and Koru.

This innovative approach has continued even though the New Zealand industry has been dramatically restructured since 2002 when the ENZA monopoly marketing board was dissolved. There was a brief period when exporters of varying size and expertise replaced the monopoly marketing effort. However, after the industry realized the need for economies of scale, there was rapid consolidation of orchard, packing and marketing operations and the development of large, integrated operations. Private apple breeders also remained very active. A further shake-up came when a German conglomerate, Baywa Limited, acquired T&G, the New Zealand company that had inherited the ENZA brand, and the Apollo Company, one of the larger surviving integrated organizations. Baywa Limited plans to focus on sourcing club apples from different regions for sale to world markets.

While New Zealand remains the source for much innovation, and newer varieties continue to replace old industry standards like Gala and Braeburn in New Zealand orchards, related operations in other countries have become more important to the dominant firms. Innovations that emerge from the New Zealand apple industry will increasingly impact production and marketing throughout the world.

### **Australia Makeover Faces Hiccups**

For many years, the spirit of innovation was weak in Australia. Imports were kept out by phytosanitary barriers. Firms lost international competitiveness. Australia's widely dispersed production regions tended to focus on local sales and had little incentive to cooperate in national efforts. However, when Australia was forced to open up its apple markets to foreign suppliers, industry leaders realized that the industry must either reform or die. For years now, the "Future Orchards" program, funded by the industry body, Apple and Pear Australia (APAL), has preached the need for Australian firms to become more internationally competitive.

That effort was aided by several other developments. The global success of the Australia-based Pink Lady program provided both encouragement and revenues. The fastest growing export markets were no longer in distant Europe, but in South and East Asia, closer to Australian suppliers. APAL also played a leading role in the Prevar breeding program initiated in New Zealand. The outcome has been dramatic improvements in productivity in Australian orchards, and the rapid transition to newer varieties. Unfortunately, returns in the domestic market have recently been disappointing. The next big hurdle will be organizing Australia's export efforts on a more coordinated and sustainable basis.

### **Spain Betwixt and Between**

The Spanish apple industry has the advantage of a large domestic market, However, it has only limited land area where apple production can compete successfully with citrus and other warm-weather fruits. As a member of the European Union, it cannot erect barriers to entry of apples from the major exporters next door, France and Italy. To improve its competitive situation, Spain has been in the process of restructuring its apple industry with improved orchards and newer varieties. However, lack of capital has slowed progress. The Spanish economy was hard hit by the Great Recession and its aftermath. The EU has been less able to provide resources for restructuring. In addition, the apple industry is heavily centered in Catalonia, the province that has been seeking independence from Spain. Until the secession issue is resolved, many investments in Catalonia may be delayed.

### **Portugal Rebounds**

The apple industry in Portugal expanded too rapidly in the 1980s after Portugal's accession to the European Union. Apple area fell by half between 1995 and 2010. It has since begun a slow recovery in areas more suitable for apple production, However, average yields remain low, and its geographic location makes it only a marginal supplier to other European markets, so it mostly supplies local markets.

### **Austria Pursues Green Niche**

Austria is another small European country located between three of Europe's largest apple producing countries, Poland, Italy and Germany. Since its commercial production was relatively small, Austria chose to emphasize its organic and natural credentials. However, the growth of green niche markets has slowed because of the Europe-wide recession and the heavy emphasis on discounting in European retailing. Other, larger competitors have also been attracted to the niche. As a result, the Austrian fresh apple industry has gone through a period of turmoil, but the green niche still appears to be its best hope for the future.

### **Belgium-Netherlands Stable**

The apple industries in Belgium and the Netherlands share many characteristics. Both serve as entry points to continental Europe for many fresh fruits. Both face heavy urban pressures, and competition between pears and apples for the available orchard land. Both were long dependent on a single apple variety, Jonagold in Belgium and Elstar in the Netherlands. Both have developed new apple and pear varieties that have gained followings in other countries.

Apple area in both countries has begun to stabilize as the comparative advantage of pears has receded. However, apple production remains highly variable due to weather effects. Both countries will continue to be integrally linked with the international fruit system through trade and innovation.

### **Greece under Stress**

The apple industry in Greece has remained relatively stable over the last decade while production of other fruits has expanded. Domestic demand has fallen because of the deep recession caused by the Greek financial crisis, a crisis that has still not ended. However, Greece has been able to partly compensate by increasing low-cost exports to neighboring countries. The continuation of the Russian embargo means that competition even for low-cost markets remains intense. The fruit industry in Greece has proved highly adaptable to the more difficult economic and competitive conditions.

### **United Kingdom Revival Wanes**

The apple industry in the United Kingdom went into a long period of decline after the UK joined the European Union in 1973. A revival began in the mid-1990s as UK retailers became more favorable to local produce, and as older UK varieties were replaced with newer varieties like Gala, Braeburn and Jazz that had been adapted to UK growing conditions. The turnaround was aided by a promotional campaign that used the patriotic symbol of the Union Jack flag to better connect with consumers. However, limited suitable land and high costs have slowed further revival.

The decision by British voters to withdraw from the European Union could once again alter the situation for UK apple producers. Within the EU, major apple exporters like France and Italy had free access to the UK market. However, after the UK withdrawal, trade relations between the UK and its former EU partners could change in unpredictable ways. At one extreme, free trade could be continued without barriers and under current EU standards. At the other extreme, the terms of trade and standards could be changed so that UK producers would regain an advantage in the domestic market. Or, compromise arrangements between these extremes could be reached. While some form of compromise is most likely, new trade arrangements could give a boost to UK apple production.

### **Uncertain Future for Mexico**

Mexico continues to have a relatively large apple industry despite limitations on the available land and water. Modernization has continued, especially in the main producing state of Chihuahua. The industry has faced stiff competition from its NAFTA partners, the United States and Canada, and from Latin America, especially Chile. Even within NAFTA, the Mexican apple industry has taken numerous trade actions against U.S. exporters, but on balance, these actions have provided little relief to the industry.

The Mexican apple industry could be affected by changes in terms of the NAFTA agreement, presently being re-negotiated at the request of the Trump administration. Under the current arrangement, U.S. and Canadian apples have duty free access to Mexico. In the unlikely event that the U.S. would walk away from NAFTA, the Mexican apple industry would again be able to erect protective barriers. However, past history suggests that such protection would delay, rather than stimulate, further needed modernization.

### **Canada Rebounds**

Apple area in Canada was on a steady downward trend between 1994 and 2010, falling by more than one half in that period. The industry had been dominated by small producers that found it difficult to compete with imported supplies of mainstream apple varieties. Some producers replaced apple acreage with plantings of sweet cherries, wine grapes or berries.

A number of factors have helped to halt the downward trend. The surviving apple growers are better capitalized. Two newer varieties, Ambrosia in the west, and Honeycrisp in the central and eastern provinces, have provided growers with more profitable alternatives to traditional varieties like Red Delicious and McIntosh. Several provinces have provided assistance for growers that wish to replant to higher densities and newer varieties. While the restructured industry is in a better position to compete with imports, many challenges remain.

### **Transition Countries Seek Renewal**

Many countries in Eastern Europe and Central Asia have transitioned from central planning in the last two decades. Their apple industries have had to be molded from command systems to ones that could respond to market signals. Although all have faced similar adjustment problems, the pace of change has varied by country.

Three of these countries, Poland, the Russian Federation and the Ukraine, have already been discussed individually. Poland, Bulgaria, Czechia, Estonia, Hungary, Latvia, Lithuania, Romania, Slovakia and Slovenia joined the European Union in 2004, and Croatia followed in 2013. One attraction of EU membership was that their agricultural industries could receive protection and funding from the CAP. However, the actual aid has fallen far short of expectations, and more capital is needed to improve their international competitiveness. Despite that, total annual apple production, excluding Poland, consistently tops one million metric tons.

Other small European transition countries, including Albania, Belarus, Bosnia-Herzegovina, Macedonia, Moldova, Montenegro and Serbia, have production of about 1.5 million metric tons. Transition countries in Central Asia include Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Uzbekistan has already been discussed separately. The other seven countries have combined annual production of over 1 million metric tons. Clearly, in aggregate, these transition countries are important producers of apples, and annual swings in crop size can have significant influence on trade in the region.

These countries have also been affected differently by the continuation of the Russian embargo on EU apple imports. Some have gained greater access to the Russian market. Others have become conduits for evasion of the Russian bans. Still others have ongoing disputes with Russia that impede normal trade relations. Overall, the Russian ban adds to the uncertainty about new investments in the apple industry in these countries.

### **Significant Apple Production in Other Countries**

The apple industry is important either in absolute or relative terms in many other countries. For small, richer countries like Norway and Switzerland, that are not subject to EU regulations, the fruit industry has received subsidies, protection from imports, and other concessions, as token preservations of traditional rural lifestyles. This is an ironic situation in countries that have among the highest per capita incomes in the world. So far, these interventions have not attracted formal objections from other members of the World Trade Organization.

In many other countries, apple production remains important despite geographic and climatic limitations. Changing cultivars and technologies have altered the options in apple production available to these countries.

Most minor producing countries sell their apples in their domestic markets, although some, such as Algeria, Morocco and Peru, have the potential to expand exports. Many lack the modern storage, sorting and packing technologies needed to compete effectively in export markets.

In summary, the world apple market is supplied by a wide diversity of producing countries with widely varying capabilities. Even within the apple market, competition for the attention of retailers and consumers will remain complex.

## 2. Future World Apple Production

### Reliability of Long-term Forecasts

Belrose, Inc., publisher of the World Apple Review, has long recognized that good information on past trends in the apple industry are of value to participants in the industry, but that it is even more important to be able to make intelligent forecasts about future trends in the industry. The reason for this is obvious. At any time, producers and packers, and their affiliated marketers, are making decisions that will affect their business for many years ahead.

For example, in making a decision to plant a new orchard block, the producer is aware that it will take several years before the block will come into full bearing. After that occurs, the block can continue at full bearing for many more years. Even with the rapid turnover in varieties in today's market, the economic life of a block may last for ten to fifteen years. In assessing the viability of the block, the producer will need to make estimates of the volume of the variety that will be produced by competitors in future years, and of the effect that volume could have on average prices, on the profitability of the block, and on the economic viability of the investment. Too often, producers and investors naively assume that prices will remain the same as they were when the investment decision was made. However, clearly future prices will be altered by any changes in future volume.

This chapter focuses on the future volume of apples that will be available from the total world and from individual countries, and on what the varietal makeup is likely to be in the next decade. The forecasts presented here are likely to be of value not only to producers, but also to investors, financial entities, breeders, nurseries, marketers, input suppliers, industry organizations, government agencies, and many other sectors whose fortunes are strongly linked to those of the apple industry.

The underlying assumptions used in making the forecasts have been made public, and the detailed methodology has been spelled out, so that forecasts can be more easily adjusted when the underlying assumptions change. The forecasts are also available to operators and investors anywhere in the world so they can make their decisions based on the likely impact of the cumulative decisions by their competitors.

It is important to reiterate the distinction between forecasts of the future and predictions of the future. Makers of predictions either claim unique abilities for prophesy (almost always fraudulent), are trading on insider information (often illegal), or attempting to conceal the weakness of their predictions by how vehemently they assert them. In contrast, forecasts are based on objectively established baseline data and documented historical relationships. For example, of each 100 trees of any variety planted in any year, a certain percentage will die for various reasons in the next year, and in each subsequent year. With data on the mortality rate for each variety, it will be possible to estimate how many bearing trees will survive to each subsequent year. In a similar way, yield per tree of each different variety, and of all varieties, tends to follow a predictable pattern as the block ages.

Of course, forecasting future apple production cannot be reduced to simple, predetermined formulas. We know that average yields of fruit trees tend to follow an S-curve as the tree ages. Yields tend to increase rapidly in the early years, then enter a phase of slower growth rates, reach a peak, and then enter a phase of slow, gradual decline. In the past, each phase tended to be stretched out over time, and clearly separated from the previous phase. However, as the profitable life span of many varieties has been reduced, producers have sought every available system and technology to speed up the process of reaching full maturity. They have become less concerned about maintaining the productivity of a block over several decades in the full knowledge that the block's economic life may be cut short.

Forecasts are also based on known, past group responses of producers and investors in perennial crops. For example, numerous studies have shown that responses to price increases or price decreases rarely occur instantaneously, but are often spread over a number of years. This is known as the "lagged" response. There are several reasons why responses tend to be lagged. For example, producers or investors may be reluctant to make major changes in their long-term strategy based on the evidence of one year. Normally, it will require a sequence of relatively high-priced years to persuade them to undertake new plantings. Conversely, they may be willing to shrug off one low priced year, but a sequence of low-priced years may persuade them to remove older plantings. New plantings during a period of optimism are also likely to be spread out over several years, to reduce costs or risks, because capital is not immediately available, or because it takes time to acquire suitable land, rootstocks or the trees needed.

The forecasts presented in this edition of the World Apple Review for the world and for major producing countries update all forecasts previously developed by Belrose, Inc. with data available through mid-year 2018. They look back at the actual production in 2010 and 2015 and look forward to the forecast production in 2020 and 2025. They take account of the latest economic and geopolitical stresses faced by the apple industry, and discussed at length in the previous chapter. They should provide producers and investors with a useful guide to the future competitive situation they are likely to face.

**World: Apple Production Trends and Forecasts,  
Actual 2010 and 2015 and Forecast 2020 and 2025  
(1,000 metric tons)**

Region or Country	2010, Actual	2015, Actual	2020, Forecast	2025, Forecast
France	1,788	1,969	1,850	1,900
Italy	2,205	2,474	2,500	2,600
Poland	1,878	3,169	4,200	4,250
Other Europe	7,945	8,437	9,641	10,059
Total Europe	13,816	16,049	18,191	18,809
United States	4,215	4,538	5,400	5,800
Other North America	957	1,124	1,242	1,322
Total, North America	5,172	5,662	6,642	7,122
China	33,265	42,613	45,760	48,000
Turkey	2,500	2,570	3,000	3,230
Other Asia	8,286	10,367	12,113	12,571
Total, Asia	44,051	55,550	60,873	63,801
Total South America	4,201	4,253	4,344	4,464
South Africa	781	940	1,030	1,080
Total Oceania	748	719	964	1,037
Total Southern Hemisphere	5,730	5,912	6,338	6,581
Russian Federation	910	1,613	1,700	1,800
Other Producing Countries	907	1,436	1,908	1,996
<b>WORLD TOTAL</b>	<b>70,586</b>	<b>86,222</b>	<b>95,652</b>	<b>100,109</b>

The forecasts were derived by analyzing trends in area, yield and production of apples for 120 individual apple-producing countries that are covered in the UN,FAO crop production database. Only the major producing countries are shown separately in the table on the previous page. The individual country results were then combined to make forecasts for major economic and geographic regions. The forecasts assume average yields in future years. Actual production in 2020 and 2025 could deviate from the forecasts if yields are above or below the average.

The table above shows that world apple production increased by over 22 percent between 2010 and 2015. World production is forecast to increase by a further 11 percent between 2015 and 2020, and by a further 4.7 percent between 2020 and 2025. Thus, the rate of growth is expected to fall sharply in the coming decade. The main driver of expansion of apple production between 2010 and 2015 was the increased level of optimism in the industry in response to rising prices, after a dismal few years early in the twenty-first century. China was the biggest absolute contributor to increased production between 2010 and 2015, but even there the future rate of growth is expected to slow.

All the major apple regions or countries separately identified in the table, except for Oceania, enjoyed increased apple production between 2010 and 2015. However, all regions and countries (except France) are forecast to enjoy some increase in production between 2015 and 2025. Each major region is expected to enjoy double digit percentage increases. Poland, the United States, Turkey, Other Asia, Oceania, and Other Producing Countries are forecast to have increases of over 25 percent. Among these countries, the forecasts for Poland and Turkey could be most vulnerable to downward adjustments because both are now operating in uncertain geopolitical situations. Adverse relations with Russia, and continuing civil and military strife in the Middle East could reduce incentives for expansion.

For other major producing countries and regions, two key influences will affect their planting decisions. One will be continuing profitable returns in the market for established, mainstream varieties, which continue to dominate their output. A second will be continuation of substantial price premiums for newer varieties that can eventually replace existing mainstream varieties. Prospects for different apple varieties are discussed in the next section.

## Sluggishness in Variety Changes

As noted in previous issues of the World Apple Review, the mix of varieties in any firm, producing district, or country is the outcome of two conflicting forces, that of inertia and that of innovation. The forces of inertia tend to be high in permanent tree fruits like apples where there are large sunk costs, where the asset has a long physical and economic life, and where outcomes tend to be evaluated over several years. Producers will tend to stick with existing varieties as long as variable costs in any year are covered, hoping that in one or more future years some or all of their fixed costs will be recovered. In addition, taking on a new variety involves unknown risks that will only be evident after the new variety has begun to mature. Other major obstacles to switching are the costs involved in establishing a new planting, and the need to raise fresh capital for the business. On the other hand, in every region there are examples of progressive growers that have switched to new or different varieties and have been extremely successful. With the right timing, innovation has been profitable for many operators.

In order to track the outcome of this battle, previous issues of the World Apple Review have identified four broad categories of apple varieties that now co-exist in the world apple market. The categories are:

- 1. Traditional Majors.** These include Red Delicious, Golden Delicious and Granny Smith varieties that have been widely grown for decades.
- 2. New Majors.** These include varieties that have been introduced since the 1980s, and are now widely planted around the world. They include Gala/Royal Gala, Fuji, Braeburn, Jonagold/Jonagored, Elstar and Cripps Pink/Pink Lady.
- 3. Regional or Local Varieties.** The forces of Inertia are most evident in these varieties that are grown in only a few localities and regions. For numerous reasons, they have remained popular in a limited number of districts, but have not gained wide acceptance elsewhere. However, they remain firmly established with loyal producers and consumers. These varieties are too numerous to list separately.
- 4. New Varieties.** What qualifies as a new variety cannot be defined exactly. The most clear-cut case is where the variety has just been released by an original breeding program. Some varieties may be subject to many years of trials before they gain wide acceptance. Sometimes, a dormant variety in one region eventually becomes widely adopted in another region.

These categories are still of practical use in observing broad changes in the apple variety mix. However, the situation has become increasingly fluid as older varieties fall out of favor, as plantings of newer varieties have increased, and as investment in higher-density plantings that speed up the availability of commercial crops has become widespread.

The first three categories of varieties discussed above are heavily influenced by inertia. The fourth category is heavily committed to innovation. Many producers, packers and marketers hedge their bets by having varieties in both camps. While the forces of inertia remain dominant, the level of innovation varies widely between different producing districts and countries.

Breeders in many parts of the world are competing vigorously to introduce new, winning varieties. Where apple breeding was once an activity heavily subsidized by government funds, many programs now hope that the royalties generated from their innovations will help sustain their breeding programs indefinitely into the future. Programs are increasingly expected to be self-sustaining. They, and the growers, packers and marketers that they serve, have different levels of ambition for each new variety. Some still dream of introducing a new variety that will eventually become a mainstream variety. Others hope that their new variety will become popular in selected regions, or with selected retailers. Still others believe that their new variety can fill a taste or seasonal niche on produce shelves.

Most new varieties are now commercialized in a managed program where the volume is carefully controlled to ensure “induced scarcity” and to generate substantial price premiums compared to mainstream varieties. However, there remain many lessons to be learned about how this can be achieved for any single variety, and about what cumulative effects may occur in the marketplace as the number and volume of new varieties is ramped up.

To hedge their bets, many integrated producer-packer-marketer companies are forming international alliances to coordinate the commercialization of newer apple varieties. Many are involved in more than one network. Since the partners are competitors in other parts of their businesses, such networks require a considerable level of trust if they are to be sustained over a long time.

In most cases, these networks involve tightly-controlled clubs that may also have breeders or nurseries as partners. The initial origin of the new variety is of less importance than its perceived potential in either taking existing market share or in creating a new market niche. For example, there has been strong interest in introducing red-fleshed apples, or apples with untypical orange skin, or superior variants of existing mainstream varieties, or varieties with distinctive branding or packaging, or combinations of these different innovations.

Twenty years ago, competition in the apple industry involved a system where all growers, packers and marketers handled the same open source apple varieties. Whether apple firms survived, flourished or went out of business depended on how well they managed the same varieties. The battle focused on total yields, and quality of yields in the orchard, on efficiency of handling, storing and packing in the packing house, on keeping down unit costs, and on good relations between marketers and their retail customers.

Now, growers, packers and marketers are moving away from open source varieties at different speeds, and devoting more of their resources to club or managed varieties. Among the incentives for change have been notable declines in the price of many established varieties, at the same time that newer varieties, in small volumes, have been earning price premiums. On the other hand, as noted previously, investing in new varieties involves high costs and a different set of risks. For example, for the grower, packer or marketer, there is the risk that they will not gain access to the desired club. And, there is the risk that the chosen new variety may not prove as successful in full production as it was in early trials.

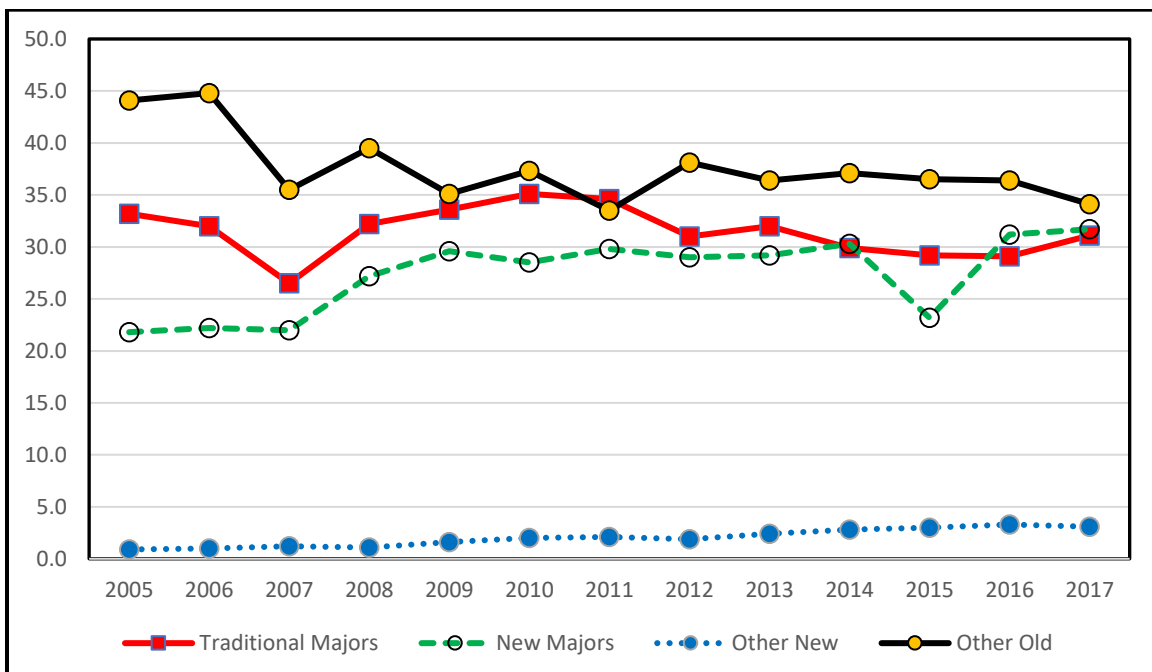
The risks involved in new varieties are heightened by the lack of good information on such varieties at the early stage of development when firms must make the decision about whether or not to invest. The sponsors of the club varieties consider information about the strengths and weaknesses of their new varieties to be proprietary. In addition, public agencies rarely collect data on these varieties while production is still small. Even where data has been collected, it often produces conflicting results. For example, many early studies of Honeycrisp pointed out the numerous difficulties in growing that variety successfully, but underestimated its appeal to consumers. Given these data problems, it is difficult to compare key metrics, such as the productivity, quality or price of each new variety, or how it would fit into a business in different soils or climates.

## Trends in Major Varieties

Comprehensive data on how the world mix of apple varieties is changing is not readily available. In some cases, data is available from government agencies that are presumed to be independent. In other cases, the data is generated by industry organizations that have no power to demand a full accounting from contributing members. Some countries report the volume of major varieties produced, some only fresh production or exports. Many data sources cover only the most important varieties, so data on newer varieties is sparse. Countries also differ on the varieties covered. These inadequacies need to be kept in mind in the following discussion.

The longest detailed series on apple varieties has been produced for the European Union. However, the number of countries covered changed drastically after the EU added ten new, member countries in 2004. In particular, the addition of Poland caused a sharp break in the varieties covered. For that reason, the chart below shows EU trends in apple production only since 2005, the first year after enlargement.

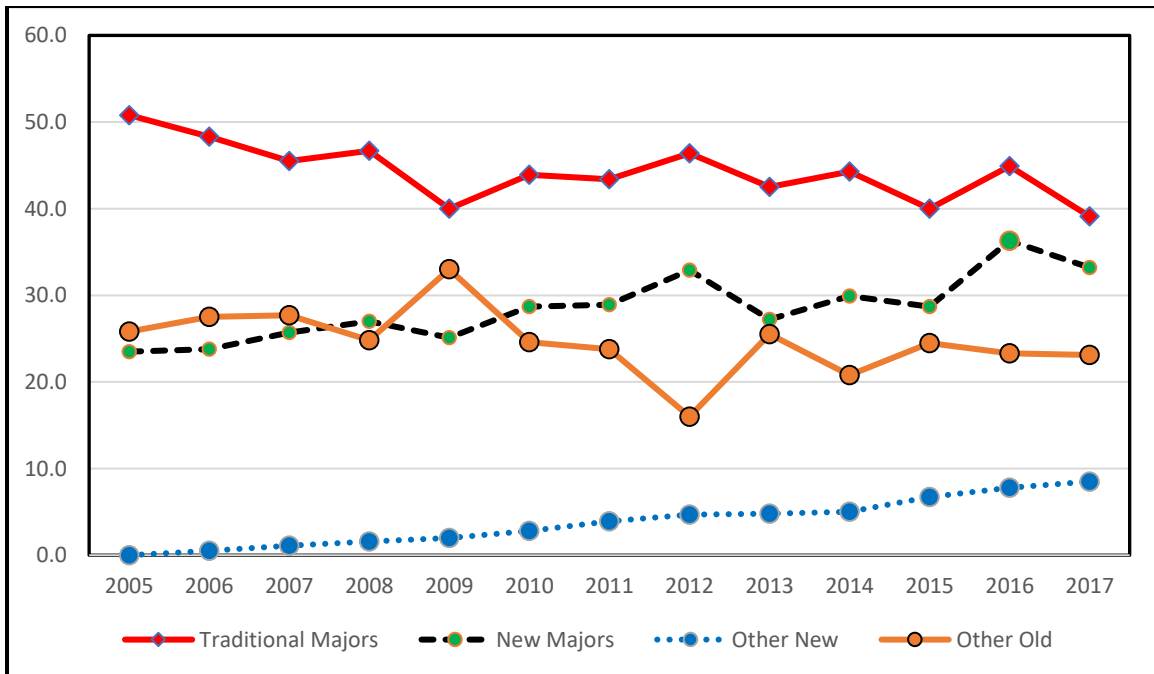
**European Union: Apple Production, by Major Categories of Varieties, 2005-2017**  
(percent)



The apple varieties in the EU are grouped into the four major categories discussed above, traditional majors, new majors, other new varieties and other old varieties. While there were significant changes between 2005 and 2009 in the share of traditional majors, new majors and other old varieties, the shares have remained surprisingly stable since 2009. Only the share for other new varieties, such as Pinova, Jonaprince and Kanzi, rose fairly steadily over the thirteen seasons. It rose from less than one percent in 2005 to slightly above 3 percent in 2017. However, even in 2017, it was still a tiny share of EU apple production. The Great Recession of 2007-2009, the euro crisis that began in 2010, and the Russian embargo in 2014, all may have impeded innovation in the European apple industry.

The chart below shows a comparable breakdown of apple varieties produced in the United States. Trends in the U.S. were more pronounced than in the EU. The share of traditional majors fell by over 10 percent between 2005 and 2017, as Red and Golden Delicious fell out of favor, while the share of other old varieties peaked in 2009 before falling by 10 percent by 2017.

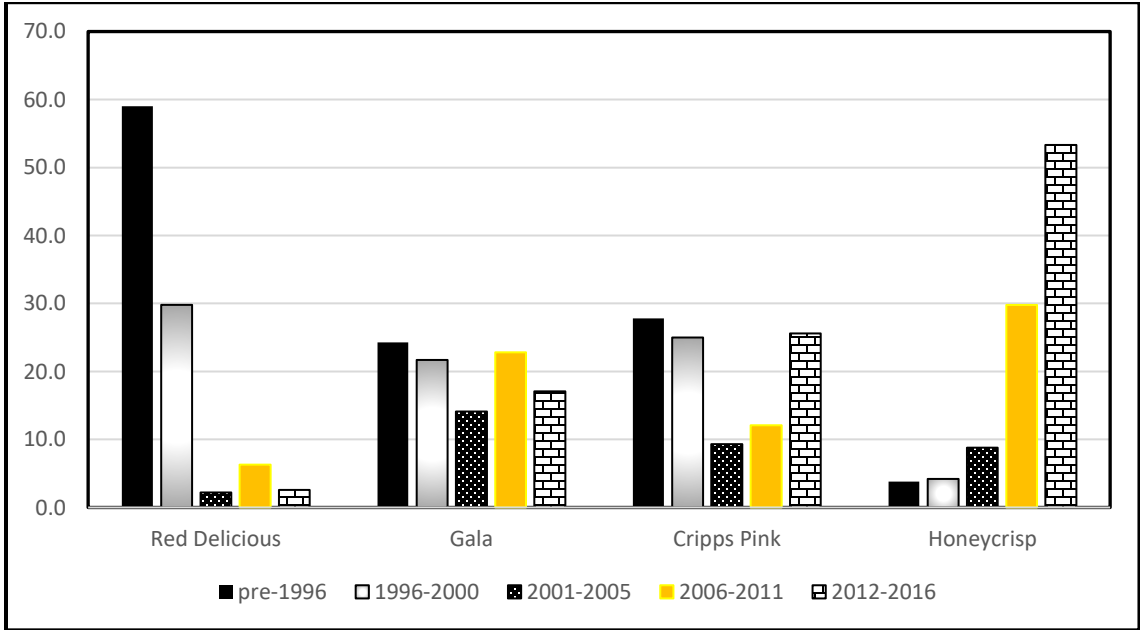
**United States: Apple Production, by Major Categories of Varieties, 2005-2017**  
(percent)



The United States apple industry recorded a much more definitive increase in the share of newer varieties than did the EU. The share of new majors, such as Gala and Fuji, rose by 10 percentage points, while the share of newer varieties was negligible in 2005, but rose steadily to 8.5 percent of the total in 2017, largely due to the contribution of the Honeycrisp variety. However, the share of the traditional majors, such as Red Delicious and Golden Delicious, was much higher in the United States in 2017 than it was in the EU, suggesting that there is still much opportunity for further declines in the share of traditional majors in the U.S.

A tree fruit acreage report was completed in 2017 for the apple industry in Washington State, the dominant U.S. supplier of fresh apples. The chart below shows the percentage of 2017 acreage that had been planted in previous five-year periods for four leading varieties, Red Delicious, Gala, Cripps Pink and Honeycrisp. Over 90 percent of Red Delicious plantings had occurred prior to the year 2000. In contrast, over 80 percent of Honeycrisp plantings had occurred after 2006. Plantings of Gala had been fairly evenly spread over the previous periods while the pace of plantings of Cripps Pink had picked up after 2012. Clearly, many different factors affected these planting decisions.

**Washington State: Period of Planting of Selected Varieties,  
pre-1996 to 2016  
(percent)**



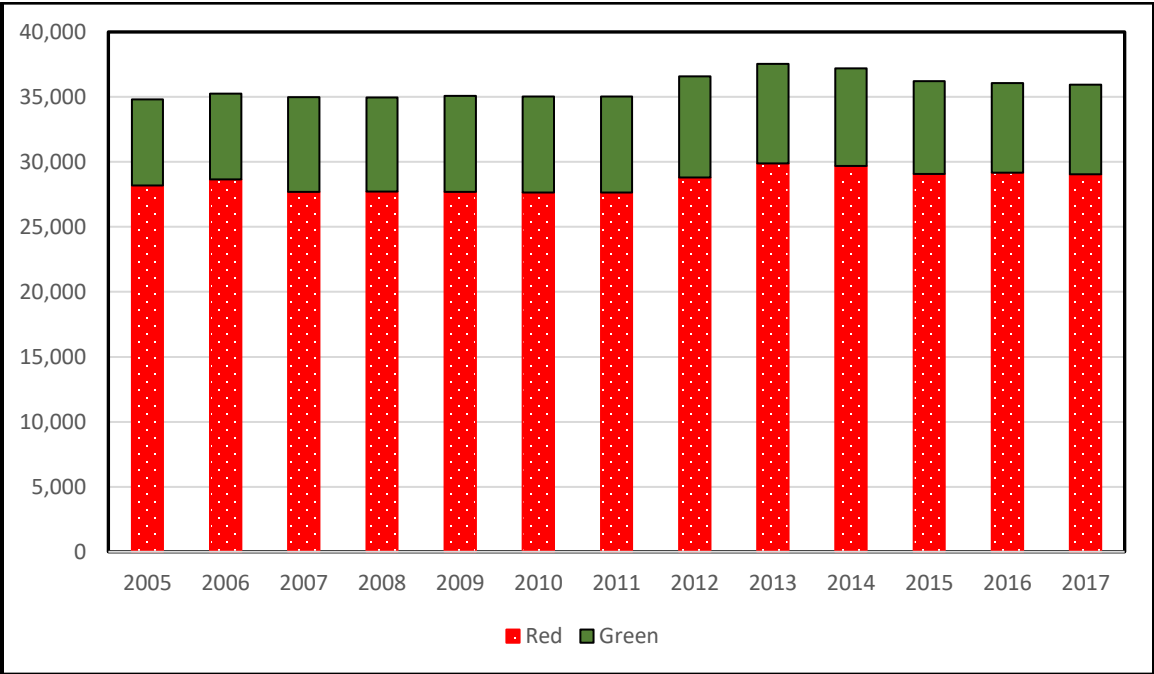
For almost three decades, much of the innovation in apple varieties has emanated from New Zealand as that country has sought to offset its geographic disadvantage in accessing world markets. The table below shows the share of major plantings of apple varieties for selected years between 2005 and 2017. In 2005, just two varieties, Royal Gala/Gala and Braeburn, accounted for over 60 percent of New Zealand apple plantings. The share of both fell by 2010. However, the share for Royal Gala/Gala remained stable between 2010 and 2017, whereas the share of Braeburn continued to fall steadily. By 2017, the Braeburn share was half what it was in 2005. Between 2005 and 2010, the share of plantings of Granny Smith, Cox's Orange, Pacific Beauty and Pacific Rose all fell, and continued to fall thereafter. The share of two newer varieties, Cripps Pink and Envy, rose between 2005 and 2010, and continued to rise in the next decade. The shares for both Fuji and Jazz rose above 10 percent by 2010, but gradually slipped thereafter. Pacific Queen had a different trajectory. Its share of plantings fell between 2005 and 2010, but then tripled between 2010 and 2017. The share of all other varieties (the category that included newer varieties not separately identified), fluctuated widely over the period, but topped 10 percent for the first time in 2017. This table suggests that the New Zealand apple industry is still actively searching for newer apple varieties.

### **New Zealand: Apple Plantings, by Variety and Calendar Year, 2005-2017 (percent)**

Variety	2005	2010	2011	2012	2013	2014	2015	2016	2017
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Granny Smith	3.5	3.1	3.0	3.1	2.9	2.8	2.5	2.6	2.5
Cox	3.7	2.9	2.8	2.4	2.1	1.8	1.6	1.4	1.2
Royal Gala/Gala	31.5	28.0	28.6	28.5	28.5	27.7	27.9	28.9	28.4
Braeburn	29.4	21.7	20.5	19.1	18.0	16.4	15.6	14.8	13.5
Fuji	9.5	10.8	11.5	11.2	10.8	9.9	9.7	9.7	9.1
Cripps Pink/ Lady	3.2	4.6	5.1	5.4	5.5	5.3	5.3	5.9	6.1
Jazz	2.7	11.3	11.6	11.3	10.8	10.3	9.9	9.4	9.0
Pacific Beauty	3.3	1.6	1.5	1.4	1.3	1.1	1.0	0.9	0.8
Pacific Queen	3.3	3.0	3.4	4.2	5.4	8.4	8.5	9.4	9.6
Pacific Rose	7.6	4.8	4.7	4.8	4.7	4.5	4.2	4.1	3.7
Envy	0.0	1.0	2.1	3.3	3.4	3.8	4.0	4.7	5.9
Other	2.3	7.2	5.2	5.3	6.6	9.0	9.8	8.1	10.1
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Data on apple plantings in Chile covers just two categories, red varieties and green varieties, with red varieties dominating. The total area planted peaked in 2013 and has fallen modestly since. Data on exports of fresh apples from Chile indicate that the Red Delicious variety has been gradually replaced by Gala and Cripps Pink apples. Granny Smith has remained the major green variety. Of the two other new majors, exports of Fuji have continued to increase, while those of Braeburn have continued to decrease. Chilean firms have also frequently been involved as the Southern Hemisphere partners in international consortia to commercialize new varieties. While production of those newer varieties has been expanding, they still represent a very small share of total Chilean Production.

**Chile: Planted Area of Apples,  
Red and Green Varieties, 2005-2017  
(hectares)**



The third major Southern Hemisphere exporter of fresh apples is South Africa. However, South Africa also has a large apple processing sector and a large domestic fresh apple market that absorbs about half of total production annually. Thus, in choosing apple varieties to plant, South Africa cannot focus as single-mindedly on export markets as can New Zealand and Chile.

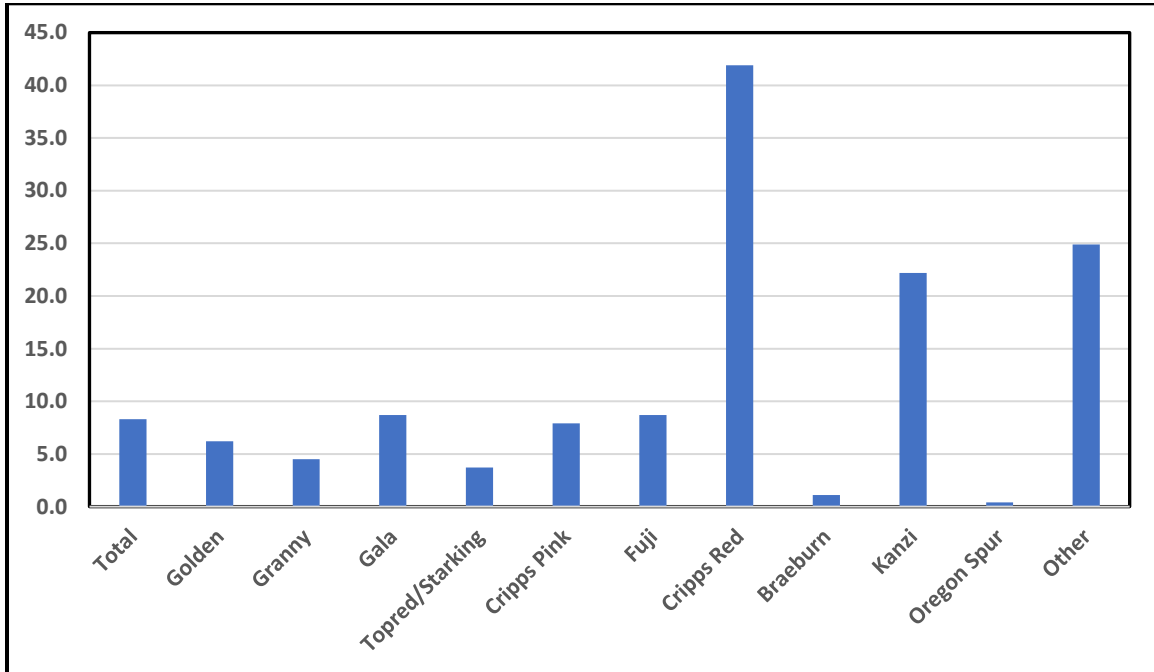
The table below shows the share of plantings devoted to major varieties in South Africa for the years between 2006 and 2016. The share planted to Golden Delicious has been very stable over time, while the shares of Granny Smith, Braeburn, Topred/Starking and Oregon Spur have all slipped. In contrast, the share of plantings for two new majors, Royal Gala/Gala and Fuji, has risen steadily in the last decade. The share of two newer varieties, Cripps Pink/Pink Lady and Cripps Red/Joya rose by two percentage points between 2006 and 2010, and have risen further since. The one truly new variety identified, Kanzi, has been growing slowly since 2010 and exceeded one percent for the first time in 2016. A number of prominent South African firms have become involved in international consortia for new club varieties. Clearly, the South African apple industry has been exploring opportunities for new apple varieties, but the pace of change has not been as rapid as in some competing countries.

### **South Africa: Apple Plantings, by Variety and Calendar Year, 2006-2016 (percent)**

Variety	2006	2010	2011	2012	2013	2014	2015	2016
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Golden Delicious	21.8	24.9	24.5	24.5	24.8	24.6	24.2	24.0
Granny Smith	25.5	22.2	21.4	20.2	18.7	18.4	17.8	17.2
Royal Gala/Gala	11.7	14.7	15.0	15.5	15.9	16.1	16.3	16.6
Braeburn	3.3	3.5	3.4	3.3	3.3	3.1	3.2	2.9
Fuji	4.0	6.3	7.1	7.6	8.2	8.3	8.5	8.7
Cripps Pink/Lady	6.7	8.9	9.3	9.4	9.8	9.8	9.9	9.8
Cripps Red/Joya	0.0	2.0	1.9	1.9	2.3	2.7	3.2	3.9
Topred/ Starking	14.9	14.3	13.9	13.8	13.0	12.9	12.4	12.2
Oregon Spur	0.0	1.2	1.1	1.1	1.1	1.0	1.1	1.0
Kanzi	0.0	0.1	0.3	0.5	0.7	0.9	1.0	1.1
Other	12.1	1.9	2.1	2.2	2.2	2.2	2.2	2.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The 2016 issue of “Key Deciduous Fruit Statistics” for South Africa also provides data on the age distribution of current apple plantings by variety. The chart below shows the percentage of each variety that was aged 0-3 years in 2016, compared to the percentage for the entire South African apple industry.

## South Africa: Share of Apple Plantings aged 0-3 years, 2016 (percent)



The overall average of young plantings was 8.3 percent. All the established varieties had a similar, or lower, percentage. Braeburn and Oregon Spur had the lowest level of renewals. In contrast, over 40 percent of plantings of Cripps Red/Joya were 0-3 years old. Kanzi was the next highest individual variety with over 22 percent. All other varieties not separately identified reached almost 25 percent. However, inertia remained strong in South Africa. Almost 70 percent of the young plantings in 2016 were established, not new, varieties.

The data available for selective countries shows both the persistence of established apple varieties in the marketing mix, and the varied attempts to introduce newer varieties. For the larger producing regions, like the United States and the European Union, it has been a slow and difficult struggle to shake off inertia and introduce newer apple varieties. Most of the changes have been due to the initiative of leading, progressive firms. Even in a smaller country like New Zealand, where innovation has been a key strategy for many years, over half of all apple plantings were still in established varieties in 2017. The next section looks at the possible share of different varieties in the world apple picture in the coming decade.

## **Future World Apple Variety Trends**

While forecasting the total volume of apples that will be produced in any country or region is hazardous, forecasting the future trajectory for individual varieties is even more hazardous. However, since those trends will be so critical to the future prosperity of the global apple industry, it still appears important to make the attempt. The offsetting forces of inertia and innovation apply just as strongly to plantings of different varieties. When overall revenues are low, costs are high and profit margins slim, producers have a natural tendency to hunker down and ride out the storm with existing plantings. When the opposite occurs, producers and investors are more likely to have the resources and incentive to take greater risks with newer varieties. The demonstration effect is also important. When a pioneer is successful with a newer variety, his or her neighbors are more likely to plant that newer variety.

Among the factors affecting the choice of variety are the expected profitability of each variety, the level of challenges involved in growing and harvesting the variety, the availability of suitable land, and adequate capital, and the availability of the needed rootstocks and trees. The latter phase is often the biggest stumbling block to rapid adoption. Nurseries have to predict in advance which trees will be in demand, and plan accordingly. Matching the supply and demand for different trees remains an inexact science.

Future plantings are also likely to be affected as the market for trees has changed. Formerly, trees were openly offered and any producer could buy any tree from any nursery with supplies. Increasingly, most new varieties are being offered within club or managed systems. Club sponsors can be quite selective regarding which producers in which producing regions can be eligible to gain club membership and acquire trees. Most clubs require membership fees (an added cost to the producer), and impose limitations on the volumes of trees that can be made available to any producer at any time. Some clubs also limit availability of trees to producers in their state or province of origin, or give precedence to producers in selected countries.

Despite these difficulties, for the last two decades, Belrose, Inc. has been making forecasts of future trends in major apple varieties for the world, excluding China. China is excluded because up to 70 percent of its massive production is Fuji apples,

and its inclusion would distort the market share for all other varieties. The table on the next page shows the actual share of major apple varieties in the rest of the world in 2015, and the forecast share in 2020 and 2025. The 37 countries included

**Countries included in Apple Variety Forecast:**

**EU-15:** Austria, Belgium-Luxembourg, Denmark, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom.

**EU-28, New Member States:** Bulgaria, Croatia, Czechia, Hungary, Romania, Slovakia, Slovenia.

**Russia and Other Europe:** Russia, Serbia, Switzerland, Ukraine.

**North America:** Canada, Mexico, United States.

**Asia:** South Korea, Japan, Turkey. (China for reference).

**Southern Hemisphere:** Argentina, Australia, Brazil, Chile, New Zealand, South Africa.

in the analysis are shown in the textbox above. Two major producing countries not included for lack of data are India and Iran. The countries included affect the aggregate percentages shown. For example, many Eastern European countries have a high percentage of traditional varieties.

The varieties shown are listed in order of their actual ranking in 2015. The first notable feature of the table is that the changes in shares between 2015 and 2025 for most varieties are less than one percent. Gala/Royal Gala is an exception with a share gain of 1.32 percent. The top ten varieties accounted for about 72 percent of the total in 2015, and about the same share in 2025. This indicates that these few varieties will continue to have a major influence on apple markets, prices and profitability. Among the top ten varieties in 2015, five are forecast to gain market share, while five are forecast to lose market share. Among the second ten in ranking in 2015, eight are forecast to lose market share, while among both the third ten and fourth ten in ranking in 2015, seven are forecast to lose market share. Clearly, these lower ranked varieties are more vulnerable to being supplanted.

Among newer varieties, Honeycrisp is forecast to improve its market share between 2015 and 2025, and to move up in the rankings, from number 14 in 2015 to number 12 in 2025. Other newer varieties for which data were available that were forecast to gain market share were Jazz, Pinova, Red Jonaprince, Ambrosia, Hokuto and Kanzi. However, other newer varieties for which specific data were not available are included in the “all other” category, which is forecast to grow modestly between 2015 and 2025. The slow growth of the share for newer varieties is not surprising given the fact that most are involved in some form of managed program where “induced scarcity” is one of the sponsors’ goals.

**World, excluding China: Share of Apple Production, by Variety,  
Actual 2015 and Forecast 2020 and 2025  
(Percent of total)**

Rank 2015	Variety	2015 Actual	2020 Forecast	2025 Forecast
1	Golden Delicious	16.75	16.46	15.96
2	Gala/Royal Gala	14.07	15.17	15.39
3	Delicious	12.25	12.33	11.77
4	Fuji	7.74	8.01	8.17
5	Idared	5.96	5.89	5.69
6	Granny Smith	5.27	5.07	5.01
7	Jonagold	3.12	3.25	3.19
8	Cripps Pink	2.58	2.82	2.95
9	Jonagored	2.03	2.09	2.19
10	Braeburn	2.00	1.89	1.83
11	Elstar	1.39	1.39	1.35
12	McIntosh	1.37	1.05	0.97
13	Jonathan	1.33	1.26	1.16
14	Honeycrisp	0.96	1.17	1.34
15	Reinette	0.79	0.79	0.79
16	Rome Beauty	0.76	0.73	0.68
17	Cortland	0.72	0.51	0.46
18	Gloster	0.67	0.67	0.65
19	Empire	0.48	0.46	0.46
20	Tsugaru	0.44	0.39	0.39
21	Ohrin	0.43	0.33	0.30
22	Lobo	0.43	0.37	0.33
23	Spartan	0.43	0.36	0.34
24	Melrose	0.41	0.37	0.38
25	Jazz	0.41	0.44	0.50
26	Pinova	0.39	0.45	0.56
27	Newton	0.37	0.34	0.35
28	Red Jonaprince	0.36	0.60	0.69
29	Boskop	0.36	0.33	0.30
30	Stayman	0.29	0.25	0.25
31	York	0.28	0.24	0.23
32	Cox's Orange	0.18	0.18	0.15
33	Pacific Rose	0.17	0.17	0.15
34	Northern Spy	0.16	0.14	0.12
35	Ambrosia	0.16	0.21	0.24
36	Sundowner	0.15	0.13	0.13
37	Cameo	0.13	0.11	0.11
38	Hokuto	0.08	0.08	0.09
39	Senshu	0.07	0.07	0.06
40	Kanzi	0.05	0.06	0.08
-	All Other	13.99	13.34	14.22
-	TOTAL	100.00	100.00	100.00

Two factors could speed up changes in the apple variety mix. First, if the price gap between newer varieties and traditional varieties can be maintained as the volume of newer varieties increases, there will be much greater incentive for sponsors to make membership more widely available, and for producers to switch to the newer varieties. Second, if more capital were made available, either from public funding, or from private sources, for investment in new apple varieties, many districts and countries that now face capital constraints could expand plantings of newer varieties. The latter constraint could prove the most difficult to overcome.

### **Apple Varieties in China**

As previously noted, the mix of apple varieties in China continues to be dominated by the Fuji variety. Originally bred in Japan, Fuji has been the apple of choice for both producers and consumers in Northeast Asia. The Fuji was particularly suitable for the growing, harvesting, storage, marketing, retailing and exporting systems that prevailed in China during the period of rapid expansion of the Chinese apple industry. Fuji provided reasonable returns at relatively low risk.

There have been several efforts to wean Chinese producers off the Fuji variety. For example, processors of apple juice concentrate encouraged planting of higher-acid Granny Smith apples that would complement the sweeter Fuji apples. Chinese breeders have also been aggressively seeking to develop indigenous, new apple varieties, with little success so far. In theory, China could introduce varieties bred in other countries. However, because of concerns about the protection of plant variety rights, foreign breeders have been reluctant to license their plant material in China. One recent exception has been the Pink Lady consortium that has lengthy experience in defending its intellectual property rights around the world.

Chinese producers have also produced large quantities of apples similar to western varieties like Red Delicious, Golden Delicious, Gala and Jonagold, although different Chinese names can cause confusion. However, it has been difficult to gain acceptance for these varieties in export markets. Normally, as incomes in a country rise, and tastes evolve, consumers begin to demand more innovation, and greater diversity in their product choices. One of the best ways to educate consumers about new product choices is from more diverse imports. However, imported apples remain a tiny fraction of total Chinese fresh apple supplies, so few Chinese consumers have been exposed to such choices. That is unlikely to change unless Chinese authorities adopt a more liberal attitude towards apple imports.

## **The Hunt for New, Winning Apple Varieties**

The hunt for potential new, winning apple varieties has picked up speed in recent years for many reasons. One major driver has been the willingness among affluent consumers to pay large premiums for innovative varieties. Many major retailers are eager to attract such high-spending consumers. Stocking innovative apple varieties both attracts such consumers and increases the gross contribution that apple sales make to the retailer's profitability. This is of increasing importance in an era when intense price competition has squeezed the margins of many retailers.

Large, integrated, producer-packer-marketers have competed to find innovative apple varieties that retailers can use to differentiate themselves from their competitors, and that can strengthen their relationship with those retailers. This has required the integrated marketing firms to develop assured supplies of the newer varieties, and to work closely with retailers in developing marketing strategies, and unique packaging and promotion. Sales of fresh apples are no longer "arms length" transactions between marketers and retail buyers. Instead, marketers are involved in every aspect of distribution, from assuring adequate production to helping the product move off the retail shelf.

In response, both formal and informal breeding programs compete aggressively to find the "next big thing" in apples. The base funding for formal breeding programs often derives from established institutions such as government research centers and universities. In addition, most such institutions have been encouraged to generate more of their funding from the sale of licenses to users of their discoveries. This has given them a strong incentive to make more varieties available for licensing and to speed up the breeding process. That, in turn, has been helped by advances in understanding and analysis of the genetics of apple cultivars.

In addition, in the apple industry, there has been a history of discovery of successful new apple varieties as "chance seedlings" in established orchards, including such successful cultivars as Granny Smith in Australia, Delicious in the United States and Ambrosia in Canada. Whether the new variety results from a large number of controlled crosses, or as a chance seedling, it then needs a series of systematic tests, legal procedures, and steps towards commercialization if it is to be established in the marketplace as a distinctive new cultivar.

The hunt for new apple varieties has both costs and risks for all involved. Nurseries must build up an inventory of plant materials that may or may not be demanded by producers. Producers must make a large investment in planting the selected variety without the assurance that it can be successfully produced and can generate high enough returns to validate the investment. Packers must learn how to sort, pack and store the new variety so it will conform to the expectations of retailers and consumers. Marketers must risk their reputation in pitching sales of the new variety to retailers in full knowledge that retailers will demand financial compensation if the variety fails to live up to expectations for any reason. Sponsors of the club for each new variety also have their reputation and substantial investment on the line in launching and managing all aspects of the new variety.

However, perhaps the biggest risk for new varieties in general is that an increase in the number and volume of such varieties will lead to erosion of potential price premiums. Traditional varieties will continue to dominate the apple market for years to come. There is a real danger that major marketers will neglect support of those traditional varieties in the vain hope that newer varieties will be more profitable. This could lead to further erosion of per capita consumption of fresh apples and lessen retailers' interest in the entire apple category. The apple industry appears confident that it can take this gamble and be successful. However, that decision is ultimately in the hands of retailers and consumers that have many other choices of fresh fruit available to them.

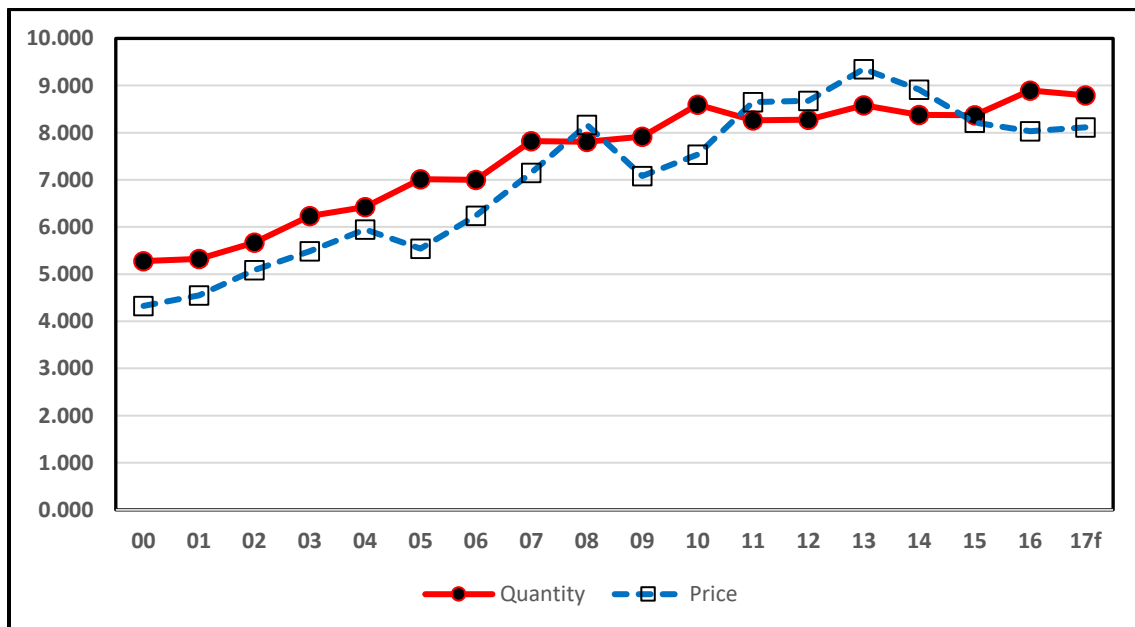
### 3. World Trade in Fresh Apples

#### World Trade in Fresh Apples Plateaus

World trade in fresh apples was on a steady upward path for the first decade of the twenty-first century. Export data through 2013 were derived from the UN,FAO FAOSTAT series, those for 2014 through 2016 from the UN Comtrade database, and those for 2017 from Belrose, Inc. estimates. Between 2000 and 2010, world exports of fresh apples grew in volume by about 63 percent. In addition, despite some setbacks, average unit prices in the same period rose by over 74 percent, far ahead of inflation.

However, since 2010, the volume of world exports of fresh apples has been essentially flat, between 8 and 9 million metric tons, while average prices have fluctuated more widely, but advanced little. The slowdown in export volume has coincided with a continuation in the expansion of world apple production, and has been accompanied by downward pressure on export prices.

**World: Exports of Fresh Apples, Calendar Years, 2000-2017**  
(Volume, million metric tons, and Average Price, US\$100 per metric ton)



Numerous factors have contributed to this slowdown in world fresh apple exports. The onset of the Great Recession in 2008, the subsequent disruption in world trade financing, and numerous economic setbacks thereafter in key markets, all contributed to the general slowdown in world trade, and the specific slowdown in the fresh apple trade. They also led many countries to introduce temporary protectionist measures in support of domestic agriculture. Markets in many countries have been disrupted by civil strife. A series of rebellions in the Middle East and North Africa, loosely referred to as the “Arab Spring”, were followed by the outbreak of civil war in Syria, the rise (and subsequent fall) of ISIS in Iraq and Syria, more confrontations between Iran and Saudi Arabia (and their proxies) in the Middle East, and the emergence of a more aggressive regime in Turkey.

However, perhaps the biggest single factor slowing world trade in fresh apples has been the Russian embargo on imports from the European Union, Australia, Canada, Norway and the United States. It was set in place in August 2014 in response to sanctions imposed on Russia because of its annexation of the Crimean province of the Ukraine, and shows no signs of being removed any time soon. Prior to 2014, Russia had been the world’s leading importer of fresh apples, and of many other produce items. However, the sanctions, and falling oil prices, sent the Russian economy into a deep recession, drove down the value of the Russian rouble, and sharply reduced Russia’s purchasing power in international markets. The implications of the Russian embargo is analyzed more fully later in this chapter.

### **Historically Important Fresh Apple Exporters**

A small number of countries are responsible for a large proportion of world exports of fresh apples. For that reason, previous editions of the World Apple Review have focused on trends among the top ten exporters and importers of fresh apples. The table below shows the countries that were among the top ten exporters of fresh apples for the calendar years between 2010 and 2017. Excluded are countries like Belgium and the Netherlands that are primarily re-exporters of apples produced elsewhere. While the makeup of the top ten exporters has changed little in the period, the volume and rankings for individual countries have changed substantially. For example, China was the leading exporting country between 2009 and 2012. Poland took over the lead role in 2013 and 2014. Italy jumped to the top position in 2015, and China regained the lead by a wide margin in 2016 and 2017.

## Top Ten Fresh Apple Exporters, Calendar Years, 2010-2017 (metric tons)

Country	2010	2011	2012	2013	2014	2015	2016	2017p
China	1,122,953	1,034,635	975,878	994,664	865,048	833,356	1,322,042	1,334,636
Poland	728,500	532,058	941,678	1,216,294	1,026,593	845,105	1,093,132	990,879
Italy	856,596	976,131	933,361	787,795	974,847	1,143,838	1,050,232	1,032,409
United States	790,376	826,438	870,185	890,463	888,632	984,379	768,757	907,260
Chile	842,668	801,167	761,984	833,251	820,184	629,046	764,813	716,203
France	695,760	726,609	625,943	541,921	695,865	634,084	574,832	535,076
South Africa	307,783	333,435	580,992	482,435	381,865	381,051	510,879	500,000
New Zealand	284,187	296,931	309,464	350,011	336,785	358,508	380,994	345,307
Turkey	80,569	87,303	68,916	25,682	111,521	142,155	140,329	201,299
Argentina	180,309	234,138	132,117	163,598	144,418	106,438	90,909	80,000
Top Ten	5,890,501	5,848,855	6,100,518	6,387,114	6,245,758	6,062,664	6,696,919	6,643,069
World Total	8,594,174	8,262,926	8,280,054	8,584,796	8,379,146	8,374,474	8,897,347	8,796,000
Top Ten %	68.5	70.8	74.9	74.4	74.5	72.4	75.3	75.5

Just in the eight years shown in the table, the volume of fresh apple exports varied by over 100 percent between the years of lowest and highest exports for Poland, Turkey and Argentina, by over 50 percent for China and South Africa, and by over 30 percent for Italy, France and New Zealand. In 2009 and 2010, only one country, China, had exports of fresh apples exceeding one million metric tons. By 2016, two additional countries, Poland and Italy, had surpassed that level, and one additional country, the United States, appeared capable of reaching the one million metric ton mark in any year. China set a new record for an individual country in both 2016 and 2017 with exports exceeding 1.3 million metric tons. Several other countries, including New Zealand and Turkey, appeared to have further growth potential. Among the top ten exporters, only Chile, France and Argentina did not appear to be on a growth trajectory.

China's fresh apple exports still represent less than 3 percent of China's total apple production. With greater attention to export quality, China could certainly increase that percentage in the future. In the past, Turkey has directed most of its production at a growing domestic market. However, it also has considerable potential to expand fresh exports even more rapidly in the near future.

The table above shows the estimated share of world exports accounted for by the top ten exporters. That share was below 70 percent in 2009 and 2010, but exceeded 75 percent in 2016 and 2017. This suggests that the top ten exporters have become even more important players in the global export market, and that competition between them is likely to become more intense in the years ahead.

### Confusion in Ranking Importers

Until the Russian embargo hit in 2014, trends and rankings among major importers of fresh apples were fairly predictable. However, efforts by numerous exporters to evade the Russian embargo have distorted normal trade flows. Until 2014, just three countries, Belgium and the Netherlands in Europe, and Hong Kong in Asia, imported large volumes of fresh apples that were destined for re-export. For that reason, the table below focuses on the ten fresh apple importers that have consistently been among the leaders prior to the Russian embargo. They have generally imported 200,000 metric tons or more of apples each calendar year.

### Top Ten Fresh Apple Importers, Calendar Years, 2010-2017 (metric tons)

Country	2010	2011	2012	2013	2014	2015	2016	2017p
	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)	(mt)
Russian Fed.	1,204,175	1,157,724	1,278,551	1,352,347	1,049,872	880,311	676,837	705,553
Germany	621,502	672,823	593,485	658,423	637,833	682,804	615,598	747,285
United Kingdom	400,722	459,187	476,525	479,540	446,026	426,356	381,592	527,191
Mexico	221,301	198,481	235,893	274,978	235,502	306,402	212,678	250,000
Spain	253,496	244,081	223,046	239,415	247,167	232,268	251,528	205,515
Canada	191,717	198,618	202,608	233,589	222,140	212,345	238,785	223,500
UAE	155,753	149,763	156,720	172,726	205,192	222,666	209,135	200,000
Saudi Arabia	176,572	181,280	187,139	189,295	179,386	204,292	200,000	200,000
India	93,264	179,015	186,368	194,335	204,570	193,692	246,808	350,000
United States	191,579	147,789	183,453	198,746	207,994	153,311	193,449	165,174
Top Ten	3,310,081	3,588,761	3,723,788	3,993,394	3,635,682	3,514,447	3,226,410	3,574,218
World Total	8,302,999	8,095,873	8,386,623	8,613,231	8,337,612	8,739,066	8,200,000	8,300,000
Top Ten %	39.9	44.3	44.4	46.4	43.6	40.2	39.3	43.1

In 2010, Russia was by far the largest importer of fresh apples, importing almost twice the volume imported by second place Germany. However, Russian imports began a steep decline in 2014, and (if reported official imports alone are counted) Russia may have lost its leadership position to Germany in 2017. However, it is impossible to estimate how much “unofficial” imports of fresh apples entered Russia after 2014.

Germany and the United Kingdom have remained firmly in second and third position as importers of fresh apples since Russia’s rise to prominence. Both have relatively high and stable per capita incomes. Their domestic production has little room to grow and has consistently fallen short of total fresh apple demand. However, there are no obvious explanations for the sharp upward swing in imports in 2017. Mexico, Spain and Canada are three other countries that need large volumes of imports to meet domestic demand. Mexico’s population and per capita incomes have been rising rapidly, while Spain and Canada are mature, developed countries. Despite suffering a severe recession between 2008 and 2010, Spain’s imports of fresh apples were not affected.

The United Arab Emirates (UAE) and Saudi Arabia both have oil-based economies and no domestic production of apples. Accordingly, all their fresh apple needs must be met by imports. The UAE also serves as a distribution point for trade among its neighbors, but its official exports are typically only about 10 percent of its imports. Since 2010, India has moved up rapidly in both volume of fresh apples imported and in its rank among top importers. With its large population, and rising affluence, India has the potential to move ahead of the United Kingdom as an importer of fresh apples in the next few years. In contrast, the United States is the second largest producer of apples in the world. It is the only country currently listed in the top ten in both imports and exports of fresh apples. Most of its imports have been complementary to domestic supplies in the off-season. However, improved storage regimes have narrowed the off-season window, so U.S. imports are unlikely to break out of the present range below 200,000 metric tons annually.

The table above also shows the estimated percentage of world imports accounted for by the top ten importers. The top ten importers have accounted for between 39 and 46 percent of total world imports of fresh apples, much less concentration than reported for the top ten exporters. This suggests that exporters must work hard to diversify markets beyond the current largest importers.

## Transit Business Confounds Trade Data

The table below shows official trade statistics in fresh apples for nine European countries engaged in the re-export of fresh apples in the 2016 calendar year, the latest for which data are available. It updates a similar table for calendar year 2015 that was published in the World Apple Review – 2017.

### Major Transit Countries: Reported Trade in Fresh Apples, 2016 (Volume, metric tons, Value, US\$1,000, Price, US\$ per metric ton)

Country	Production 2016 (1,000 mt)	Exports, 2016			Imports, 2016		
		Quantity (mt)	Value (\$ 1,000)	Price (\$/mt)	Quantity (mt)	Value (\$ 1,000)	Price (\$/mt)
Austria	120,000	84,284	70,347	834.64	119,683	46,751	390.62
Belgium	238,244	212,312	134,147	631.84	131,345	136,066	1,035.94
Netherlands	317,000	183,968	184,427	1,002.49	208,587	220,545	1,057.33
W. Europe	675,244	480,564	388,921	809.30	459,615	403,362	877.61
Belarus	509,264	112,959	24,520	217.07	599,014	308,856	515.61
Czechia	124,997	67,998	14,384	211.54	84,935	35,884	422.49
Lithuania	68,434	67,650	17,956	265.42	87,008	25,854	297.15
Serbia	328,369	232,223	127,103	547.33	75,851	23,208	305.97
Macedonia	101,088	82,268	23,825	289.60	547	231	422.30
Moldova	411,768	131,312	24,687	188.00	2,142	936	436.97
E. Europe	1,543,920	694,410	232,475	334.78	849,497	394,969	464.94
TOTAL	2,219,164	1,174,974	621,396	528.86	1,309,112	798,331	609.83

The message of the table is similar. The volume of fresh apples imported by the selected countries was suspiciously large given their total population. The table above shows the reported level of domestic production in these countries in 2016. The selected countries in Western Europe would have exported 71.2 percent of their domestic production, and those in Eastern Europe 45.0 percent of their domestic production. Belgium was reported to have exported over 89 percent of its domestic production, and Serbia over 70 percent. In 2016, imports by the selected Western European countries equaled 95.6 percent of their exports, while for the Eastern European countries imports were 122.3 percent of exports. There were also considerable imbalances between the prices paid for imports and those paid for exports. These results suggest that caution is needed in interpreting trends in trade flows that will be presented in the following pages.

## Strategies of Major Exporters

Since detailed trade flows from export origins and import destinations are not available in a timely manner, the best guide to the strategies of major exporting and importing countries is the trade flows from the major exporters. The following three tables compare exports of fresh apples by major destinations for the two most recent calendar years, 2016 and 2017, for the European Union in total and for the eight largest individual exporting countries, China, the United States, France, Italy, Poland, Chile, New Zealand and South Africa.

The table on the next page compares the volume of fresh apple exports from China, the United States and the EU-28. Together, these three origins account for about 70 percent of total world fresh apple exports in any year. Exports from the EU-28 have been consistently bigger than the combined exports from China and the United States. However, more than 60 percent of EU-28 exports are to countries within the EU-28, so its sales to the rest of the world are just ahead of those from China.

In general, each of the three major exporters of fresh apples focused on different primary destinations. As previously noted, EU-28 exports went primarily to EU-28 member countries, while its second most important markets were in other European countries. China shipped about 88 percent of its exports in both 2016 and 2017 to other Asian countries. The primary markets for the United States were in the Americas, including North America and Central America. China was the only one of the three that retained access to the Russian market in 2016 and 2017, but its volume of sales was slightly lower in 2017.

The major markets where all three top exporters went head to head were in Asia, the Middle East and Africa. The United States was particularly strong in Asian markets, while the EU-28 was strongest in the Middle East and Africa. Sales to Africa suffered in 2017 as many African economies fell into recession. The EU-28 was also successful in penetrating the markets in central and southwest Asia. The EU-28 lost ground in Southern Hemisphere markets in 2017, while the United States gained. Production of apples in the EU-28 is likely to bounce back in 2018 after weather-related reductions in 2017. China and the United States are also expecting larger apple crops in the near future. That is likely to intensify competition among the big three in future years.

**China, United States and EU-28: Destination of Fresh Apple Exports, Calendar Years, 2016 and 2017**  
(metric tons)

Destination	China 2016	China 2017	U.S. 2016	U.S. 2017	EU-28 2016	EU-28 2017
Germany	0	0	0	0	545,594	686,601
United Kingdom	839	754	4,363	3,017	201,059	205,796
Other EU-15	1,304	264	100	177	1,050,394	1,019,715
NMS	0	0	0	0	444,595	361,763
Total EU-28	2,143	1,018	4,463	3,194	2,241,642	2,275,875
Other Western Europe	836	1,202	379	403	60,217	59,754
Russian Federation	114,620	102,941	0	0	1,929	1,665
Other Europe	12	6	23	0	701,881	570,880
Europe, exc EU-28	115,468	104,149	402	403	764,027	632,299
Canada	4,647	3,370	143,757	144,635	5,141	6,071
Mexico	0	82	212,433	281,684	0	0
United States	3,819	3,402	0	0	383	90
North America	8,466	6,854	356,190	426,319	5,524	6,161
Central America	73	382	70,427	74,278	6,581	6,692
Southern Hemisphere	866	950	17,116	26,954	70,911	39,016
Middle East	34,885	36,238	53,456	64,745	238,497	213,699
Africa	1,329	1,261	340	317	308,584	166,494
Middle East & Africa	36,214	37,499	53,796	65,062	547,081	380,193
North Asia	113,357	111,485	104,662	110,369	12,613	13,735
Southeast Asia	615,392	595,186	99,680	92,142	26,768	24,559
South Asia	406,801	398,012	61,331	106,257	31,049	45,247
Other Asia	51,782	79,060	0	30	85,775	96,654
Total Asia	1,187,332	1,183,743	265,673	308,768	156,225	180,195
All Other	55	301	690	2,282	14,571	11,904
TOTAL	1,350,617	1,334,896	768,757	907,260	3,806,562	3,634,543

The table on the next page compares fresh apple exports in 2016 and 2017 for the three leading European exporters, France, Italy and Poland. France and Italy have been leading exporters of fresh apples for decades and have adapted their variety mix to the tastes and preferences of higher-income consumers, primarily in Western Europe, but also in other developed markets. However, the closure of the Russian market has forced them to seek new opportunities in lower-income countries in Eastern Europe, and Africa. France, in particular, has strong ties with numerous former colonies. Italy has been under greater pressure to find new markets because its export volume has grown rapidly. In contrast, that of France has shrunk in recent years, and fell by a further 7 percent in 2017.

Poland has been most directly impacted by the Russian embargo. Prior to the embargo, Russia was the dominant market for Poland's fresh apple exports. Most of this was low-priced product that was not acceptable in Western Europe. Exports to Russia through official channels were insignificant in 2016 and 2017. As noted in the previous section, some apples from Poland may have entered Russia through unofficial channels. However, overall export availability from Poland remains so large that it has been difficult to pivot rapidly towards alternative markets.

Both France and Italy have continued to ship most of their exports to other member countries of the EU-28. The EU-28 remains important to Poland, but the largest share of its exports in both 2016 and 2017 went to other European countries that are not members of the EU-28. All three countries have sought to expand sales into non-traditional markets. However, that effort has been slowed by the bureaucratic challenges of gaining market access, and by combinations of tariffs, quotas or licensing systems that hinder exports.

France and Italy have traditionally been important suppliers to Middle East markets. However, conditions in those markets were more difficult in 2017. Both countries have also expanded their efforts in many African countries, but slowing economies there have prevented growth of sales. Each country has had mixed success in Asia. France made gains in Southeast Asia in 2017. Italy did best in South Asia, while Poland expanded sales in nearby markets in central Asia. Despite their best efforts, none of these countries have had much success in expanding sales in other key regions, including North America, Central America and the Southern Hemisphere. Increased prices of their exports after the smaller apple harvest in 2017 created further challenges.

**France, Italy and Poland: Destination of Fresh Apple Exports,  
Calendar Years, 2016 and 2017  
(metric tons)**

Destination	France 2016	France 2017	Italy 2016	Italy 2017	Poland 2016	Poland 2017
Germany	43,074	65,175	256,973	327,496	53,935	65,135
United Kingdom	112,884	111,438	30,840	36,482	8,384	10,152
Other EU-15	262,765	247,056	292,022	278,765	74,913	75,969
NMS	1,198	1,017	85,669	100,582	234,136	182,625
Total EU-28	419,921	424,686	665,504	743,325	371,368	333,881
Other Western Europe	2,031	3,584	38,810	38,187	7,129	6,261
Russian Federation	0	0	57	0	156	43
Other Europe	4	32	9,846	15,305	553,121	491,516
Europe, exc EU-28	2,035	3,616	48,713	54,122	560,406	497,820
Canada	846	815	2,929	4,290	674	183
Mexico	0	0	0	0	0	0
United States	251	42	96	0	0	0
North America	1,097	857	3,025	4,290	674	183
Central America	1,356	1,938	1,944	1,065	21	0
Southern Hemisphere	6,410	4,370	33,182	15,417	0	0
Middle East	65,928	50,797	135,450	105,081	9,467	12,874
Africa	44,933	16,725	133,825	70,456	31,627	19,350
Middle East & Africa	110,861	67,522	269,275	175,537	41,094	33,394
North Asia	5,498	5,161	704	693	464	5,360
Southeast Asia	13,181	21,126	326	3,745	1,630	1,224
South Asia	2,202	5,297	15,082	20,269	2,179	5,236
Other Asia	3	50	174	82	64,113	74,974
Total Asia	20,884	31,634	16,286	24,789	68,386	86,794
All Other	12,268	453	11,510	13,864	51,183	38,807
TOTAL	574,832	535,076	1,049,439	1,032,409	1,093,132	990,879

Chile, New Zealand and South Africa are forecast to have smaller exports for the 2017-18 season. All three have continued to rely heavily on European markets. Chile's second focus was on Southern Hemisphere and North American markets,

New Zealand on Asian markets and South Africa on African markets. The three have also focused on different parts of Asia.

## **Chile, New Zealand and South Africa: Destination of Fresh Apple Exports, Calendar Years, 2016 and 2017** (metric tons)

Destination	Chile 2016	Chile 2017	N. Zealand 2016	N. Zealand 2017	S. Africa 2016	S. Africa 2017
Germany	9,791	15,155	13,285	18,147	4,884	5,741
United Kingdom	27,150	28,256	47,432	49,233	107,614	66,043
Other EU-15	86,612	79,419	69,585	59,803	27,007	23,200
NMS	639	535	67	21	46	0
Total EU-28	124,192	123,365	130,369	127,204	139,551	94,984
Other Western Europe	4,424	4,351	1,173	1,517	1,278	1,000
Russian Federation	20,632	26,722	6,327	8,188	14,739	16,598
Other Europe	0	0	0	42	5,946	4,000
Europe, exc EU-28	25,056	31,073	7,500	9,747	21,963	21,598
Canada	22,648	21,808	6,012	5,257	2,259	2,765
Mexico	3,983	3,263	23	84	0	130
United States	105,039	87,569	53,319	38,447	29	0
North America	131,670	112,640	59,354	43,788	2,288	2,895
Central America	34,390	33,305	23	107	0	0
Southern Hemisphere	276,504	252,952	7,606	6,224	1,502	1,000
Middle East	67,501	64,786	22,848	21,772	34,188	30,000
Africa	3,949	2,186	68	34	200,873	200,000
Middle East & Africa	71,450	66,972	22,916	21,806	235,061	230,000
North Asia	67,007	66,935	67,016	57,455	17,007	15,000
Southeast Asia	902	690	64,635	58,134	64,141	51,739
South Asia	33,493	28,130	21,445	20,534	29,289	25,000
Other Asia	0	0	0	0	43	0
Total Asia	101,402	95,755	153,096	136,123	110,480	91,739
All Other	87	141	130	308	34	57,784
<b>TOTAL</b>	<b>764,751</b>	<b>716,203</b>	<b>380,994</b>	<b>345,307</b>	<b>510,879</b>	<b>500,000</b>

## Turmoil in World Apple Import Markets

Import markets for fresh apples continue to be roiled by economic and political uncertainties and by the trade disputes between several major exporters and importers. The enlarged European Union remains the biggest single stabilizing influence on world markets. However, it, too, has introduced miscellaneous phytosanitary and regulatory measures that have hindered imports.

The table below shows EU-28 imports of fresh apples for the calendar years between 2009 and 2017. Overall imports have remained relatively stable around an average of 3 million metric tons per year. However, there has been a notable advance in imports from member countries within the EU-28, while third countries have generally lost ground.

### EU-28: Imports of Fresh Apples, by Major Sources, 2009-2017 (1,000 metric tons)

Source	2009	2010	2011	2012	2013	2014	2015	2016	2017
France	450.8	525.5	523.1	464.4	413.4	499.8	446.9	418.3	410.8
Italy	536.5	672.1	615.2	579.2	517.9	520.8	605.2	582.9	657.7
Poland	165.9	100.5	57.6	183.7	345.9	281.4	397.8	385.4	406.5
Other EU-28	1,031.9	1,064.2	1,151.1	1,196.7	1,145.9	949.0	1,337.9	959.3	1,119.6
<b>Total EU-28</b>	<b>2,184.9</b>	<b>2,262.2</b>	<b>2,356.0</b>	<b>2,424.0</b>	<b>2,423.0</b>	<b>2,251.0</b>	<b>2,787.7</b>	<b>2,345.9</b>	<b>2,594.6</b>
Canada	1.2	1.6	1.2	0.8	0.1	0.2	0.2	0.2	0.1
United States	26.4	20.1	10.2	10.5	12.1	9.0	6.2	4.3	2.4
N America	27.6	21.7	11.4	11.3	12.2	9.2	6.5	4.5	2.6
China	18.4	11.0	5.6	3.2	7.8	1.6	0.9	2.0	1.0
Argentina	57.7	47.1	49.8	29.2	45.5	34.9	14.1	14.4	17.7
Australia	0.3	0.4	0.3	0.5	0.5	0.1	7.0	1.4	1.1
Brazil	80.2	70.7	39.8	57.8	66.4	30.5	35.6	16.8	28.8
Chile	186.5	177.8	170.2	133.0	169.4	164.3	112.2	124.7	121.5
New Zealand	165.2	126.6	147.0	115.5	131.6	129.0	117.2	117.7	121.4
South Africa	144.9	112.8	110.5	120.0	152.7	84.4	105.7	97.5	91.3
S Hemisphere	634.8	535.4	517.6	456.0	566.1	443.2	391.8	372.4	381.9
All Other	19.4	47.3	61.3	33.7	82.6	40.8	56.1	66.6	62.8
<b>TOTAL</b>	<b>2,885.1</b>	<b>2,877.5</b>	<b>2,951.9</b>	<b>2,928.2</b>	<b>3,091.7</b>	<b>2,745.8</b>	<b>3,243.0</b>	<b>2,791.4</b>	<b>3,042.9</b>

Imports from EU-28 member countries rose almost 19 percent between 2009 and 2017, while imports from the rest of the world have fallen by 36 percent. This fall has hit almost all third countries, including the United States, Canada and China. Southern Hemisphere suppliers, that are heavily dependent on off-season sales in the European Union, have been even harder hit, with a decline of 40 percent. Minor suppliers like Argentina and Brazil have been particularly hard hit.

The Russian Federation was long the second largest import market for fresh apples. However, Russia's imports peaked in 2013, and have fallen dramatically since for reasons already discussed, including domestic economic problems, international concerns about Russia's intervention in the Crimea, in Eastern Ukraine and in Syria, and conflicts with Turkey.

The single biggest source of the decline of Russian fresh apple imports has been the self-inflicted wound resulting from Russia's embargo on fresh produce from the European Union. Poland alone accounted for over 50 percent of Russia's fresh apple imports in 2013. Cumulatively, other EU countries were also important suppliers to Russia. However, Russia reported zero imports of fresh apples from EU-28 countries in 2015, 2016 and 2017, although a substantial (but immeasurable) volume may have entered through unofficial channels.

The Russian government anticipated that the lost imports from the EU-28 could be easily replaced by increased domestic production and by imports from alternative suppliers eager to secure a share of the Russian market. However, while increases in domestic production are challenging with annual crops like fresh vegetables, they are extremely difficult with perennial crops like apples, where large amounts of additional capital are needed, and production takes years to come on stream. Also, about the same time that the Russian embargo was imposed, the Russian economy ran into trouble and the value of the Russian ruble fell sharply. These events discouraged many exporters from attempting to increase sales to Russia.

The gaps in the Russian market have been only partially, and temporarily, filled by increases in sales from non-traditional exporters, such as Belarus and Serbia, and by untypical sales volumes in selected years by countries like Brazil and South Africa. Imports from the latter two countries netted average prices of \$360.26 and \$289.39 per metric ton respectively, far below the normal prices for their exports. One can only conclude that these were "distress" sales.

**Russian Federation: Imports of Fresh Apples from Major Sources, Calendar Years, 2013-2017**  
(metric tons)

Source	2013 (mt)	2014 (mt)	2015 (mt)	2016	2017 (mt)
Poland	705,639	418,997	0	0	0
France	17,332	22,397	0	0	0
Italy	26,544	31,345	0	0	0
Other EU-15	40,080	28,752	0	0	0
Other NMS	853	967	0	0	0
EU-28	790,448	502,458	0	0	0
Azerbaijan	37,499	43,388	36,474	61,714	66,846
Belarus	67,268	175,460	37,925	96,172	13,823
Moldova	182,140	33,116	78,339	112,943	229,337
Serbia	69,046	123,790	176,903	193,364	168,162
Turkey	276	1,169	37,282	0	11,595
Ukraine	10,525	18,984	0	0	0
Neighbors	366,754	395,907	366,923	464,193	489,763
China	110,470	86,084	117,554	113,228	100,212
United States	8,703	7,053	0	0	0
Argentina	22,361	13,293	21,792	9,944	11,071
Brazil	380	737	67,993	2,335	2,352
Chile	34,283	18,368	27,325	20,766	27,322
New Zealand	6,524	10,627	7,849	5,803	8,341
South Africa	7,266	4,613	69,981	14,017	16,598
S Hemisphere	70,814	47,638	194,940	52,865	65,684
All Other	5,158	10,732	200,894	46,551	49,894
TOTAL	1,352,347	1,049,872	880,311	676,837	705,553

While the reliability of statistics for trade in fresh apples has come into question in recent years as a result of the trade disputes, the reported trends in imports by the EU-28 and the Russian Federation have not been encouraging for major third-country exporters. There is no evidence that these trends are likely to be reversed in the near future.

## Adjustments to Russian Import Embargo

The sudden imposition by Russia of the import embargo on fresh produce from the European Union caused a major shake-up in the EU's fresh apple exports. Poland was particularly hard hit because Russia had been a major buyer of a large proportion of its fresh apple exports. Both the EU Commission and individual governments rushed through various measures to reduce the impact of the embargo, including subsidies to producers, and promotional programs to stimulate domestic apple demand. However, these measures were generally considered to have been inadequate for the task at hand, and have been allowed to gradually lapse. Individual countries have made determined efforts to circumvent the Russian embargo and to find alternative markets, again with limited success.

The table below shows how exports of fresh apples from the EU-28 have fared in the August-December period of 2013, before the embargo was imposed, and in the same period in the four post-embargo years. It shows that exports to Russia fell dramatically in 2014, and have been insignificant in subsequent years. In contrast, exports to countries that border Russia, and that might have been used to circumvent the embargo, more than doubled in the August-December periods of 2014, 2015 and 2016, but fell back sharply in 2017. While total EU-28 exports have averaged close to the 2013 level in the subsequent four seasons, the share going to Russia and its neighbors has slipped from 15.1 percent in August-December 2013 to 6.0 percent in August-December 2017.

### EU-28: Adjustments to the Russian Import Ban Four Years on. August-December 2013, 2014, 2015, 2016 and 2017 (metric tons)

Destination	Aug-Dec 2013	Aug-Dec 2014	Aug-Dec 2015	Aug-Dec 2016	Aug-Dec 2017
	(mt)	(mt)	(mt)	(mt)	(mt)
Russia	155,138	9,252	105	122	464
Russia's Neighbors	61,281	164,290	147,605	163,295	81,065
Russia + Neighbors	216,419	173,542	147,710	163,417	81,529
Percent of EU-28	15.1	12.0	9.2	11.1	6.0
Total EU-28	1,437,949	1,442,603	1,599,166	1,466,326	1,366,492

Poland was the pivotal player in servicing the Russian market up to and including the 2013-14 season. It has been under particular pressure to find alternative outlets after its sales to Russia were banned. The table below shows exports of fresh apples from Poland to Russia and its neighbors in the August-July seasons from 2013-14 to 2016-17. Exports to Russia have fallen from over half a million metric tons in 2013-14 to insignificant levels in the subsequent three seasons. The table shows how exports from Poland have fared to countries that are Russia's neighbors and that facilitate unofficial cross-border entry into Russia. Poland's exports of fresh apples to Belarus more than doubled between 2013-14 and 2016-17 and reached almost one half million metric tons in 2016-17. Exports to the next three most important markets have experienced large percentage increases, Kazakhstan up 46.4 percent, Romania up 76.5 percent, and the Ukraine up 17.3 percent. Combined exports to all neighboring countries were up 89.2 percent. However, such increases have not been sufficient to offset the loss of the Russian market.

**Poland: Seasonal Adjustments to the Russian Import Ban,  
August-July 2013-14 to 2016-17  
(metric tons)**

Destination	2013-14	2014-15	2015-16	2016-17
Russia	529,031	173	158	43
Azerbaijan	398	158	1,015	0
Belarus	234,561	289,921	436,154	496,115
Georgia	488	1,044	3,377	2,829
Kazakhstan	54,019	61,473	54,579	79,090
Kyrgyzstan	59	880	77	0
Moldova	32	717	1,873	731
Romania	36,406	45,942	64,078	64,245
Tajikistan	625	117	39	142
Ukraine	35,212	61,725	25,718	41,300
Sub-total	361,790	461,975	586,910	684,452
All Other	235,892	437,788	393,417	410,603
Grand Total	1,126,713	899,936	980,485	1,095,098
Ave Price	336.15	299.47	300.45	312.71

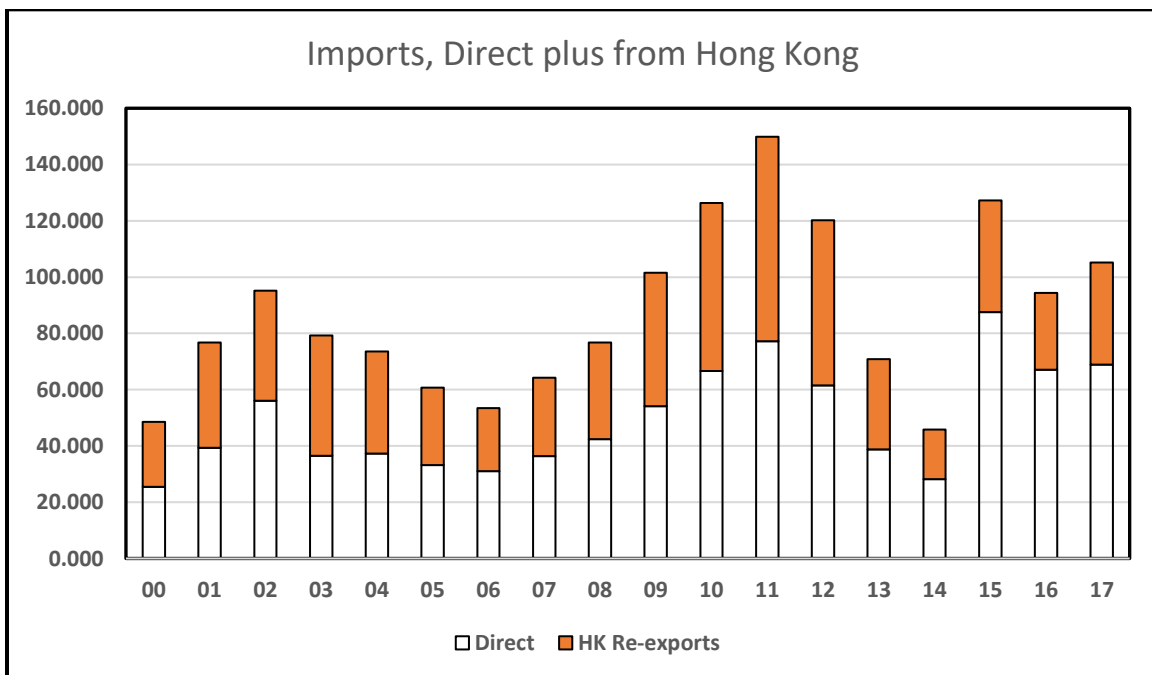
Poland was able to find additional markets outside the Russian orbit for about 200,000 metric tons of fresh apples in 2014-15, but has not been able to add to

that volume in the two subsequent seasons. Average prices, which were already low, have remained below the 2013-14 level since. Clearly, the Russian embargo has continued to cause challenges both for Poland and for the total EU-28 apple industry. There are no obvious remedies.

### Can Help Come from China?

As previously noted, many exporters of fresh apples are betting that markets in Asia, particularly in China, will provide a needed boost for world exports in the near future. However, recent trends in imports of fresh apples by Greater China (Mainland China plus Hong Kong) indicate that imports have run into headwinds in recent years.

### China: Imports of Fresh Apples, Direct and Reported Re-exports from Hong Kong, 2000-2017 (1,000 metric tons)



The chart above shows annual imports of fresh apples by Mainland China. It includes both direct imports by China, and re-exports to China from Hong Kong. Total imports remained below 100,000 metric tons between 2000 and 2008. A surge in imports between 2006 and 2011 suggested that China was finally about to become a major world importer. Total imports of fresh apples reached almost 150,000 metric tons in 2011. However, total imports have fluctuated wildly since.

There are a number of reasons why China may not be a growing target market for EU-28 fresh apple exports. First, China's production of apples has continued to expand so there are more apples available domestically. Second, China has become more aggressive in restricting imports because of real or perceived international disputes. China has given preference in imports to off-season supplies from the Southern Hemisphere. Finally, the Chinese government has been urging its industries to expand exports as a way to stimulate its economy. Its apple industry has responded with record exports in 2016 and 2017.

### **Prospects for World Fresh Apple Trade**

Many factors have combined to suggest that the prospects for future expansion of world trade in fresh apples are less favorable than they were before the onset of the Great Recession.

The first factor is the breakdown in the global consensus that free trade helps lift all economies by providing exporters with greater economies of scale and by stimulating gains in efficiency in domestic industries that are threatened by imports. That consensus fueled eight negotiating rounds of trade liberalization under the General Agreement on Tariffs and Trade (GATT), and persuaded many countries to embrace the GATT process. It was the consensus that led to the replacement of the informal GATT process with the establishment of a more formal World Trade Organization (WTO) in 1995. The WTO was tasked with furthering trade liberalization around the world through a series of global summits, and with establishing a formal dispute resolution process to resolve any trade disputes that might arise in the future. However, despite numerous efforts, the WTO had limited success in advancing trade liberalization. When the Great Recession led many countries to introduce new protections, the WTO dispute resolution system was so slow and cumbersome that it provided little relief to complaining parties.

Many countries remained undeterred by the failure to reach global trade agreements. They rather chose to advance trade through bilateral or regional agreement where each negotiating party made concessions in return for reciprocal concessions from the other parties. However, such limited agreements have several weaknesses. One, they allow participating governments to protect less efficient industries that have political clout. Two, the stronger party (or parties) to the negotiations can exact more favorable terms for their country. This has happened in negotiations between the European Union and smaller countries. Three, the most efficient partners may be excluded from limited agreements, leading to perpetuation of inefficiencies in specific industries.

The global reach of the Great Recession in the 2008-2010 period led governments to seek global solutions to their economic problems. It also revived interest in wider trade deals. First was the Transpacific Partnership (TPP), which sought to promote freer trade in the Pacific region. The TPP involved 12 partner countries, including the United States and Japan, but not China. The hope was that if the TPP could establish a rule-based system that was widely used and effective, China could be brought in at a later date, but be forced to accept the established rules. Negotiated under the Obama administration, the TPP was rejected by the replacement Trump administration. Undeterred, the other 11 partners decided to move ahead without U.S. participation in a modified TPP, and signed the Comprehensive and Progressive Transpacific Partnership (CPTPP) in Chile in March 2018. The CPTPP left the door open for the United States and other Pacific Rim countries to join at a later date.

A second ambitious outcome of the Great Recession was the proposed Transatlantic Trade and Investment Partnership (TTIP) between the European Union and the United States. Together this trading block represented almost half of world trade. In addition to advancing trade, it was hoped that the TTIP could offset the influence of China in setting world trade, investment, environmental and social rules. However, interest in finalizing the TTIP faded when the Trump administration opposed the concept, and when the European Union became preoccupied with other pressing problems. An economic crisis in Greece that began in 2010 raised doubts about the sustainability of the European Union. The survival of the euro currency appeared to be in doubt. After the Arab Spring of 2011, Europe faced a flood of refugees. Member countries quarreled over how many refugees could be accepted, and who should pay for them. Dissatisfaction with the Union crystallized in June 2016 when the British electorate voted to leave the Union.

At the same time that the western nations were divided and under stress, China began to promote alternative visions about how societies should be run, and about the regulation of international trade, finance and investment. China had joined the WTO in 2002, and gained substantial benefits from membership. However, the Chinese leadership argued that the crises of the Great Recession had exposed the weakness of the western democratic model, and shown the superiority of the state-centered, managed Chinese approach. A new President, Xi Jinping, gradually acquired control of all the major levers of power in China. Internally, he asserted the primacy of the Communist Party in setting China's agenda, promoted Chinese state champions in many industries, squeezed foreign industries and sought to quash any citizen dissent. Externally, he moved to expand China's military presence, and promoted a major Chinese initiative, the Belt and Road initiative. It would use China's financial resources to develop infrastructure that would extend China's influence across Asia and into Europe and Africa. China's neighbors, and many other countries, were torn between the potential for greater trade with China, and fear of China's military aggression.

Even as China was becoming more authoritarian, several other countries have been moving in the same direction, by centering power in a few hands. These include Russia under President Putin, Iran under an Islamic regime, Turkey under President Erdogan, and Egypt and Thailand under military rulers. The common thread in such regimes is their desire to retain power. Preserving state control internally overrides concerns about external issues. They are unwilling to give up any of their sovereignty for the furtherance of global trade.

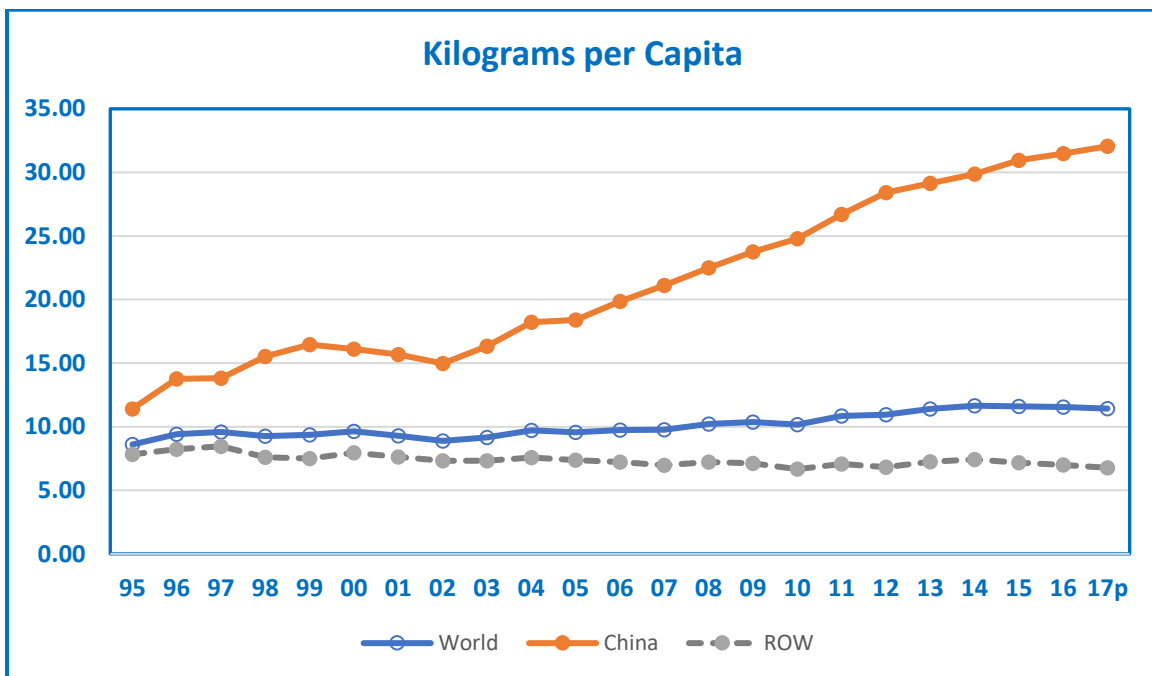
Western countries have been slow to recognize or respond to authoritarian threats. However, U.S. President Trump has taken an aggressive stance over any actual or perceived obstacles to free and fair trade, threatening tariffs, investment restrictions, or controls on free movement of people or goods in order to gain redress. As we went to press, the United States was acting unilaterally. However, its initiatives would be greatly strengthened if other countries that have been similarly disadvantaged would join a coalition to bring pressure on the worst offenders, such as China and Russia. Given the heavy dependence of the apple industry on international trade, its future prosperity could be greatly affected by the outcome of these battles over the future governance of world trade.

## 4. Consumption of Fresh Apples

### World Apple Availability Stalls

The volume of apples available for all uses is dependent on the volume produced. That volume was rising faster than world population in the last decade. The major factor in the rise of per capita apple availability was China, shown separately in the chart below. Chinese apple production more than tripled between 1995 and 2017. In contrast, apple production in the rest of the world (ROW) stagnated between 1995 and 2007. It rose by 17 percent between 2007 and 2014, but edged downwards in each year since.

**World: Per Capita Supplies of Apples, 1995-2017**  
(kilograms)



Per capita supplies of apples from China have been on a long, upward trajectory since 2002, but the rate of growth has slowed markedly in the last two years. By 2017, it is estimated that they had exceeded 32 kilograms per person for the first time, double the level achieved at the turn of the century between 2000 and 2002.

In contrast, per capita availability of apples in the rest of the world peaked at 8.46 kilograms in 1997. It had fallen to 7.18 kilograms in the 2005-07 period and to 6.97 kilograms in the most recent, 2015-17, period. Thus, in the 2015-17 period, per capita supplies of apples in the rest of the world was almost 18 percent below the most recent peak level. Due to the influence of China, per capita availability of apples for the entire world has advanced over time. It grew most rapidly, by 23 percent, between 2002 and 2012. However, it stagnated at about 11.53 kilograms per capita in the latest five-year period, 2013 to 2017.

In 2017, China had 18.5 percent of the total world population, giving China a major influence on world per capita supplies of apples. However, the rate of growth of the population in China has fallen below one half percent per year, and could fall to zero in the next decade. In contrast, population in the rest of the world grew by 76.7 million people in 2017, a growth rate of about 1.3 percent, so the rest of the world should become relatively more important to the global apple industry in the next few years. These developments will also affect the balance of apple supplies going to various uses. In China, most apple production enters the fresh market, whereas in most other producing countries, a substantial share of production is deemed unfit for the fresh market, and is diverted to processing uses. Thus, the fresh share of apple availability is likely to grow faster than the processed share in future years. This implies that the volume available for fresh exports will also rise. This will have major impacts on fresh consumption and prices, topics that will be discussed in later sections.

### **Trends in Per Capita Fresh Apple Consumption**

No other, single factor is more important for the profitability and sustainability of the global apple industry than trends in per capita consumption of fresh apples. Fresh apples consistently generate the highest returns to all the participants in the apple distribution system, both on the supply side, with growers, packers and marketers, and on the demand side, with wholesalers, retailers, transportation agencies and other marketing services. However, recent reliable data on per capita consumption of fresh apples is rarely available in a timely manner. Since information on per capita consumption trends is so important, the World Apple Review has, for many years, generated its own unofficial estimates of per capita fresh apple consumption in major countries and regions.

Fresh apple consumption in each country in each year has been derived from the following relationship:

$$\text{Fresh apple consumption} = \text{Total apple production} + \text{Fresh apple imports} \\ - \text{Fresh apple exports} - \text{Apples for processing} - \text{Withdrawals from market.}$$

This is known as the “balance sheet” approach to estimating fresh apple consumption. The supply of apples should equal (balance) the demand for all uses.

Per capita consumption is estimated by dividing the total fresh apple consumption by the population in the relevant period. This method may overstate actual fresh apple consumption because it does not take account of shrinkage of apple weight in storage, deterioration in the distribution system, or unused fruit wasted by consumers. However, the measure should be a useful proxy, and should facilitate making comparisons between countries in any period, or over a number of periods, major goals for the tables presented below. For ease of reference, separate tables are presented for countries in the EU-11, other European countries, selected other Northern Hemisphere countries, and major Southern Hemisphere exporters. The data refer to marketing years from July of one year to June of the next.

### **Western Europe: Estimated Per Capita Consumption of Fresh Apples, Selected Countries and Periods, 2001-2017** (kilograms)

Country	2001-03	2008-10	2015-17	15-17 v 01-03
	(kg)	(kg)	(kg)	(% change)
Austria	23.97	24.68	19.06	- 20.5
Belgium	17.55	17.82	12.98	- 26.0
Denmark	19.66	19.30	16.58	- 15.7
France	16.06	14.76	14.15	- 11.9
Germany	18.26	18.94	17.24	- 5.6
Greece	20.21	19.96	19.51	- 3.5
Italy	19.87	21.19	17.68	- 11.0
Netherlands	19.99	18.16	19.27	- 3.4
Spain	17.14	12.88	12.06	- 29.6
Sweden	14.99	15.07	13.54	- 9.7
United Kingdom	9.25	9.60	7.61	- 17.7
EU-11	16.72	16.28	13.36	- 20.1

The table above includes the 11 member countries of the EU-15 for which adequate data were available, so it excludes minor producers like Ireland, Finland, Luxembourg and Portugal. Estimates are presented for each country and the region for the three, three-year periods, 2001-03, 2008-10 and 2015-17. Comparisons are used for three-year periods to reduce distortions due to unusual crop conditions in any single year. The results are presented as annual per capita consumption.

Data for the EU-11 countries indicate a gradual reduction in per capita consumption over the 17-year period, from relatively high initial levels. The major exception was the United Kingdom. Its per capita consumption of fresh apples was the only one below 10 kilograms per capita in 2001-03. It was less than 40 percent of the per capita consumption estimated for Austria. The overall average for all eleven countries in 2001-03 was 16.72 kilograms per capita. The overall average was only slightly lower in 2008-10, at 16.28 kilograms. Five countries had lower per capita consumption in 2008-10, with the biggest declines being in France and Spain. Six of the EU-11 had higher per capita consumption in 2008-10, with Italy enjoying the biggest percentage gain.

However, the biggest decline in per capita consumption is expected for the 2015-17 period. This is partly, but not wholly, due to the sharp decline in the European apple crop in 2017. The only country showing an increase is the Netherlands. However, much of that increase is likely due to increased imports of fresh apples.

Comparing estimated per capita consumption of fresh apples in the EU-11 in 2015-17 with the actual at the beginning of the period in 2001-03 shows an average decline for all countries combined of 20 percent, and an expected decline for each individual country. The decline is expected to exceed 20 percent for three countries, Austria, Belgium and Spain. The absolute level of per capita consumption of fresh apples was greater than 20 kilograms for two countries in both 2001-03 and 2008-10, but for no single country in 2015-17. In contrast, in the two earlier periods, only one country, the United Kingdom, had per capita consumption below 14 kilograms. By 2015-17, four countries, Belgium, Spain, Sweden and the United Kingdom had per capita consumption below 14 kilograms. While the smaller European crop in 2017 may have magnified the decline in per capita consumption in the EU-11 countries, the other data suggest that the trend in per capita consumption has been either flat or declining across the board in these countries.

## Other Europe: Estimated Per Capita Consumption of Fresh Apples, Selected Countries and Periods, 2001-2017 (kilograms)

Country	2001-03	2008-10	2015-17	15-17 v 01-03
	(kg)	(kg)	(kg)	(% change)
Norway	14.73	15.91	13.18	- 10.5
Bulgaria	4.22	4.48	6.71	+ 59.0
Croatia	15.55	15.93	15.92	+ 2.4
Czechia	9.15	9.88	9.95	+ 8.7
Hungary	13.82	14.69	15.03	+ 8.8
Poland	14.54	13.78	19.43	+ 33.6
Romania	17.02	17.18	19.87	+ 16.7
Slovakia	8.91	11.31	10.04	+ 12.7
Slovenia	39.40	47.97	26.61	- 32.5
Serbia	13.17	7.63	9.82	- 25.4
Other Europe	13.86	13.67	15.89	+ 14.6

The table above gives similar per capita fresh apple consumption estimates for 10 other European countries not in the EU-15. Eight of these countries are now part of the enlarged EU-28, while two, Norway and Serbia, are not. Norway is the only one of the ten that would be considered a developed or advanced country. With the exception of Slovenia, all these countries had per capita fresh apple consumption lower than the average for the EU-11 countries in 2001-03. Three countries, Bulgaria, Czechia and Slovakia, had per capita consumption of less than 10 kilograms per capita per year.

Average per capita consumption in 2008-10 was little changed from 2001-03. Seven of the 10 countries showed slight increases. Average per capita consumption for 2015-17 was about 2 kilograms (16 percent) higher than in 2008-10. For the entire period, from 2001-03 to 2015-17, average per capita consumption increased by 14.6 percent. Estimated per capita consumption in Slovenia was outside the normal range, possibly due to errors in data or unreported cross-border movements. Seven of the ten countries showed increases. The largest were for Bulgaria and Poland. By 2015-17, average per capita fresh apple consumption in other Europe was higher than in the EU-11 countries. These countries have enjoyed both substantial increases in domestic production and become more receptive to imports.

The table below shows similar data on per capita fresh apple consumption for other major Northern Hemisphere producers of fresh apples not in Europe. Per capita consumption in North America has been relatively low. This has been particularly true for Mexico. It rose in all three countries between 2001-03 and 2008-10, but fell in Canada thereafter. For the entire period, per capita consumption was down slightly in Canada, but up strongly in Mexico and the United States. However, per capita consumption for all of North America was very similar to that of the United Kingdom, the poorest performer of the developed countries of Western Europe.

Only four Asian countries had adequate data to be included in the analysis. They varied widely in level and trends in per capita fresh apple consumption. Per capita consumption of fresh apples in China more than doubled between 2001-03 and 2015-17 due to the huge increase in Chinese apple production. That of Turkey was among the highest in the world in 2001-03. It fell modestly by 2015-17 as Turkish exports increased. Per capita consumption in Japan and Taiwan was the lowest among developed countries. While that of Japan has continued to decline over time, that of Taiwan rose substantially. The final country in this group, the Russian Federation, saw per capita consumption increase rapidly while imports were increasing, and its rate of increase slow as imports slowed.

**Other Northern Hemisphere: Estimated Per Capita Consumption of  
Fresh Apples, Selected Countries and Periods, 2001-2017  
(kilograms)**

Country	2001-03	2008-10	2015-17	15-17 v 01-03
	(kg)	(kg)	(kg)	(% change)
Canada	11.28	11.98	10.79	- 4.3
Mexico	5.22	5.75	6.89	+ 32.0
United States	8.46	9.28	10.12	+ 19.6
N America	7.87	8.58	9.32	+ 18.4
China, mainland	12.66	18.39	27.37	+116.2
Japan	6.02	5.74	5.04	- 16.3
Taiwan	5.37	5.98	7.27	+ 35.4
Turkey	34.36	34.19	32.73	- 4.7
Asia	12.95	17.90	25.58	+ 97.5
Russian Federation	6.01	10.06	11.22	+ 86.7

The final group of countries included are the six leading apple producers in the Southern Hemisphere. These vary in the extent of their focus on export markets, with Chile and New Zealand most dependent on exports. This influences the volume and quality of apples that are retained for the domestic market. In 2001-03, New Zealand was the only Southern Hemisphere country that had per capita consumption of fresh apples above 10 kilograms. By 2008-10, it was joined by Australia and Chile. A major factor in Australia was the shrinkage of the processing apple sector. In Chile, rising incomes kept more apples in the domestic market. Argentina, Brazil and South Africa remained the laggards among the group, but Argentina was the only one that saw per capita consumption slip between 2001-03 and 2015-17. Its producers and consumers have been buffeted by a succession of economic problems. Overall, these Southern Hemisphere countries have lagged the developed countries in per capita consumption of fresh apples.

### **Southern Hemisphere: Estimated Per Capita Consumption of Fresh Apples, Selected Countries and Periods, 2001-2017 (kilograms)**

Country	2001-03	2008-10	2015-17	15-17 v 01-03
	(kg)	(kg)	(kg)	(% change)
Argentina	8.58	7.08	6.18	- 28.0
Australia	6.51	10.50	11.66	+ 79.1
Brazil	4.64	5.57	5.39	+ 16.2
Chile	7.22	11.11	14.28	+ 97.8
New Zealand	16.07	14.28	13.79	- 14.2
South Africa	3.71	4.10	3.79	+ 2.2
S Hemisphere	5.39	6.26	6.22	+ 15.4

The table below summarizes the average per capita consumption of fresh apples for the 35 countries included in the analysis. The overall average rose over 25 percent both between 2001-03 and 2008-10 and between 2008-10 and 2015-17, for an overall increase of 58 percent. However, the rapid growth of per capita consumption of fresh apples in China, and the sheer size of the Chinese population, distorts the actual gains worldwide. When China was excluded, the rate of growth fell below 3 percent over the period. When Russia, usually the largest importer, was also excluded, the average for the remaining 33 countries fell below 11 kilograms, and was 2.8 percent below the level in 2001-03.

## **Global Results: Estimated Per Capita Consumption of Fresh Apples, Selected Countries and Periods, 2001-2017 (kilograms)**

Country	2001-03	2008-10	2015-17	15-17 v 01-03
	(kg)	(kg)	(kg)	(% change)
All 35 Countries	11.54	14.44	18.27	+ 58.3
Excluding China	10.61	11.22	10.91	+ 2.8
Excluding China and Russia	11.08	11.34	10.88	- 1.8

The estimates of levels and trends in per capita consumption of fresh apples presented above have both positive and negative implications for world fresh apple demand among major producing countries. The weakest regional performance was in Western Europe. Performance was generally positive in other European countries, and mixed in other regions. As world apple production increases, markets in non-producing countries will become much more important.

### **Consumption Trends in Non-Producing Countries and Regions**

There are many other countries that do not produce apples that have become substantial consumers of fresh apples. However, the level of per capita consumption varies widely depending on circumstances in the individual countries. Their per capita consumption of fresh apples corresponds to their net imports (imports minus exports) divided by their populations. This formula only works for countries that have either no or miniscule domestic production of apples. The following two tables present estimates for non-producing regions, and for selected countries in those regions whose per capita consumption is especially notable. These estimates are based on data on fresh apple imports and exports and population derived from the United Nations, Comtrade and FAOSTAT databases.

The first table on the next page shows estimates of the average per capita consumption of fresh apples by region for non-producing countries for the three-year periods, 2002-04, 2011-13 and 2014-16 and annually for 2014, 2015 and 2016. The averages are for 15 countries in Africa, 3 in North Asia, 9 in Southeast Asia, 6 in the Middle East, 11 in Central America, 5 in Latin America and 5 in the South Pacific.

## Non-Producing Regions: Average Per Capita Consumption of Fresh Apples, Selected Years, 2002-2016 (kilograms)

Region	2002-04	2011-13	2014-16	2014	2015	2016
	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)
Africa	0.24	0.43	0.34	0.52	0.35	0.18
North Asia	7.75	7.63	11.94	8.81	13.26	13.70
Southeast Asia	0.82	1.12	0.93	0.85	0.84	1.08
Middle East	7.24	8.64	7.75	8.87	9.45	5.06
Central America	1.12	1.38	1.37	1.38	1.36	1.38
Latin America	1.06	1.67	1.49	1.55	1.46	1.46
South Pacific	0.85	1.04	0.98	1.00	0.94	1.00

Most of the countries included in the selected regions listed above are small in both area and population. Per capita consumption of fresh apples in all but one region was higher in 2011-13 than in 2002-04, and then fell back in 2014-16, although still above the 2002-04 level. The exception was North Asia, where per capita consumption was slightly lower in 2011-13, but strongly higher by 2014-16. Only in North Asia and the Middle East was per capita consumption close to that in the developed world. In the other regions, it was consistently less than 1.5 kilograms per capita.

The table below shows data for some of the more notable non-producing countries in the seven regions. In general, these are small countries with small populations, but all have features that would tend to increase imports of fresh apples. For example, Cape Verde, Mauritius, Macau, Barbados, Cyprus and Malta all attract tourists to enjoy the sun, sand, gambling and other entertainment. The economies of Namibia and Brunei are powered by their large petroleum resources. Per capita consumption of fresh apples was estimated to be higher in Iceland and Malta than in the United Kingdom. In general, per capita consumption in these countries has been rising over time. However, the annual data also show how vulnerable they are to economic shocks. For example, Cyprus suffered from a financial crisis in 2015, while Namibia and Brunei have been hit by the decline in petroleum prices. On the other hand, Bolivia and Ecuador have benefited from being close to Chile, one of the world's largest, and most aggressive, exporters of fresh apples. Botswana is also close to another major fresh apple exporter, South Africa.

**Other Non-Producing Countries: Average Per Capita  
Consumption of Fresh Apples, Selected Years, 2002-2016  
(kilograms)**

Region	2002-04	2011-13	2014-16	2014	2015	2016
	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)
Botswana	3.90	3.29	4.48	3.67	4.31	5.29
Cape Verde	2.03	3.48	3.50	3.26	3.56	3.66
Mauritius	4.68	4.48	4.56	4.26	4.75	4.66
Namibia	2.62	4.32	2.87	4.37	0.00	4.31
Macau	6.15	6.37	8.28	8.00	8.22	8.59
Barbados	6.65	7.04	7.41	7.76	6.72	7.75
Cyprus	2.97	5.95	3.85	6.21	0.00	5.39
Iceland	9.46	11.97	12.04	11.79	12.07	12.26
Malta	16.86	9.26	10.64	11.82	9.16	10.91
Bolivia	1.70	2.45	2.87	2.50	2.88	3.22
Ecuador	2.90	3.46	3.18	4.30	2.84	2.44
Brunei	5.21	4.13	3.31	1.77	4.18	3.97

The table on the next page updates a table that has been presented in the annual World Apple Review for many years. It includes data for selected years since 1990 for countries in East Asia, the Middle East and Latin America that first became attractive markets for fresh apple exports in the 1990s. While their experiences since then have been diverse, all have faced both positive and negative factors that affected their imports of fresh apples. For example, most of the countries in East Asia were affected by the Asian financial crisis, which began in 1997, and slowed their economic performance in the subsequent decade.

Most of the countries in the Middle East have been whipsawed by fluctuations in petroleum prices while some, like Libya and Egypt, have also been affected by the uprisings of the Arab Spring that began in 2011. In Latin America, the main cause of fluctuations has been political turmoil and erratic economic and trade policies. The most extreme case has been in Venezuela, where the state-centered policies of Hugo Chavez, and his successor, Nicolas Maduro, have essentially bankrupted the economy and made normal trade virtually impossible.

## Non-Producing Countries: Estimated Per Capita Consumption of Fresh Apples, Selected Years, 1990-2016 (kilograms)

Country/Region	1990	1995	2000	2005	2010	2013	2014	2015	2016
East Asia									
Indonesia	0.01	0.23	0.32	0.56	0.82	0.52	0.55	0.33	0.54
Hong Kong	9.74	11.53	7.64	8.49	9.99	8.74	12.36	16.93	18.01
Malaysia	1.28	2.71	3.12	3.23	3.55	3.59	2.97	3.36	3.68
Philippines	0.54	0.78	0.89	0.79	0.75	0.87	0.67	0.69	1.50
Singapore	9.65	12.36	9.05	8.61	8.88	7.81	7.33	7.24	7.30
Taiwan	3.82	5.17	6.16	6.18	5.86	6.41	6.77	6.67	7.27
Thailand	0.42	1.09	0.68	1.46	1.92	2.14	1.92	2.32	2.78
Subtotal	0.68	1.17	1.18	1.40	1.60	1.52	1.47	1.49	1.89
Middle East									
Bahrain	8.11	13.86	6.74	12.95	5.84	6.98	7.50	8.47	7.74
Egypt	0.00	0.33	0.58	0.79	1.37	1.19	0.17	0.47	3.78
Kuwait	5.20	12.48	10.42	6.51	7.03	8.37	7.37	8.65	6.96
Libya	4.02	1.48	0.96	1.69	8.44	11.38	n.a.	n.a.	n.a.
Oman	4.41	4.50	3.07	15.36	9.06	8.23	8.21	6.85	5.23
Saudi Arabia	8.27	6.85	5.29	5.72	6.22	6.40	6.04	6.37	n.a.
UAE	13.32	22.99	34.38	9.68	10.87	16.44	18.89	21.47	19.94
Subtotal	2.52	2.81	2.72	2.77	3.42	4.26	3.19	3.49	n.a.
Latin America									
Colombia	0.75	1.48	1.17	1.19	1.82	2.07	2.31	2.07	2.00
Costa Rica	1.60	2.04	3.10	1.70	3.21	3.19	3.49	3.85	3.96
Dominican Rep.	0.14	0.49	1.00	1.43	1.47	1.08	1.11	1.39	1.92
El Salvador	0.95	0.99	1.48	1.95	1.94	1.82	2.24	2.55	2.49
Honduras	0.42	0.32	0.46	1.18	1.60	0.99	1.17	1.22	1.24
Nicaragua	0.06	0.16	0.31	0.37	0.35	0.42	0.48	0.65	0.65
Panama	1.93	2.09	2.54	2.17	2.01	2.09	2.39	2.32	2.28
Peru	0.11	0.63	0.59	0.91	1.63	1.40	1.66	1.55	1.63
Venezuela	0.59	1.11	1.92	1.17	0.52	0.41	0.30	0.12	0.05
Subtotal	0.56	1.05	1.22	1.19	1.48	1.42	1.58	1.49	1.51
Total 23 Countries	0.94	1.40	1.44	1.59	1.94	1.99	1.80	1.86	n.a.

In general, the level of per capita consumption has varied widely between countries in each region, but has been fairly consistent over time. The average per capita consumption of fresh apples for all 23 countries doubled between 1990 and 2010, but there has been limited growth since.

The combined population of the countries in East Asia was almost 500 million in 2016. The countries in the Middle East and in Latin America each had total populations over 150 million. Thus the 23 countries together accounted for over 800 million people, over 11 percent of the world total. Together, they constitute large market potential for imports of fresh apples. In general, per capita consumption of fresh apples was highest in those countries with the highest per capita incomes, such as Hong Kong and the United Arab Emirates. However, both these countries also have considerable exports to other countries that go through unofficial channels (smuggling), so the volume that is retained for domestic use can not be determined exactly. Both have shown wide fluctuations in per capita consumption in recent years.

Two other countries in Asia, Singapore and Taiwan, and four other countries in the Middle East, Bahrain, Kuwait, Oman and Saudi Arabia, had per capita consumption of fresh apples exceeding 6 kilograms. The best performer in Latin America, Costa Rica, did not quite reach 4 kilograms per capita. For most other countries, per capita consumption was relatively low, but had upside potential.

The outlook for per capita consumption of fresh apples in these non-producing countries will be heavily dependent on their ability to achieve political and economic stability in the coming years. That is a prerequisite for generating the increases in per capita income needed to drive increased consumption of imported goods such as fresh apples. It will also be affected by the absence of protectionist policies that could limit imports. Many of these countries have employed varied protectionist policies in the past, and have not committed to avoid such policies in the future.

### **Apple Consumption Relative to Produce Consumption**

Information on the relationship between consumption of fresh apples and consumption of all fresh fruit and fresh vegetables is limited in most countries. In addition, the data are presented in formats that are often not directly comparable. The four tables presented below summarize the relevant information available from four major consuming countries, the United States, Canada, the United Kingdom and Japan.

The table below shows that in the United States, per capita consumption of fresh apples in 2016 was just slightly below the level of a quarter century ago. It has generally been higher in recent years. Per capita consumption of fresh oranges fell markedly between 1990 and 2000, and has recovered little. Per capita consumption of fresh bananas jumped by 16 percent between 1990 and 2000, and has remained close to the 2000 level since. The biggest change has been in per capita consumption of all other fresh fruits. It rose by 7 percent between 1990 and 2000, and by a further 5 percent between 2000 and 2010. However, it has moved steadily upward since then. The cumulative gain between 2010 and 2016 has been over 13 percent.

The fresh apple share of fresh fruit consumption in the United States has fallen from 21.5 percent in 1990 to 15.9 percent in 2016, that for oranges from 15.7 percent to 7.9 percent, while that of bananas has slipped from 26.7 percent to 23.7 percent. In contrast, the share of all other fresh fruits has risen from 37.5 percent to 52.5 percent in the same period. Clearly, other fresh fruits have been the major drivers of increased demand for fresh fruit in the United States.

### **United States: Per Capita Consumption of Fresh Fruit and Vegetables, Selected Years, 1990-2016 (kilograms)**

Fruit	1990	2000	2010	2011	2012	2013	2014	2015	2016
Apples	8.89	7.94	6.94	6.99	7.26	7.85	8.44	7.89	8.39
Oranges	6.52	3.81	4.40	4.54	4.76	4.76	4.26	3.95	4.17
Bananas	11.07	12.88	11.61	11.57	12.25	12.75	12.70	12.70	12.47
Other Fruit	15.56	19.82	23.64	24.57	25.04	25.31	26.26	26.49	27.63
Fresh Fruit, total	41.44	44.45	46.49	47.67	49.31	50.67	51.66	51.03	52.66
Fresh Vegetables	65.10	78.90	65.50	64.40	65.60	63.90	64.40	64.20	65.80

For Canada, Statistics Canada reports fresh fruit availability per person, and availability after adjusting for losses. Only the former is presented here because it is more compatible with data from other countries. Between 2008 and 2016, the total availability of fresh fruit per person rose by 4.6 percent. The availability of fresh apples in the 2014-16 period was little changed from the availability in 2008. Availability of bananas grew faster than that of oranges/ mandarins.

**Canada: Availability of Fresh Fruit, 2008-2016**  
(kilograms per person per year)

Item	2008	2009	2010	2011	2012	2013	2014	2015	2016
Apples	10.87	11.81	9.40	12.54	10.74	10.92	11.46	10.96	10.16
Oranges/Mandarins	12.93	12.37	12.65	12.62	12.57	12.50	11.60	12.91	13.26
Bananas	14.32	14.28	14.53	14.69	14.75	15.43	15.61	15.68	15.70
Strawberries	3.05	3.30	3.47	3.81	3.83	3.70	3.12	3.13	3.18
Other Fresh Fruit	23.90	23.65	24.27	25.11	26.70	26.95	26.43	25.13	25.76
Total Fresh Fruit	65.07	65.41	64.32	68.77	68.59	69.50	68.22	67.81	68.06

Unlike the United States, per capita availability of other fresh fruits in Canada grew only modestly between 2008 and 2016. This may reflect the fact that Canada must import a much higher proportion of mainstream fruits like apples and oranges than does the United States, which may reduce the opportunity for the more exotic imported fresh fruits.

In the United Kingdom, household purchases of fresh fruit and vegetables is reported annually in the “Family Food” series of publications. Between 2007 and 2015, the quantity of all fruit purchased per person per week fell by 15 percent, while that of all vegetables fell by about 3 percent. However, the volume of fresh fruit purchased fell by about 10 percent, while the volume of processed fruit fell by over 25 percent. In the case of vegetables, fresh purchases fell by about 4 percent, while purchases of processed vegetables were little changed.

**United Kingdom: Quantity of Household Purchases of Fresh Fruit and Fresh Vegetables, 2007-2015**  
(grams per person per week)

Item	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fresh Fruit	855	790	762	755	764	744	744	766	773
Fresh Vegetables	790	760	753	757	739	734	748	745	756
Processed Fruit	430	408	381	368	386	363	370	330	320
Processed Vegetables	350	358	350	350	351	352	354	335	347
All Fruit	1,285	1,198	1,143	1,133	1,150	1,107	1,114	1,096	1,093
All Vegetables	1,140	1,118	1,103	1,107	1,090	1,086	1,102	1,080	1,103

The Family Food reports tracked changes in purchases before and after the Great Recession. For various reasons, prices rose rapidly in the United Kingdom during the transition period. As a result, lower income households adjusted their buying habits by both reducing the quality purchased and reducing the volume.

In Japan, the statistics agency reports the average quantity of fresh fruit purchased per household per year. There was a major decline in total purchases of fresh fruit in both the 1990s and the first decade of the twenty-first century. Purchases in 2010 were 29 percent lower than in 1990. That strong downward trend has continued in the 2010-2016 period. Purchases of fresh apples have held up better than those of the other fruit categories shown here.

### **Japan: Average Quantity of Fresh Fruit Purchased per Household per Year, 2000-2016 (kilograms)**

Fruit	1990	2000	2010	2011	2012	2013	2014	2015	2016
Apples	18.50	14.87	12.37	12.17	10.72	13.32	12.87	13.25	12.75
Mandarin Oranges	27.79	19.49	12.78	11.79	12.22	12.29	13.03	11.33	10.50
Bananas	13.09	18.88	20.39	19.60	20.36	18.24	18.02	18.12	17.96
Strawberries	4.51	4.06	2.95	3.12	2.52	2.79	2.57	2.54	2.27
Other Fruit	56.60	45.58	37.21	36.68	38.75	35.74	34.30	32.73	n.a.
Fresh Fruit, total	120.45	102.88	85.70	83.36	84.57	82.38	80.79	77.97	n.a.

This brief review of consumption data for fresh fruits and vegetables tallies with the information presented previously. Per capita consumption, availability or purchases of fresh apples have fluctuated from year to year but the general level has remained relatively firm. The other mainstream fruits, such as oranges and bananas have also maintained their position in the different countries. The biggest difference has been for minor fruits. Their purchase and consumption has continued to grow strongly in the United States, but has been either static or growing only slowly in the other countries reviewed. This suggests that the fresh apple category has been able to hold its own in the fresh produce sector through the uncertain economic conditions brought on by the Great Recession and subsequent economic slowdowns.

## **Future Prospects for Fresh Apple Consumption**

The data presented in the previous section shows that demand for fresh apples is either stagnant, or declining, in most parts of the developed world. This has occurred despite the exhortations from leaders of health and educational organizations that point out the scientifically validated benefits of including more fresh fruits and vegetables in diets. This can both improve the current health condition of the population, and help extend life spans.

It has become clear that in the developed world, increased per capita consumption of fresh apples will not occur without a substantial, directed promotional effort. However, for that effort to succeed, it must first identify the stumbling blocks to greater apple consumption and the positive triggers that might enhance consumption. Among the major stumbling blocks is the constantly changing array of snack items that are available to consumers twenty-four hours per day from convenience stores, drug stores, vending machines, sporting and entertainment sites, and even at home in the family refrigerator. With the increased urbanization of modern societies, longer commutes, and increasing time pressures, there are attractive manufactured snacks available at every turn.

Even within the fruit complex, promotional programs, such as Five-a-Day, are discouraged from favoring consumption of any fresh fruit or fresh vegetable above any other. In effect, an apple organization or firm that contributes to such a promotional program is also contributing to promotion of competing fresh produce items. For various reasons, generic promotions that focus solely on fresh apples have lost the support of most apple firms. In contrast, many competing fruits, vegetables and nuts continue to have well-funded generic promotional programs. Much promotion of apples is now done by large, individual marketers in support of their own, exclusive varieties, leaving established, mainstream varieties with no specific promotional support.

The apple also faces another handicap within the fruit segment. As consumers become more affluent, they seek to diversify their consumption of fresh fruits. In response, importers and retailers have provided a steady stream of new tropical and exotic fruits, and taught consumers how best to prepare, serve and enjoy such fruits. Over time, many fruits that were once exotic and expensive have become mainstream and affordable.

Another obstacle to apple consumption that has become more evident in recent years is the perception by lower income consumers that apples are expensive relative to other available snack items. As a result, a growing share of the population in the developed world rarely buy fresh apples. This is not an obstacle for higher income consumers. Indeed, many of them appear to be quite comfortable in paying substantial price premiums for the varieties they prefer. The apple market in developed countries is becoming increasingly bifurcated. On the one hand, lower income consumers are increasingly dropping out of the apple market. On the other hand, higher income consumers are pleased with the increased diversity of apple varieties that they can enjoy. The U.S. Department of Agriculture has published studies showing that fresh fruit remain affordable compared to alternative snacks, but lower income consumers have not been persuaded. Some retailers and marketers have offered “economy” packs of apples, but apple growers, packers and marketers continue to measure their success by how high an average price they can obtain in any season. This philosophy runs counter to that of attracting different income segments back into the apple market.

The previous section has also shown that there are many other markets outside the developed world that can be attracted to buying fresh apples if the economic conditions are favorable. Rising incomes, increased urbanization, and the introduction of modern supermarkets has encouraged year-round imports of products like fresh apples in many developing countries. While protectionism remains a problem, there appears to be unlimited potential for increased sales of fresh apples in such markets. However, sales and promotional campaigns in most developing country markets have been underfunded, opportunistic, inconsistent, and lacked long-term goals, and the strategies to reach those goals.

The challenges to increasing consumption of fresh apples in both the developed and developing world are real, but they are not insurmountable. However, it will require a coordinated effort among apple industry organizations in the major producing countries to tackle these challenges. Unfortunately, the discussion of such a coordinated effort has not yet begun.

## 5. Prices and Marketing Margins

### Retail Prices Affect All Apple Firms

Participants in the apple industry are most directly affected by the prices they receive at their point of sale. It is easy for them to forget that all prices in the distribution system are influenced most by the prices that are determined at the retail level. Retail buyers are in a pivotal position because they have detailed knowledge of the prices being offered by both domestic and foreign suppliers for every product variant. They know how their customers are likely to react to the prices they see on the produce shelves. And, they know what combination of prices will be most likely to give their retail firm an advantage over competing retailers. Some chain retailers apply a common pricing system to all the stores in their chain. Some allow local managers discretion to adjust prices to meet local competition. Others adapt their pricing tactics to changing market conditions.

Regardless, the prices at FOB shipping point for packed fruit, and at the grower level for raw fruit, are derived from the prices established at the retail level after deducting all the costs involved in moving the product through the distribution system. Thus, to understand the level and trends in prices throughout the distribution system, it is first necessary to understand the forces affecting retail prices.

Increasingly, food retailers are employing large databanks of information on consumer behavior for each commodity, and with each variety, size, condition and pack type within each commodity. In the past, retailers had to manage a delicate balancing act between optimizing retail revenues while retaining customers and attempting to gain an advantage over competitors. Big data, and dramatic increases in computing power, now allow retailers to run continual experiments on pricing and promotion for every product. However, there is a limit to how radical any experiment can be. Consumer tastes tend to change both slowly and gradually. In addition, frequent changes in prices or promotion can be costly to the retailer, and can confuse consumers. For these reasons, retail prices of products like fresh apples tend to be “sticky”, that is, to change slowly. Sudden weather events can disrupt stability. However, such weather events are more likely to affect a seasonal product like fresh sweet cherries, than a product like fresh apples that can be stored for many months.

## **Prevailing Economic Conditions**

While retailers are the key decisionmakers in setting prices, they also must respond to the general economic conditions in which they are operating. They are affected by conditions both in their home country and around the world. This was demonstrated dramatically in the last decade when a worldwide economic, financial and banking crisis caused many businesses to close, and many individuals to lose their jobs, homes and savings. Retail sales that had been fueled in the previous decade by cheap credit and widespread optimism among consumers were suddenly hit by pessimistic consumers and sharp falls in purchasing power.

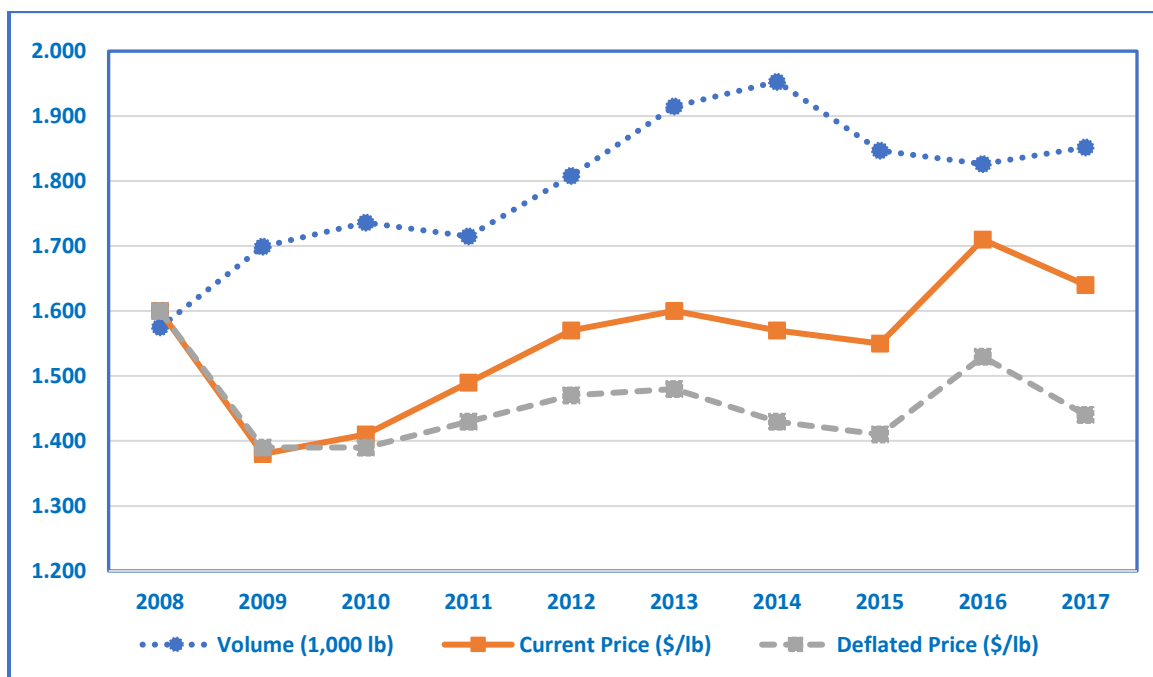
Recovery from the global economic woes was both slow and varied. In Europe, the euro crisis in Greece threatened to disrupt the economies of the 17 countries that used the euro currency. It was only after Mario Draghi, head of the European Central Bank, vowed to “take any steps necessary” to restore economic growth that the European economies began to recover. Japan, under Prime Minister Abe, took a broad range of steps to help the Japanese economy rebound. In contrast to most other countries, the economy in China rebounded very rapidly from the global crisis. Indeed, for several years after, Chinese demand for raw materials to fuel its industrial and export engine helped prop up the economies of both large and small commodity producers around the world. When Chinese import demand slowed in 2013, many dependent countries slipped back into recession.

However, one of the most significant elements of the economic recovery in many countries was that only the more affluent segments of societies rapidly regained their pre-recession levels of prosperity. Many of the poorer segments have not been able to regain their former well-paying jobs, retain their homes or rebuild their savings. While upscale retailers benefited from the quick recovery among their affluent clientele, and discount retailers gained an ever wider following among financially-stressed customers, the mainstream, traditional supermarket chains found their market share pinched from above and below. This has resulted in bankruptcies, increased consolidation, and changed tactics among the mainstream retailers. The growth of online shopping and home meal deliveries has added to the competition. Thus, changes in economic conditions have shaken up the traditional retail food distribution system, and presented new challenges in setting prices for many commodities.

## Retail Demand for Fresh Apples in the United States

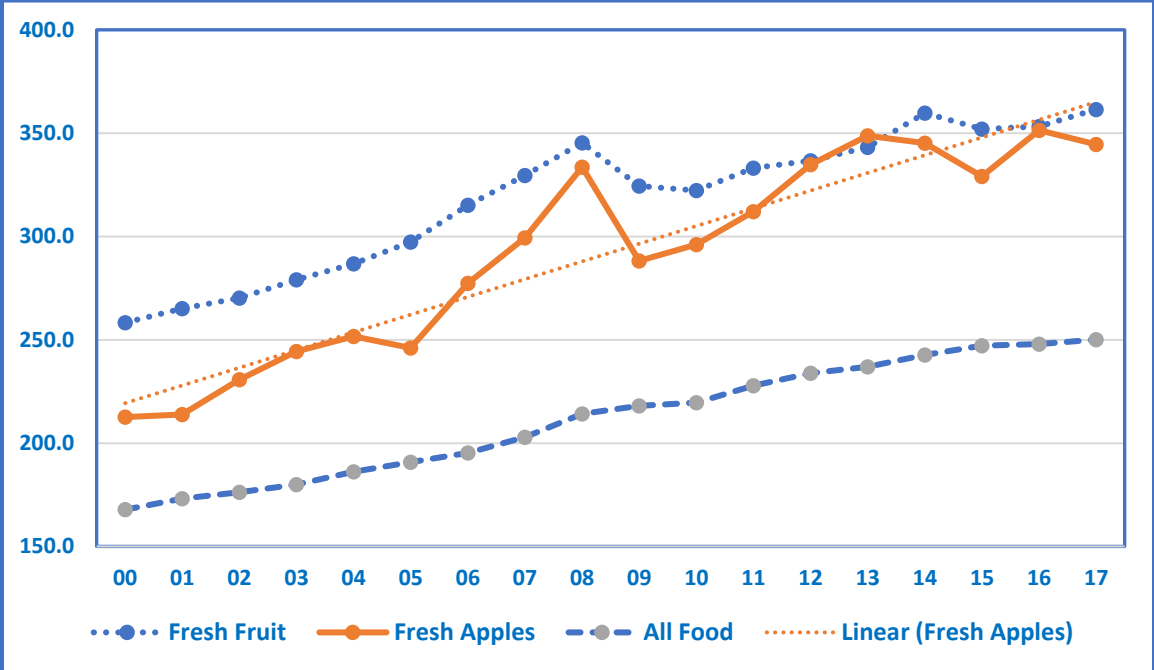
The chart below shows how retail demand for fresh apples has fared since the onset of the Great Recession. The data are drawn from the quarterly report, Fresh Facts on Retail, published by United Fresh. Similar data are not available prior to 2008. The upper dotted line shows the average weekly volume of fresh apples sold per store in each calendar year between 2008 and 2017. The middle (solid) line shows the actual average price paid per pound, and the lower (dashed) line shows the real (deflated) prices at 2008 prices. The average weekly volume continued to rise during the worst of the recession, reaching 1,953 lbs in 2014. It dropped back to an average of 1,842 lbs per week in the 2015-2017 period. In contrast, the average actual price fell sharply in 2009, and did not exceed the 2008 level until 2016. After deflation, the real retail price remained consistently below the 2008 level through 2017. In 2016, it bounced back nearer the 2008 level, but in 2017, it was again 10 percent below the 2008 level. After combining volume and price effects, the real weekly value of fresh apple sales at retail was just slightly above the 2008 pre-recession level in 2017. The best that can be said is that the fresh apple category did not lose ground in U.S. retail stores between 2008 and 2017.

### United States: Fresh Apples, Average Weekly Volume per Store and Average Retail Prices, Current and Deflated, 2008-2017



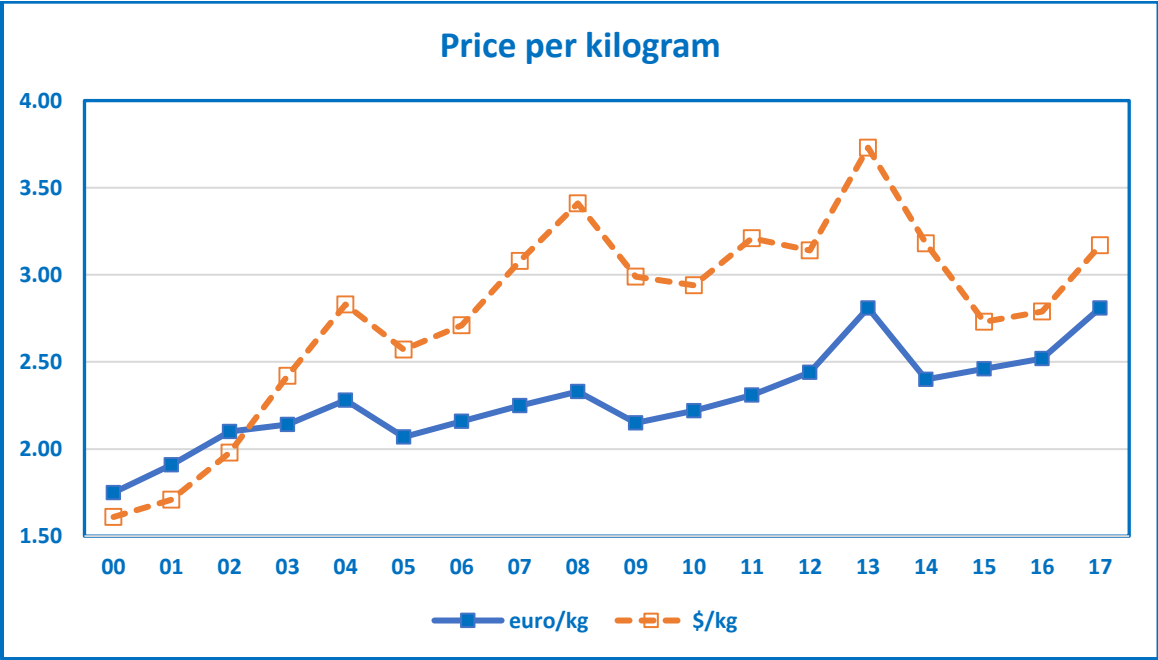
One of the factors that guides retailers in setting prices for fresh apples are the trends in prices of all foods, and particularly of all fresh fruits. The chart below compares the retail price index for fresh apples in the United States with the price index for all food and the price index for all fresh fruit. All three indexes moved upwards between 2000 and 2008. After the recession hit, the rate of growth in the price index for all food slowed dramatically, while those for all fresh fruit and for fresh apples both fell sharply in 2009. Since then, all three indexes have risen slowly. As one might expect, the index for the individual item, fresh apples, has been more variable than that for all fresh fruit, while that for all fresh fruit has been more variable than that for all food. The linear trend line for fresh apple prices indicates that apple prices have risen faster than those for all food over the entire period. However, since the recession, between 2008 and 2017, the index of prices for all food rose by 16.8 percent, that for all fresh fruit by 4.7 percent, and that for fresh apples by only 3.3 percent. Conditions have turned less favorable for the prices of fresh apples.

**United States: Annual Average Retail Price Index of Fresh Apples, Fresh Fruit and All Food, 2000-2017**  
(1982-84 = 100)



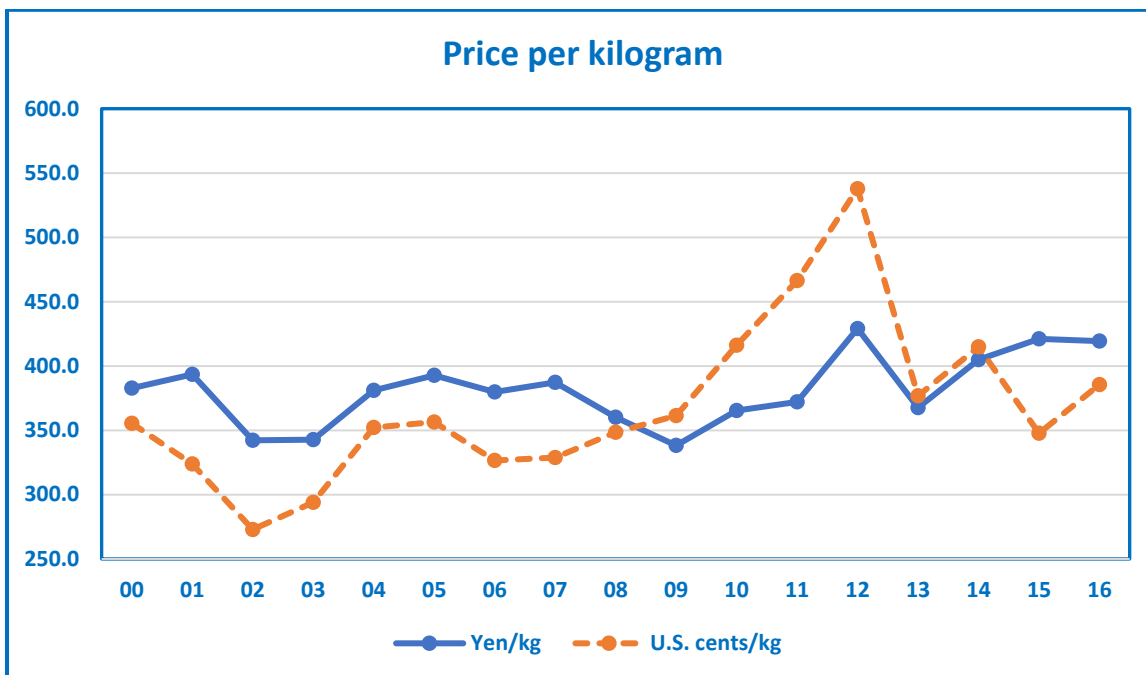
Although the Americas are separated from Europe by the Atlantic Ocean and from Asia by the Pacific Ocean, trade tends to lead prices in different continents to move roughly in step. The chart below shows annual average retail prices of fresh apples in France in both euros, and when converted to U.S. dollars. Prices in euros (solid line) had a similar trajectory to those in the United States shown in the previous chart with temporary peaks in 2004, 2008 and 2013. Prices for 2017 are likely to be an anomaly because Europe had a very short apple crop, while the United States had a large crop, and trade between the two has been greatly reduced because of phytosanitary barriers. Prices in U.S. dollars showed wider fluctuations than those in euros. However, French retailers and consumers would have been responding to actual prices in euros.

**France: Annual Average Retail Prices of Fresh Apples, 2000-2017  
(euros and U.S. dollars per kilogram)**



A similar analysis was conducted for retail prices of fresh apples in Japan in terms of Japanese yen and U.S. dollar equivalents. The results are shown in the chart on the next page. The average retail prices of fresh apples for Japan were derived from the annual series on expenditures and quantities for two or more person households, so they represent the actual prices paid by consumers.

## Japan: Annual Average Retail Prices of Fresh Apples, 2000-2017 (Japanese yen and U.S. cents per kilogram)



The prices in Japanese yen were much more stable than those shown for the United States and France. However, when converted to dollar equivalents, the pattern of Japanese prices more closely resembled those of the United States and France, even though trade between these three countries is minimal.

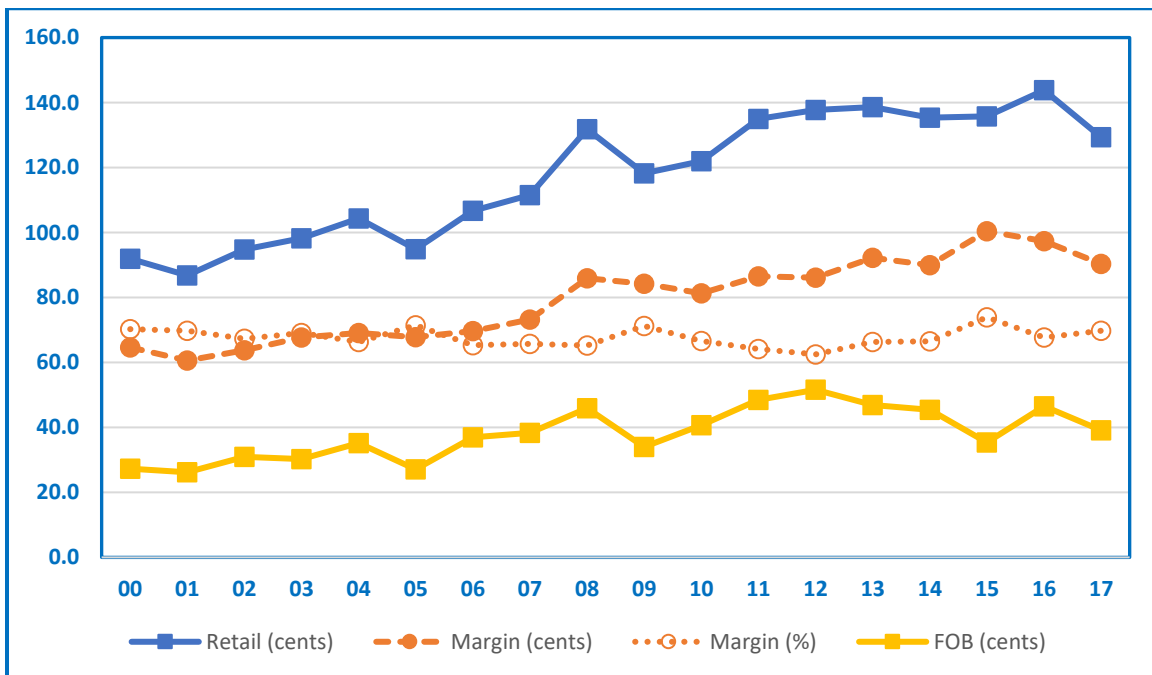
### Transmitting Retail Prices through the Marketing System

As previously noted, prices of fresh apples and other foods are initially set at the retail level. Typically, retailers mark a price on their shelves, and shoppers decide how much, if any, of each product they will buy. Both the retailer and the shopper can adjust their decisions over time. But, in general, prices earlier in the marketing chain will reflect that retail price after deductions for moving the product to each point in the marketing chain. Ultimately, the grower price will reflect all the deductions incurred in that process. Among the many costs are assembling raw apples for sorting and packing in inner and outer containers, storage, loading in shipping containers, hauling across country, offloading at distribution centers and breaking down loads for distribution to individual stores.

In addition to the physical costs, the marketing system also requires payment for many additional services, including quality inspections in orchards, packing sheds and storage rooms, government and private certifications, industry levies, and financial, insurance, communications, research, promotion and public relations activities. Apple operations also incur all the normal business costs of capital, labor, rent, taxes, and interest on borrowings.

Because there are so many inter-related, moving parts in the marketing system, it is both difficult and expensive to measure how retail prices are converted to prices earlier in the marketing chain. For example, a single variety of apple may be shipped from different origins, by different routes and modes, to different destinations. It may be shipped in one month or calendar year, and arrive in a different month or calendar year. Different varieties may face different situations. The marketing system can only be tracked using broad generalizations based on the available data. Because of its once dominant position in the U.S. apple marketing system, such tracking was done most easily for the Red Delicious variety.

### United States: Red Delicious. Retail Prices and Marketing Margins, Annual, 2000-2017



The chart above shows annual average estimates of the retail prices and FOB shipping point prices of Red Delicious in the United States for the calendar years from 2000 to 2017. It also shows the actual margin in cents per pound, and as a percent of the retail price. This method assumes that the identical item is being priced at the different marketing levels, so it does not allow for variations in grade, size or quality between shipping point and retail.

The chart shows that annual average retail prices of Red Delicious have shown a similar upward trend and temporary peaks to those of all U.S. apples, so it should be reasonably representative of all U.S. apples combined. Both retail prices and absolute marketing margins have been on a long, upward trend. However, percentage marketing margins have been remarkably stable during the 17-year period. For example, they averaged 69.1 percent for the three-year period, 2000-2002 and 70.5 percent for the three-year period, 2015-2017.

The lowest (solid) line in the chart above shows that FOB shipping point prices of Red Delicious were on a long upward trend between 2000 and 2012, but have generally drifted downward since. The FOB shipping point share of the retail price is the inverse of the marketing margin share, so it has fallen from 30.9 percent in 2000-2002 to 29.5 percent in 2015-2017. This indicates that changes in marketing margins have not led to major changes in FOB prices.

### **Effects of Inflation on Apple Prices**

In the past, in many apple producing countries, price inflation, that is, a general increase in prices, has been a disruptive economic force. Rapid inflation has been a particular problem when the prices paid by apple operators for various inputs have risen faster than the prices received for apple products. Such a situation is often referred to as a cost-price squeeze. Essentially, the profitability of the operation is reduced without any change in the operator's practices. In many cases, the apple industry has little or no control of the prices paid or prices received. For example, prices of petroleum-based products are determined in world markets, while prices of labor (wages) are determined by the supply and demand for labor in the operating region. In order to avoid such a cost-price squeeze, operators have been forced to review the various activities performed by their firm, and to alter the mix of inputs they purchased, or increase the value of the products they sell, neither of which are easy options.

Rapid inflation has also distorted the decisions apple operations make regarding expansion or contraction of their businesses. For example, in a period of rapid inflation, a producer or packer could borrow to expand operations, and then pay off the loan in cheaper dollars. The inverse is also true, that in a period of rapidly falling prices, a producer or packer who borrowed to expand operations would have to pay off their loan at more expensive dollars. However, that latter situation has not occurred as frequently.

Since the onset of the Great Recession, many countries have experienced periods of either low inflation, or of actual deflation (a general fall in prices). This has contributed to interest rates that have been persistently low. Low borrowing costs have, in turn, induced many apple firms to expand their operations more than they otherwise would. However, if interest rates were to rise suddenly, firms could be faced with a rapid escalation in repayments, an outcome that has occurred in many industries, and in many periods, in the past.

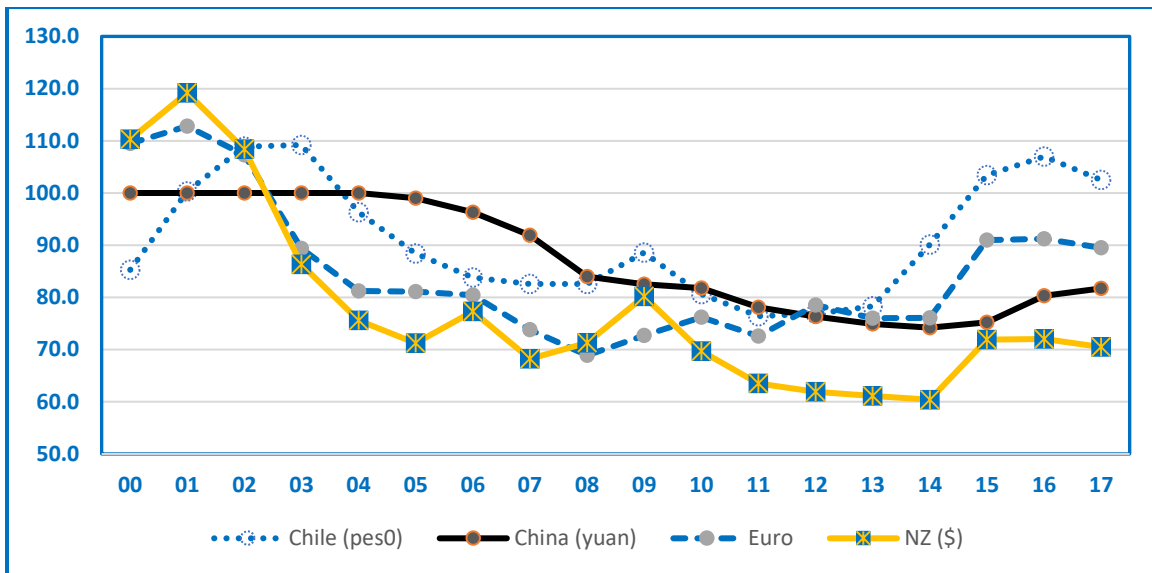
Central bankers in many countries have used various policy levers to bring general price inflation back to a normal level, defined by them as about 2 percent per year. One of their levers has been a gradual increase in prime lending rates, so interest rates are also scheduled to rise. There is always the danger that central bankers will overshoot their inflation targets, and that inflation could again get out of control. However, the chances of that happening in the near future are low. Inflation and interest rates should remain relatively benign for the apple industry in most countries.

### **Distorting Effects of Exchange Rate Changes**

Exchange rates are just another form of price faced by international traders. The exchange rate is the price an operator must pay in one currency to buy a unit of another currency. If exchange rates between currencies were stable, they would have little effect on business decisions. However, this is far from the case. The chart on the next page shows how the value of key trading currencies have changed relative to the U.S. dollar between calendar year 2000 and calendar year 2017. To make comparisons easier, all the exchange rates shown use a standard base of the average rate for the five-year period, 2000-2004. Changes also occur within years, but these are not shown here.

There have been wide swings in these key exchange rates over time. The most extreme example is the New Zealand dollar. It ranged from a high of 119.2 percent of the base in 2001 to a low of 60.4 percent in 2014. Essentially, the New Zealand dollar could buy twice as many U.S. dollars in 2001 as it could in 2014. There were similar wide variations for the Chilean peso and the euro. In contrast, the value of the Chinese yuan was fixed between 2000 and 2005, then tightly managed in a sharp decline between 2005 and 2008, and controlled in a narrow band thereafter.

### Value of Selected Currencies per U.S. Dollar, 2000-2017 (Index to Base 2000-04 = 100)

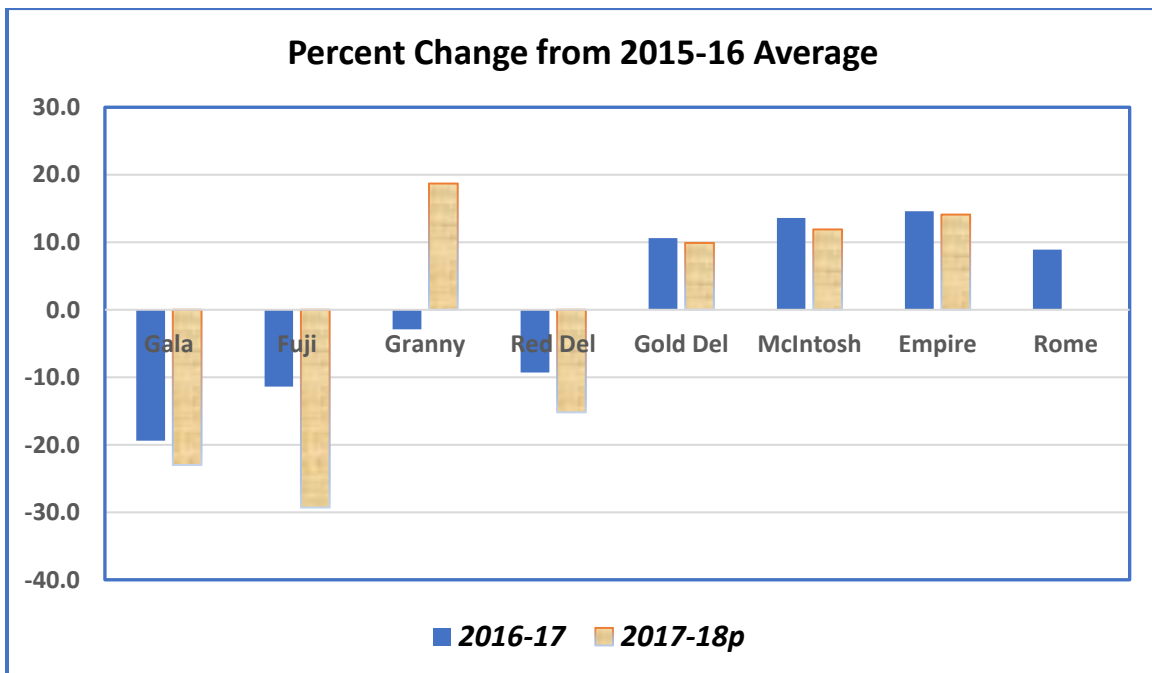


In general, all four currencies declined against the U.S. dollar between 2000 and 2013, making their products more competitive against U.S. products. Since 2014, the value of all four currencies have increased against the U.S. dollar, making their products relatively more expensive. However, over the entire period from 2000 to 2017, all but the Chilean peso have fallen in value against the U.S. dollar. These exchange rates changes also affect the returns to producers in these exporting countries. When trade is conducted in U.S. dollars, as it often is, producers benefit from a low value of their currency against the U.S. dollar. Conversely, when their currency strengthens against the U.S. dollar, as the Chilean peso did between 2013 and 2016, producers get lower returns in the domestic currency. Thus, dealing with adverse currency moves is just one more challenge that international marketers must face.

## Wholesale Price Trends, by Variety

Information on prices of fresh apples at the wholesale level are occasionally available by variety, but are rarely summarized in a format for re-use. One exception has been the Producer Price Index published monthly by the U.S. Bureau of Labor Statistics. For many years, only traditional mainstream varieties like Red Delicious, Golden Delicious, Granny Smith, Rome and McIntosh were covered. In the last three years, data has been added on three established, but newer, apple varieties, Gala, Fuji and Empire. The chart below shows how average wholesale prices for each of these varieties changed in 2016-17 and 2017-18 from the base in 2015-16. Prices fell in both 2016-17 and 2017-18 for Gala, Fuji and Red Delicious. In contrast, Golden Delicious, McIntosh and Empire recorded price gains in both years. Granny Smith prices fell in 2016-17, but rebounded in 2017-18. Rome prices gained in 2016-17, but no data were available for 2017-18. While these newer series add to our understanding of price trends by variety, many important emerging varieties, like Honeycrisp and Ambrosia, are still not covered.

### United States: Estimated Changes in Producer Price Indexes for Selected Apple Varieties, 2016-17 and 2017-18 v 2015-16 (Percent Changes)



## **Influence of Varieties and Promotional Claims**

Differences in the prices of different varieties are also reflected at the retail level. While much of the information is proprietary, occasional reports are made public. For example, in the second quarter report of Fresh Facts on Retail, from United Fresh, the category spotlight showed that the U.S. average retail price of fresh apples was \$1.59 per lb. However, for individual varieties, the prices varied from a high of \$2.50 for Honeycrisp to a low of \$1.23 for Red Delicious. Price for Fuji (\$1.51), Granny Smith (\$1.47) and Gala (\$1.32) were nearer the lower end of the range. This has major implications for producers, marketers and retailers. For example, while Honeycrisp only accounted for 15 percent of weekly fresh apple volume, it contributed 23 percent of retail revenue. In contrast, Gala accounted for 27 percent of volume but only 22 percent of retail revenue. Trends in these shares need to be closely monitored for the apple industry to develop effective promotional strategies at every level of the marketing system.

Most of the information on promotion of different apple varieties remains proprietary and is not publicly available. However, in the 2010-11 season, USDA,AMS began to produce a weekly report, “National Retail Report – Specialty Crops” that lists the number of stores with ads, and the average advertised prices for hundreds of produce items, including major varieties of fresh apples. The survey is based on responses from 400 retailers that control over 30,000 individual stores, providing very wide coverage of produce sales in the United States.

The number of apple varieties covered has grown over time, enabling comparison between varieties, both within and between seasons. Data are reported separately for apples grown using conventional methods and those labeled as organic. The share of organic apples in total apple shipments has been rising steadily, and was about 10 percent of the total in the 2017-18 season.

The table below shows average weekly number of stores with ads for each major variety sold per pound in the three complete seasons, 2014-15, 2015-16 and 2016-17, and for two-thirds of the 2017-18 season. Traditionally, twenty percent or more of fresh apples were sold in nondescript 3-lb or 5-lb film bags. More recently, they have also been sold in special packs, such as 5.5-lb clamshells and 2-lb glossy pouch bags. However, to enable long-term comparisons, we focus here only on apples sold per pound.

The table below shows that the total average weekly number of stores with ads has varied by season with the volume of apples sold. The organic ad share of the total has fluctuated around 20 percent of the total. In 2014-15, the largest number of ads for conventional apples was for Gala apples, followed by Red Delicious, Fuji and Granny Smith. In 2017-18, there was a very large increase in stores with ads for Honeycrisp. Gala was nudged into second place. The increase in the share of ads devoted to the most expensive apple represented a significant shift in retailer promotional tactics. For organic apples, by far the largest share of stores with ads in 2014-15 were for Gala, with Fuji a distant second, and Honeycrisp accounting for less than 6 percent of the total. By 2017-18, Gala was still the leader in number of stores with ads, but Honeycrisp had leapfrogged into second place with almost 20 percent of the stores with ads. The top three varieties, Gala, Honeycrisp and Fuji accounted for almost 75 percent of all ads for organic apples.

### **United States: Average Weekly Number of Ads for Major Varieties, sold per pound, 2014-15 to 2017-18 Seasons**

Variety	2014-15	2014-15	2015-16	2015-16	2016-17	2016-17	2017-18	2017-18
	Conv.	Org.	Conv.	Org.	Conv.	Org.	Conv.	Org.
Braeburn	935	132	799	105	690	137	481	149
Fuji	2,541	842	2,039	754	2,546	1,080	2,433	999
Gala	4,387	1,558	3,011	937	4,311	1,581	4,364	1,651
Golden	1,765	408	900	139	766	144	495	114
Granny	2,278	359	1,809	264	1,902	402	1,901	387
Honeycrisp	1,793	250	2,262	287	2,428	448	5,345	916
McIntosh	424	1	405	1	268	1	466	1
Cripps Pink	627	94	864	124	1,203	179	646	145
Red Delicious	3,459	669	2,063	354	2,308	470	1,829	395
TOTAL	18,208	4,313	14,153	2,965	16,422	4,442	17,960	4,757

The table below shows average weekly advertised prices for the same varieties and seasons in both conventional and organic modes. As one would expect, advertised prices were generally lower in years with the largest fresh apple crops, and higher in years of smaller crops. For example, advertised conventional prices were higher for each variety and for all varieties combined in 2015-16 compared to those in 2014-15. They were lower for seven of the nine varieties, and for all varieties combined, in 2016-17.

In contrast, in 2017-18, while advertised prices of six varieties were lower than in 2016-17, the average for all varieties was higher. This was due largely to the greater frequency of ads for the highest-priced Honeycrisp apples. A similar outcome was found for organic prices in 2017-18. Advertised prices for Honeycrisp, Granny Smith, Fuji and Gala had similar rankings as did the retail averages reported by United Fresh. However, one variety not included in the United Fresh data, Cripps Pink, was second only to Honeycrisp in advertised prices.

Advertised prices for organic apples averaged over 50 percent higher than conventional prices in 2014-15, 2015-16, and 2016-17, but less than 40 percent higher in 2017-18. This change was strongly influenced by the greater number of ads for Honeycrisp in 2017-18. While the absolute premium for organic Honeycrisp over conventional Honeycrisp was among the highest for all varieties at 85 cents per lb, the percentage premium for organic Honeycrisp was among the lowest at 36.5 percent. Retailers may believe that there is an upper bound of organic prices that is acceptable to consumers. Much of the variation in average advertised prices from season to season has been due to changes in the number of stores featuring ads for Honeycrisp. As supplies of Honeycrisp continue to grow, the influence of Honeycrisp in retail apple promotions is also likely to grow.

### **United States: Average Weekly Advertised Prices for Major Varieties, sold per pound, 2014-15 to 2017-18 Seasons**

Variety	2014-15	2014-15	2015-16	2015-16	2016-17	2016-17	2017-18	2017-18
	Conv.	Org.	Conv.	Org.	Conv.	Org.	Conv.	Org.
Braeburn	1.193	1.850	1.331	1.935	1.334	2.011	1.298	2.123
Fuji	1.277	2.041	1.457	2.302	1.364	2.081	1.360	2.081
Gala	1.268	2.010	1.393	2.254	1.263	2.047	1.318	2.030
Golden	1.176	2.122	1.242	2.286	1.272	2.017	1.196	1.938
Granny	1.327	2.166	1.352	2.349	1.349	2.238	1.545	2.117
Honeycrisp	2.240	3.145	2.447	3.086	2.383	3.540	2.339	3.193
McIntosh	1.174	n.a.	1.188	1.710	1.143	1.990	1.150	2.154
Cripps Pink	1.557	2.163	1.701	2.449	1.663	2.219	1.620	2.182
Red Delicious	1.154	1.920	1.222	2.076	1.128	1.802	1.096	1.873
TOTAL	1.346	2.090	1.540	2.332	1.466	2.202	1.632	2.264

## Influence of Processing Options

The volume of apples demanded for processing uses continues to significantly influence average grower prices and profitability in many countries. While many growers have been trying to reduce the share of their production that goes to the processor, that share remains high. The prices received by growers also differ depending on the apples' final use. The following table shows the volume of apples in the United States going to different uses in selected three-year periods over the last quarter century and in the two most recent seasons. The next table shows the average grower price received for apples in different uses over the same periods.

The total quantity of all apples used in the United States has varied over the quarter century, but was about 6 percent higher in 2016-17 than in the three-year base period, 1991-93. However, the volume used fresh has risen by over 30 percent in the period, while the volume processed has fallen by 26 percent. In absolute terms, fresh use rose by 805,500 metric tons, while processing use fell by 531,300 metric tons. The general trend among individual processing uses has been downward, with the biggest percentage drop occurring for uses in juice and cider and in frozen products. Uses in fresh slices soared between 2003-05 and 2015-16, but fell back in 2016-17. In contrast, dried uses rebounded to earlier levels in 2016-17.

### United States: Quantities of Apples in Major Alternative Uses, Selected Years, 1991-2017 (1,000 metric tons)

Use	1991-93	1997-99	2003-05	2009-11	2012-15	2015-16	2016-17
Fresh	2,621.5	2,755.1	2,754.4	2,853.6	3,231.5	3,127.9	3,427.0
Processed	2,016.4	1,998.4	1,580.0	1,407.6	1,370.6	1,392.9	1,485.1
Canned	626.6	608.0	553.0	509.6	474.2	503.5	541.4
Juice/ cider	1,065.6	1,072.0	759.0	584.2	619.1	602.8	606.6
Frozen	123.3	125.5	120.7	96.5	79.9	85.0	62.4
Dried	149.6	132.2	86.8	78.6	85.4	81.2	153.9
Fresh slices	n.a.	n.a.	34.4	79.2	76.8	84.6	60.6
Other	51.3	60.6	26.1	30.3	35.0	35.8	60.2
TOTAL	4,637.9	4,753.5	4,334.3	4,080.6	4,602.6	4,520.7	4,912.1

Changes in price levels over time also help to explain some of the changes in uses of apples. Fresh prices have grown faster than average processed prices. For example, in 1991-93, fresh prices averaged about three times processing prices. By 2016-17, they averaged close to four times processing prices. In general, prices for the different processing uses tended to move in tandem from period to period and over the long-term, reflecting the overall availability of apples in any period. Average inflation between 1991-93 and 2016-17 has been about 71 percent, so fresh prices have beaten inflation, while processed prices have not.

Among processing uses, the highest prices have been for apples used in fresh apple slices. These generally must meet the same quality criteria that are demanded by the fresh market. However, the price to the grower has consistently been about half that for whole fresh apples. After an initial spurt in demand as major fast food chains expanded use of fresh apple slices, demand fell sharply in 2016-17, and prices to the grower flatlined. In recent years, most of the innovation in the U.S. apple industry has been directed at the whole fresh apple market, while that in processed apple uses and in fresh slices has waned. Accordingly, the prices of whole fresh apples are likely to continue to be the main influence on the average prices received by U.S. growers for all apples.

**United States: Prices of Apples in Major Alternative Uses,  
Selected Years, 1991-2017  
(\$ per metric ton)**

Use	1991-93	1997-99	2003-05	2009-11	2012-15	2015-16	2016-17
Fresh	460.12	444.17	520.36	758.64	862.09	972.23	908.30
Processed	149.04	136.61	125.78	195.22	233.37	221.56	234.79
Canned	167.96	178.00	166.11	219.20	282.79	265.65	268.96
Juice/ cider	130.52	109.17	86.97	158.50	173.52	168.81	179.67
Frozen	193.13	182.70	176.72	216.07	270.50	267.86	268.96
Dried	159.39	110.11	109.45	154.49	190.24	205.03	222.66
Fresh slices	n.a.	n.a.	235.55	390.33	417.17	450.84	429.90
Other	141.76	169.53	186.07	344.93	250.84	212.13	281.93
TOTAL	324.87	314.87	375.95	682.93	674.74	740.74	705.47

## **Influence of Trade on Apple Prices**

Trade is the major equilibrating force that brings apple prices closer together in different countries. The most direct effects are seen in bilateral trade between any two countries. Exports from country A to country B will tend to take place when prices of any product (for example, fresh apples) in country A are lower than prices for the same product in country B. However, an increase in fresh apple exports from country A to country B will tend to raise the domestic apple prices in country A, and lower the domestic prices in country B. As trade increases, the gap in apple prices between country B and country A will keep on narrowing until apple exports to country B no longer lead to higher prices in country A and exports will cease.

The indirect effects of trade are less obvious. However, if country C also exports apples to Country B, its prices will be affected by increased supplies from Country A. Theoretically, if a country belongs to a free trade area, exports landed in any country in that free trade area can potentially affect every other country in that free trade area. Most obviously, when exports arrive in transit countries like Belgium or the Netherlands, the impact on markets in other EU countries can be almost instantaneous. So many apple exporting countries are now participants in bilateral or multilateral trade deals that the indirect effects of trade can penetrate most countries in the world.

The major justification for international trade is that when different countries or regions have a competitive advantage in different products, it will pay each to concentrate production in the product in which they have a comparative advantage, and to trade their surpluses. An obvious example would be where a country with a tropical climate specializes in bananas and a country with a temperate climate specializes in apples, and they trade their surpluses. Both countries gain economically and, as a bonus, their diets are enriched. The process of specialization has progressed far beyond agricultural products. In manufactured products such as complex electronic devices, different countries may contribute to the supply chain in areas where they have a comparative advantage. One country may have design capabilities, another supplies of a scarce mineral, a third the needed engineering structure, a fourth a plentiful supply of skilled labor, and so on. Even in a product like fresh apples, different countries may specialize in different apple varieties, or differ in harvest timing, so trade between apple producing countries is still appropriate.

Trade has become intrinsic to worldwide economic progress, but also remains a magnet for opposition on many grounds. While it benefits the overall economy and consumers generally, it can lead to lower prices for domestic producers of imported products. This can, in turn, lead to loss of jobs, of individual firms, or, in the extreme case, of entire commodities or industries. The reaction to such losses is often highly emotional. Since the gains from trade tend to be dispersed among many thousands of consumers, while the losses are concentrated on a few firms or workers, critics of free trade are usually better organized and more vocal in their opposition than are supporters. Opposition to free trade tends to rise in periods of greater economic stress such as those that followed the Great Recession.

The promoters of freer trade after World War II recognized that opposition was deeply ingrained, persistent, and easily re-activated. In response, they set out to build an international system that would gradually absorb countries that were willing to accept the pain of freer trade for the potential of receiving broader benefits. The General Agreement on Tariffs and Trade (GATT) provided a framework for that process. Beginning with just a few countries, it used a series of negotiating rounds to gradually lower barriers to trade. Essentially, negotiating partners traded concessions with each other. The process was most successful with manufactured products. Key to the GATT's success was the use of the Most Favored Nation (MFN) principle. Member countries agreed to extend their best (most favored) trade concessions with any partner country to all partner countries. Over time, as the GATT process helped to stimulate the economies of partner countries, it attracted more members. By the 1980s, the GATT process had reduced tariffs on most industrial products around the world.

However, between the 1940s and the 1980s, freer movement for services, capital and intellectual property had become more important than trade in goods to many economies. Much of agriculture remained behind protective barriers, which tended to be highest for processed products. When it appeared that the GATT system had lost its effectiveness, the Reagan administration in the U.S. mounted a last major negotiating round, dubbed the Uruguay Round because its inaugural meeting was held in Uruguay. Major breakthroughs in freeing trade were achieved during the Uruguay Round negotiations, so much so, that the partner countries agreed to convert the GATT into a more permanent World Trade Organization (WTO) that would be tasked with completing the trade liberalization agenda.

The WTO hired a small staff in Geneva, initiated a number of trade summits, added many new members, notably including China and Russia, and set up a dispute resolution system. Unfortunately, the WTO became a target around which those who opposed trade liberalization coalesced. A small number of dissenting voices were able to block progress at the series of WTO global trade summits. Eventually, member countries abandoned prospects for comprehensive global trade agreements, and chose to pursue more limited bilateral or regional trade deals. However, lack of coordination between such deals can lead to further distortions of trade. In addition, the larger partners, such as the United States or the EU, can exert undue influence on the terms of such agreements. Weaker partners can be forced to accept commitments or restrictions demanded by the stronger partner.

During and after the Great Recession and the global financial crisis, government policy makers focused more of their attention on emergency measures to stimulate their economies, while the WTO aimed to prevent a resurrection of protectionism. As the emergency faded, a number of large liberalization efforts were initiated. One was the Transpacific Partnership (TPP) that included the United States, Japan and ten other Pacific Rim countries, but omitted China. A second was the Transatlantic Trade and Investment Partnership (TTIP) between the United States and the European Union that would have included about half of world GDP. Upon his inauguration, President Trump withdrew the United States from the TPP. Eventually, the eleven remaining partners have agreed to move ahead with a more limited TPP. Given its other problems, and a lack of interest from President Trump, the European Union has allowed the TTIP proposal to become dormant.

President Trump has thrown trade relationships into further confusion with two stances. The first is his general dissatisfaction with agreements negotiated by previous U.S. administrations, including the WTO and NAFTA. He has called for major changes in both these agreements. The second is placing temporary tariffs on various products deemed to be putting U.S. producers at an unfair advantage. The third, and perhaps most serious, is his proposal to place tariffs and other obstacles to Chinese goods and companies in retaliation for Chinese theft of intellectual property, dumping excess production on world markets, and ignoring its WTO obligations to treat foreign firms equally with domestic Chinese firms. China has promised to retaliate in kind, including threatening to place additional tariffs on many agricultural products, including apples.

Due to past liberalization efforts, trade in fresh apples continues to be robust, but vulnerable to further disruptions. This section explores how trade has affected apple prices. The next two tables show how the largest trading block, the European Union, has influenced fresh apple export and import prices from many countries between 2010 and 2017. The first table shows average annual fresh apple export prices for the EU-28 in total, and for member countries with the largest exports of fresh apples. The period covered includes the years that the EU was emerging from the Great Recession, and the last year of more robust economic growth.

Average export prices for the entire EU-28 in 2017 were virtually identical to those recorded in 2008 before the global recession hit. Prices fell by over 20 percent in 2009 and were still 18 percent lower in 2010, when trade was most severely disrupted. They bounced back by 14 percent in 2011, and have averaged close to that level since. There was a strong tendency for export prices for individual countries to move in step with each other and with the overall average. For example, the EU-28 average price, and the price for all ten individual countries fell between 2013 and 2014. However, there were occasional exceptions to this general rule. There were also notable differences in the prices received by major Western European exporters like France and Italy, and Eastern European exporters like Poland and Czechia, due to perceived quality differences. High export prices for the Netherlands, reflect the inclusion of higher-valued re-exports.

### **EU-28: Average Fresh Apple Export Prices of Major EU Exporters, 2010-2017 (Euros per metric ton)**

Exporter	2010	2011	2012	2013	2014	2015	2016	2017
Austria	523.35	671.83	647.95	771.78	643.04	584.66	680.20	497.15
Belgium	548.93	556.78	699.21	781.24	626.00	540.71	570.83	711.96
Czechia	238.16	364.69	219.34	292.18	232.53	206.32	234.69	409.56
France	690.42	729.76	855.05	900.39	777.66	875.76	929.09	976.64
Germany	565.74	670.30	582.37	774.10	635.34	596.69	646.27	711.51
Greece	379.63	474.90	479.08	522.90	460.56	415.39	376.21	384.79
Italy	680.89	731.25	780.61	892.65	753.52	757.37	789.01	832.40
Netherlands	676.51	729.80	812.03	1,148.31	962.90	957.18	1,027.54	1,068.82
Poland	281.49	375.43	355.36	360.40	321.05	317.99	289.85	341.99
Spain	501.89	602.41	659.10	687.22	664.80	703.86	755.78	656.61
All EU-28	550.22	628.14	632.24	676.51	594.92	572.81	618.93	671.89

In addition to being the world’s largest exporter, the EU-28 remains the world’s largest fresh apple importer as it includes the second and third largest individual importers, Germany and the United Kingdom. The table below shows the average price of fresh apples sourced from 10 major supplying countries outside the EU-28. Six of these are off-season suppliers from the Southern Hemisphere, while four are from the Northern Hemisphere, two from Asia, and two from North America. One can observe similar patterns with import prices as with export prices. Prices fell by 14 percent between 2008 and 2009, and did not exceed the 2008 level until 2013. Prices in 2017 were only modestly above those in 2008, despite substantial inflation in the intervening period. Prices for individual suppliers tended to move in step with the overall average import price. For example, average prices rose between 2014 and 2015, as did prices for nine of the ten individual countries. Between 2015 and 2016, all prices, both the average, and those for individual countries fell.

There were also major differences in the prices received in the EU-28 by the major suppliers. Australian prices were generally highest due to the preponderance of premium Pink Lady apples in the small Australian supplies. Prices for apples from Brazil, China and Turkey were generally lowest, those for New Zealand and the United States highest behind Australia. Not obvious here is that prices for individual countries were sensitive to the volumes supplied.

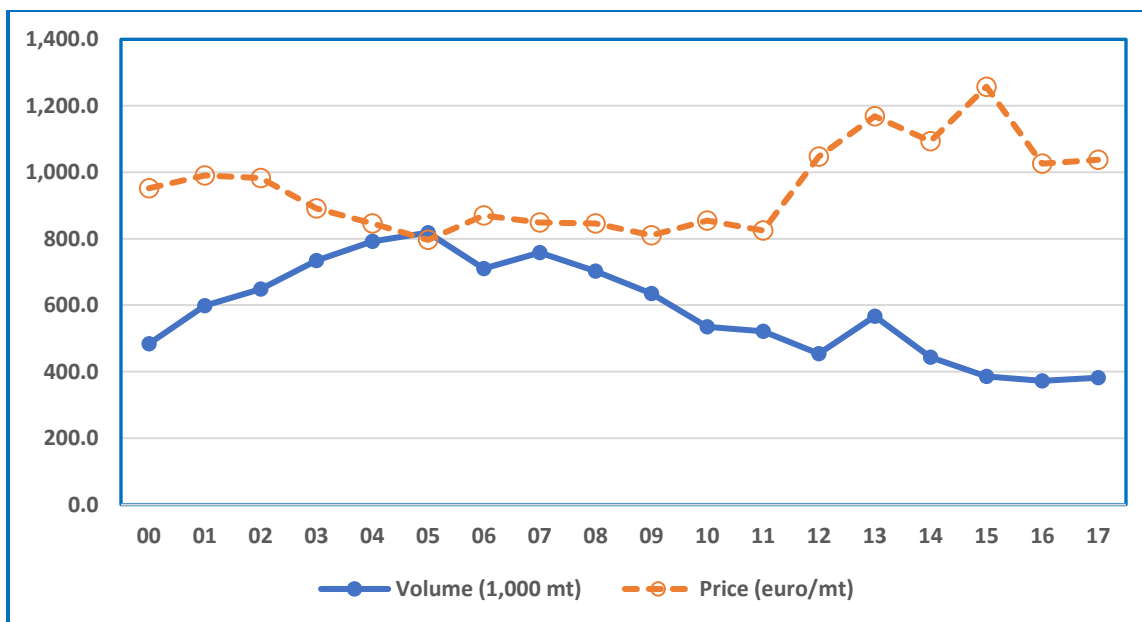
**EU-28: Average Fresh Apple Import Prices of  
Major Exporters to the EU, 2010-2017  
(Euros per metric ton)**

Exporter	2010	2011	2012	2013	2014	2015	2016	2017
Argentina	912.22	904.75	1,087.06	1,259.53	1,042.33	1,224.76	1,194.86	1,276.34
Australia	1,541.86	1,282.33	1,285.97	1,637.52	2,746.62	2,107.08	1,989.82	1,670.84
Brazil	815.91	798.45	848.09	959.12	895.29	967.94	949.34	1,024.04
Chile	890.97	876.08	1,008.70	1,214.76	1,027.28	1,259.08	1,238.25	1,227.71
New Zealand	1,096.27	1,083.15	1,234.31	1,321.26	1,301.97	1,408.51	1,354.75	1,386.76
South Africa	925.51	881.90	995.84	1,089.90	1,130.82	1,184.26	1,024.80	1,090.50
China	769.13	935.15	963.94	908.86	977.37	1,401.98	1,025.49	1,108.65
Turkey	686.10	639.80	973.27	750.58	761.15	1,084.28	647.04	661.45
Canada	883.53	1,038.86	1,163.83	1,184.57	1,133.17	1,746.82	1,174.59	1,149.54
Unit. States	1,089.93	1,173.07	1,318.09	1,435.31	1,267.62	1,430.55	1,408.48	1,239.69
All Sources	663.03	693.00	725.72	804.86	710.25	773.71	727.04	753.42

## Effects on Prices of Recent Developments in World Fresh Apple Trade

A number of other developments in world trade in fresh apples have continued to shake up the competitive situation. One with great long-term significance is the decreasing importance of the EU-28 market to Southern Hemisphere suppliers of fresh apples. The chart below shows the trends in the volume and deflated average prices of EU-28 imports of fresh apples from the Southern Hemisphere. The volume of imports rose rapidly between 2000 and 2005, while average real prices fell modestly. After 2005, the volume of Southern Hemisphere imports has steadily declined until it was only half the 2005 level in the 2015-17 period. Real prices remained flat between 2005 and 2011, but have moved upwards since. By 2016 and 2017, they were at approximately the same level as in the 2000-2002 period.

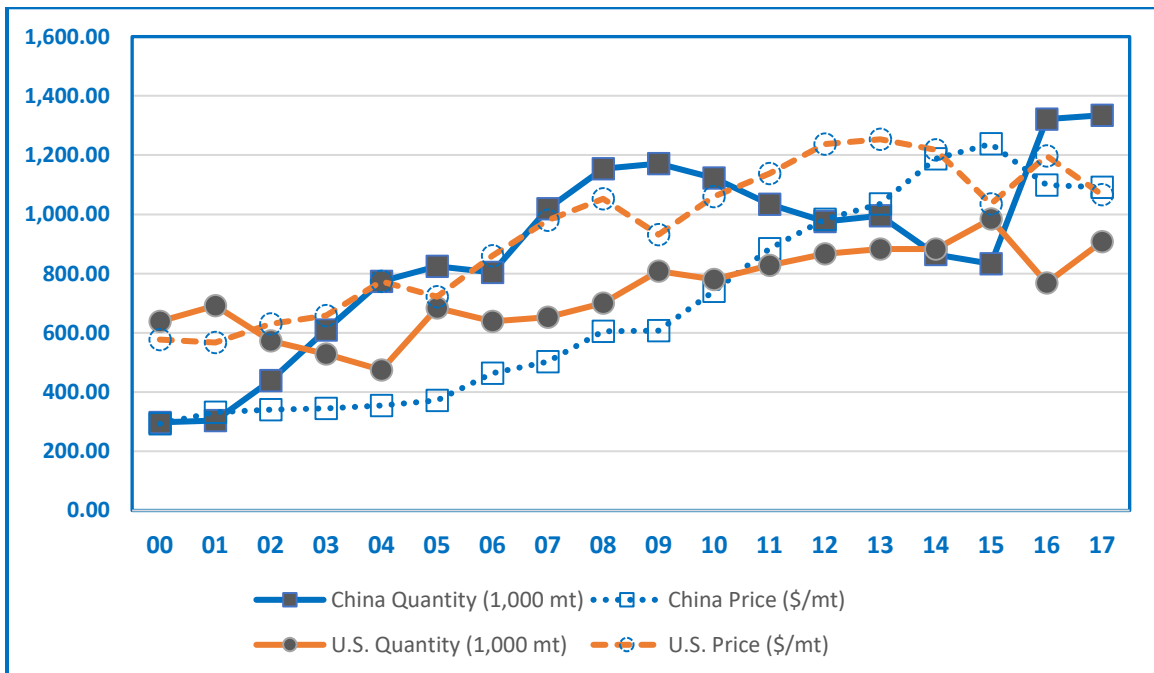
**EU-28: Imports of Fresh Apples from Southern Hemisphere Suppliers, 2000-2017**  
(Quantity, 1,000 metric tons, and Price, deflated euros per metric ton)



A number of factors have contributed to the loss of sales by Southern Hemisphere suppliers in the EU-28. One is greater competition from EU producers. Another is subtle protectionist measures, such as tighter residue standards. However, Southern Hemisphere suppliers can no longer rely on the EU-28 to justify expansion of their apple industries, and must seek alternative opportunities for growth.

Another development with global implications is the change in fresh apple supplies coming from China, and from its main competitor in Asian markets, the United States. The chart below shows how China's exports of fresh apples more than tripled between 2000 and 2007. During that period, Chinese export prices were kept artificially low as China sought to penetrate additional markets. After China adjusted its exchange rates upwards, its average prices gradually converged with world prices. Export volume fell, both because of rising prices, and because of strong demand in the Chinese domestic market. However, after the Chinese economy slowed in 2013, the Chinese government put pressure on all its industries to expand exports. The apple industry responded with large percentage increases in exports of fresh apples in 2016 and 2017. The volume of U.S. fresh apple exports increased more slowly between 2000 and 2017. It tended to vary with the overall size of the Washington State apple crop. U.S. prices, in current dollar terms, rose more rapidly than volume over the period. However, they have remained at or below the \$1,200 per metric ton level since 2012. Competition between these two large exporters is likely to intensify in the next few years.

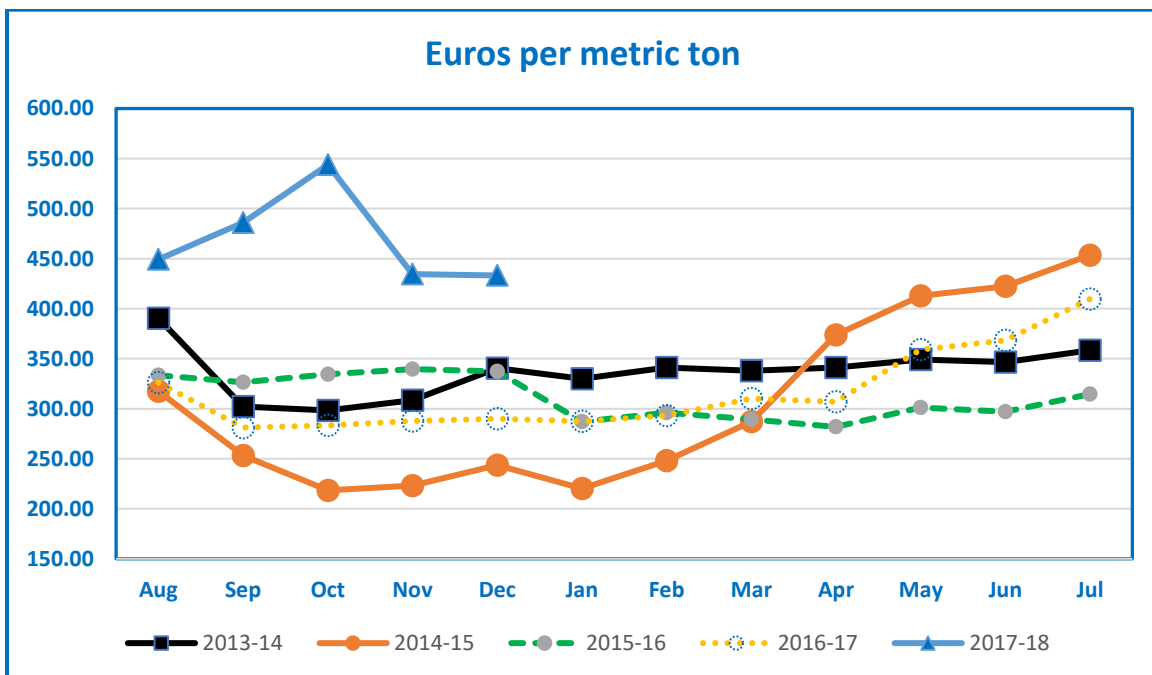
**China and the United States: Volume and Average Prices of Fresh Apple Exports, 2000-2017**  
 (Quantity, 1,000 metric tons, and Price, US\$ per metric ton)



The last major development in the global fresh apple market is the continuing Russian ban on fresh produce, including fresh apples, from the European Union. That ban was first imposed in August 2014, has since been extended several times, and is likely to remain in place in the near future. It was originally instituted after the EU, United States and other countries placed sanctions on selected Russian citizens who were close to President Vladimir Putin after Russia annexed the Crimea. Since then, Russia has further displeased the West by supporting the Assad regime in Syria and by its involvement in the poisoning of two Russians now resident in the United Kingdom. Many countries have expelled Russian diplomats in protest, and the United States has imposed sanctions on numerous other prominent Russians. After being recently re-elected as Russian President, Mr Putin is unlikely to quickly seek rapprochement with the West.

Poland was impacted more than any other country by the Russian ban. Prior to the ban, Russia was its main market for fresh apples and took more than half of all Polish fresh apple exports. The chart below shows average monthly export prices of Polish fresh apples before and after the Russian ban.

### Poland: Monthly Export Prices of Fresh Apples, 2013-14 through 2017-18 Seasons (Euros per metric ton)



In the 2013-14 season, before the Russian ban was imposed, average prices for Polish apple exports were flat around \$350 per metric ton. After the ban was imposed, Polish export prices fell below \$250 per metric ton, and only recovered in the last few months of the 2014-15 season. Polish prices were again depressed for much of the 2015-16 and 2016-17 seasons. They began to recover in May 2017 after it became clear that the Polish apple crop would be reduced by severe weather. For the first five months of the 2017-18 season, Polish fresh apple export prices have soared far above traditional levels. It remains uncertain whether or not higher export prices will offset the loss of crop by many Polish apple growers.

### **Outlook for Apple Prices**

As shown in this chapter, many factors affect the prices growers receive for their apples. These include decisions by major retailers, the costs incurred in the marketing system, prevailing economic conditions, prices of competing fruits, the rate of inflation, exchange rate changes, the influence of newer varieties, promotional expenditures, allocations to processing, and trading opportunities. The major underlying determinant is the balance between supply and demand in any year.

While apple domestic demand tends to be fairly static, export markets are variable from year to year. Thus, prices are most vulnerable to overall swings in apple supply, and variations in export markets. However, the long-term trend is for continued increases in global apple supplies, which will tend to depress prices. More recently, general economic conditions have been improving and marketing margins, the rate of inflation, and the share allocated to processing have been fairly stable. The major levers available to the apple industry to improve prices are expansion of more desirable varieties, and promotions targeted at potential growth markets. The industry has made considerable advance in the former, but its efforts in international market expansion still fall well below what is needed to secure improved prices.

## 6. The Processed Apple Sector

### Apple Processing Struggling

Like many other food processing industries, the processed apple sector has been affected by significant changes in consumer preferences. Consumers have increasingly switched to fresh fruits and vegetables because of the perception that they are more nutritious than processed products. Consumers have also increasingly questioned the authenticity of processed products as processors have become more expert at substituting other ingredients for genuine fruit or vegetable products. For example, the reputation of apple juice has suffered from accusations that imported apple juice was made from a sugar base rather than from raw apples.

On the supply side, apple growers have become less interested in supplying the processing sector because, as shown in Chapter 5, returns from the fresh market have increasingly outdistanced those from processing outlets. As a result, most of the effort put into breeding new, or improved, apple varieties, now goes to varieties targeted for fresh consumption, even though the processing industry recognizes that breeders could bring similar enhancements to processed apple products, for example, by increasing the juice yield per ton of raw product, or improving the organoleptic properties of processed apple products.

Another result of the increased share of apples targeted for the fresh market is that the majority of apples for processing now come as rejects from fresh packing lines and are only suitable for the manufacture of apple juice or dried apples, which give the lowest returns to growers. The apple juice industry has become an “accidental” industry, in the sense that it adds value to raw materials that would otherwise be discarded. Fewer growers and apple growing districts specialize in providing apple varieties suitable only for processing.

Under these economic pressures, economies of scale in manufacturing have become vital to the survival of apple processing firms. Through consolidation, one or two companies have come to dominate processing in major apple producing districts. Apple juice processing is particularly responsive to scale economies. Processors of other apple products, that cannot be so easily scaled up, continue to struggle to survive.

Several developments have shaken up the apple processing business around the world. One was the explosion of apple production in China, beginning in the 1970s. In the early 1990s, a number of Chinese firms began to process apple juice concentrate for export. The volume of Chinese AJC exports grew so rapidly, and at very competitive prices, that it undermined AJC processing in many traditional, apple producing countries, and drove many firms out of business. An anti-dumping action against Chinese AJC in the U.S. market did little to slow this development.

Apple production has also grown very rapidly, if more erratically, in Poland. Poland had long been a provider of fresh apples and AJC to Russia and its satellite countries in the former Soviet Union. In the early twenty-first century, the Russian economy boomed on the basis of high prices for metals, petroleum products and other commodities. Russia became the world's largest importer of both fresh apples and AJC, and Poland's production and exports of those two products soared to service the Russian market. China and Poland have since become the dominant world suppliers of AJC.

This long-term relationship between Polish exporters and Russian importers was abruptly severed in August 2014 when Russia imposed a ban on produce imports from the EU. Polish AJC was included among the embargoed products. The Russian ban is now entering its fourth year without any sign of a resolution.

Because the volume of apples available for processing in any year depends on both the volume of rejects from the fresh packing line, and on the volume grown specifically for the processing sector, it has tended to fluctuate from year to year based on the total size of the world apple crop. The table below shows estimates of the volume of apples available for processing in selected periods between 2000 and 2017-18. The original series has been updated by including non-EU countries in the "Other Europe" category after 2015-16. These countries have traditionally targeted a substantial share of their apple production towards processing uses.

The old series shows that the volume of apples for processing in the original 31 countries rose by more than one-third between 2000-02 and 2006-08, when it reached its recent peak. It fell by 22 percent between the peak and the 2012-14 period. The volume of apples for processing is expected to be again depressed in 2017-18 because of the short European apple crop.

**World: Apples for Processing, by Region,  
Selected Periods, 2000-2018  
(1,000 metric tons)**

Region	2000-02	2003-05	2006-08	2009-11	2012-14	2015-18	2016-17	2017-18
EU-15	2,173	1,958	2,118	1,720	1,629	1,404	1,412	1,064
Other Europe *	2,216	2,315	1,924	1,825	2,423	4,227	4,461	3,665
Russia	916	1,277	949	686	485	301	348	220
North America	1,890	1,793	1,735	1,763	1,587	1,654	1,747	1,585
Asia	2,515	4,418	6,755	5,488	4,278	4,919	4,901	5,563
S. Hemisphere	1,337	1,470	1,399	1,417	1,201	984	916	979
Total, 40 countries *	11,047	13,231	14,881	12,899	11,602	13,489	13,785	13,076
Total, old series	11,047	13,281	14,881	12,899	11,602	11,994	12,064	11,508

\* Includes non-EU countries after 2015-16.

In general, the table above shows that the volume of apples for processing has fallen since the 2006-08 peak in every region, with the notable exception of Eastern Europe.

**Top Ten Countries: Apples for Processing,  
Selected Periods, 2000-2018  
(1,000 metric tons)**

Rank	Region	2000-02	2003-05	2006-08	2009-11	2012-14	2015-18	2016-17	2017-18
1	China	2,357	4,152	6,520	5,253	4,083	4,621	4,600	5,263
2	United States	1,634	1,576	1,460	1,506	1,363	1,405	1,485	1,337
3	Poland	1,521	1,466	1,309	1,182	1,520	1,893	2,132	1,417
4	Germany	853	773	850	648	656	597	708	400
5	Hungary	464	393	270	307	440	389	325	448
6	Russia	916	1,277	1,309	686	485	301	348	220
7	Chile	367	396	391	393	340	316	307	321
8	Argentina	531	587	436	443	319	212	200	206
9	France	312	266	292	284	252	256	267	200
10	Brazil	9	0	219	307	144	132	77	160
11	Macedonia	n.a.	n.a.	n.a.	n.a.	n.a.	1,405	1,485	1,337
-	Top TEN	8,855	10,886	13,056	11,009	9,602	11,527	11,934	11,309
-	% of total	80.2	82.1	87.7	85.3	82.8	84.7	86.6	86.5

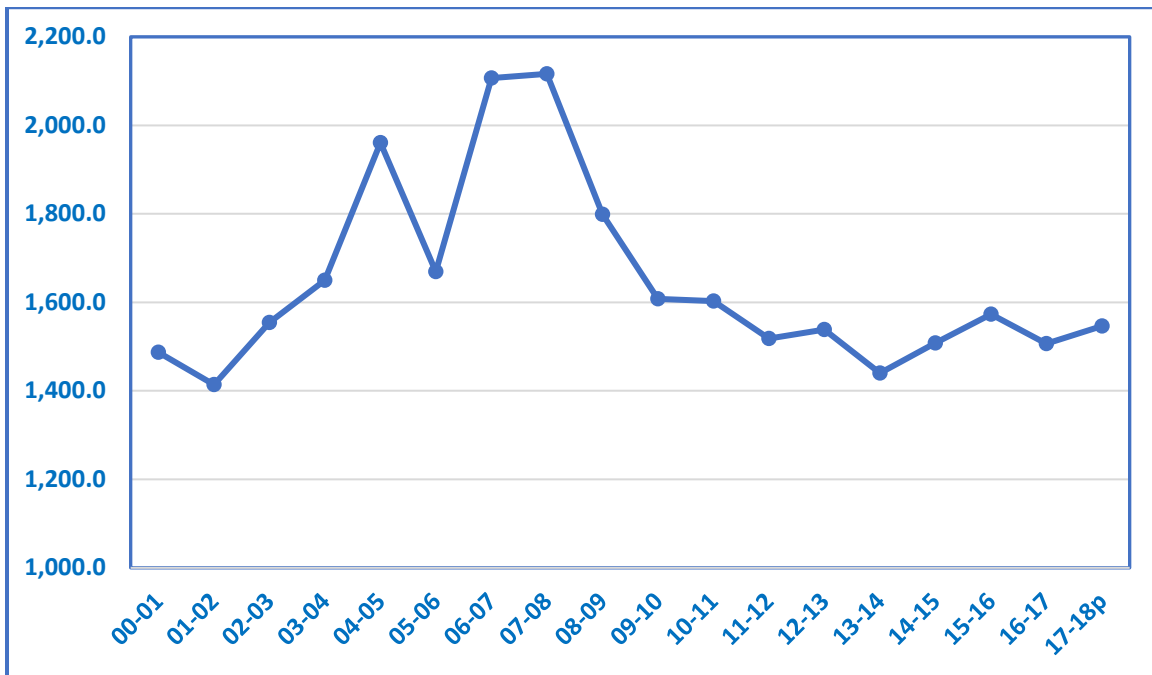
The table above shows trends in the volume of apples for processing in individual countries, and how that has impacted regional totals. Clearly, in Asia, China has been the dominant influence. Apple processing in China appears to have expanded more rapidly than export markets could absorb. Chinese AJC processors sharply reduced capacity after the peak in 2006-08. Volume appears to be gradually rising again in recent years. The United States remains the dominant force in apple processing in North America, but the volume is heavily influenced by the size of the total U.S. apple crop. Poland has been the dominant player in Eastern Europe. However, the wide variability in the Polish apple crop from year to year has led to similar volatility in the volume of apples for processing. For most other leading countries (except Macedonia) and regions, the general trend in volume of apples for processing has been downward. The biggest percentage declines have been for Russia and Argentina.

The supplies of processing apples, and apple processing activity, remains heavily concentrated in a small number of countries. The table above shows that the top ten countries have consistently accounted for over 80 percent of the world supplies of apples for processing. The top four, China, Poland, the United States and Macedonia now account for over 70 percent of all apples for processing.

### **Trends in Production of AJC**

The most highly traded, and most influential, product in the world of apple processing is apple juice concentrate (AJC). It can be processed to meet standard specifications that are recognized worldwide, and can be easily transported and stored for eventual use in finished apple products. Trade in AJC grew steadily from the early 1970s when it was centered primarily in North and South America. However, the biggest explosion in production and trade occurred after China entered the business on a large scale, with modern technology and large volumes. The chart below shows the estimated total volume of AJC produced in major apple producing countries between the 2000-01 and 2017-18 seasons. It also shows the explosion of AJC production that occurred between 2000-01 and 2006-07, and the rapid fall-off in production as overcapacity depressed world prices. Not all of the changes in AJC production have been a response to market demand. Some have been caused by weather-induced changes in the size of total apple crops.

### Selected Countries: Trends in Production of AJC, 2000-2017 (1,000 metric tons)



The outlook for AJC supplies is clouded by uncertainties, such as the need of the Chinese economy for increased exports, or the Russian ban on Polish imports, discussed previously. As noted for trade in fresh apples, the Russian ban has led to increased smuggling and potential distortion of trade statistics. Since AJC can be stored from one season to the next, changes in inventories can also affect trade.

The table below shows a snapshot of the decision-making process for apple producers, packers, marketers and processors in the major apple-producing regions in the 2017-18 season. It links the volume of all apples produced to the volume sent for processing, the share of the processing volume delivered to AJC processing plants, and the estimated volume of AJC processed. The 73 million metric tons of apples produced in these 40 countries represents over 80 percent of estimated world apple production in 2017-18. About 18 percent of that production went to processing uses, and over 70 percent of processing apples were delivered for processing into AJC. Each metric ton of AJC produced required 6.45 metric tons of raw apples.

**World: Production of All Apples, Apples for Processing, Apples for AJC and AJC Produced, by Region, 2017-18 preliminary  
(1,000 metric tons)**

Region	Production of All Apples (1,000 mt)	Total Apples for Processing (1,000 mt)	Apples Processed into AJC (1,000 mt)	AJC Produced (1,000 mt)
EU-15	5,891.8	1,064.2	721.0	133.3
NMS	4,252.5	2,097.4	1,991.5	296.9
Other Europe	1,859.0	1,568.6	654.7	89.5
Russia	1,100.0	220.0	220.0	44.0
North America	5,812.4	1,584.6	654.7	87.3
Asia	49,172.0	5,563.0	4,820.0	738.8
Southern Hemisphere	5,002.1	978.6	910.0	156.3
Total 41 Countries	73,089.8	13,076.5	9,971.9	1,546.1

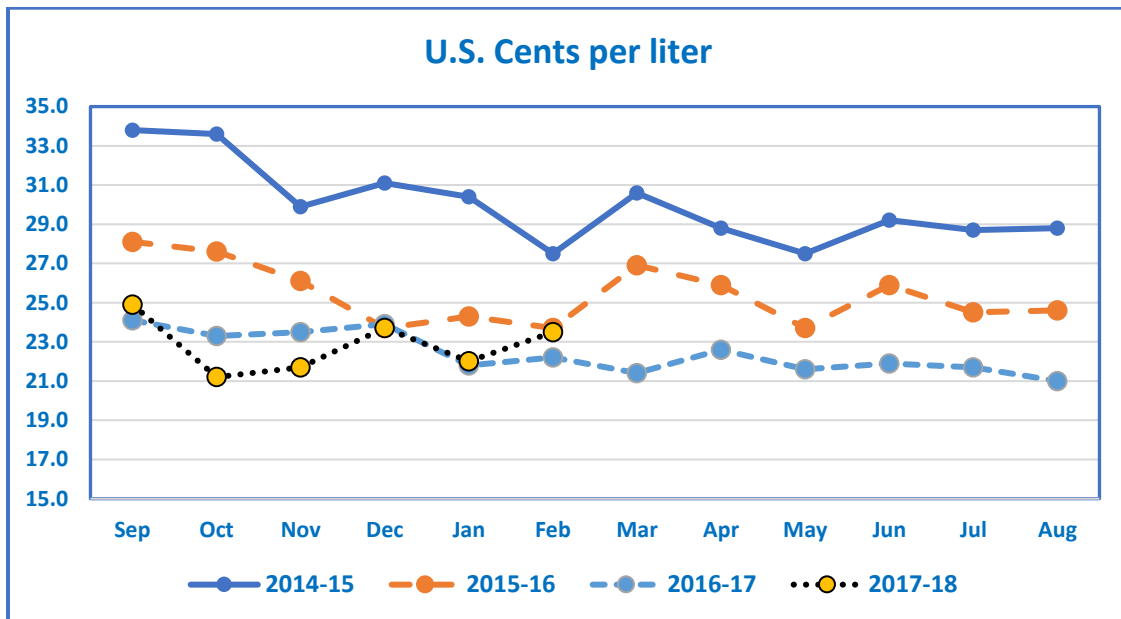
The share of the apple crop processed was highest in the New Member States (NMS) of the EU-28 (49.3 percent) and in Other Europe (84.4 percent) and lowest in Asia at 11.3 percent. By far, the highest share of processing apples going to AJC processing was in the NMS countries and Russia. The conversion factor from raw apples to AJC was fairly uniform across regions, with the exception of Russia, where it only took five tons of raw apples to produce one ton of AJC. This low conversion factor could be due to errors in the data on either raw apples or AJC produced.

### **AJC Trade and Price Sensitivity**

The fluctuations in supplies of AJC, the portability and storability of the product, and the potential carryovers from one season to the next cause the price of AJC in international markets to be highly sensitive to changing supplies. Another factor is the differences between suppliers from the Northern and Southern Hemispheres in their timing of peak shipments. Also, increasing price sensitivity is the concentration of import demand in a few countries, most notably, the United States and Western Europe. The Russian ban on EU product has added another level of uncertainty to the mix.

The chart below shows average monthly prices of AJC imported by the United States in the four most recent seasons, 2014-15 to 2017-18, from the beginning of the Russian ban. All seasons run from September to the following August. Average monthly prices in the 2014-15 season were markedly above those in any subsequent season, even though prices fell from an average of 33.7 cents per liter in September and October 2014 to 28.7 cents in July and August 2015. Average prices in the subsequent seasons have been consistently well below the 2014-15 level. The lowest level was in the second half of the 2016-17 season, when prices averaged less than 22 cents per liter. Even despite the reduced apple harvest in Europe (especially Poland) in 2017, U.S. import prices have improved little in the first half of the 2017-18 season.

### United States: Monthly Average Prices of Imported AJC, 2013-14 through 2017-18 seasons



This apparent price stability masks considerable turmoil in the U.S. market since the Russian embargo was imposed. The table below shows how supplies from China had come to dominate U.S. imports of AJC in recent years. China’s share rose from 3.7 percent in 1995-97 to over 80 percent in 2010-12. For various reasons, the volume and share of U.S. AJC imports from China fell sharply in 2015 just as European exporters were looking for alternative outlets to the Russian market.

## United States: Imports of AJC, Calendar Years, 1995-2017

Period	China (m. liters)	Other (m. liters)	World (m. liters)	China (cents/l.)	Other (cents/l.)	World (cents/l.)
1995-97	34.1	889.0	923.1	0.405	0.344	0.347
1998-00	179.8	845.8	1,098.8	0.168	0.223	0.203
2001-03	307.0	874.9	1,181.9	0.149	0.172	0.166
2004-06	854.8	649.2	1,504.0	0.177	0.192	0.183
2007-09	1,522.0	388.1	1,910.1	0.274	0.279	0.275
2010-12	1,342.8	309.8	1,652.6	0.323	0.346	0.327
2013-15	1,048.7	490.9	1,539.6	0.319	0.330	0.322
2015	834.4	737.4	1,571.7	0.271	0.290	0.280
2016	1,107.4	513.2	1,620.6	0.222	0.291	0.244
2017	1,155.8	404.9	1,560.7	0.201	0.274	0.220

While China had used relatively low prices to expand its market share after 1995, by 2010, it was able to dominate U.S. import supplies with prices that were comparable to those of other competing suppliers. Even though supplies of AJC from China were well below normal in 2015, its offer prices were more than 20 percent lower than in 2014, before the Russian embargo.

The table below provides details on the volume and average prices of U.S. imports of AJC from the major supplying countries in the calendar years 2014 to 2017. The volume of imports from European suppliers more than tripled between 2014 and 2015, with imports from Poland, the leading European supplier, increasing almost tenfold. There were also notable increases in AJC imports from other European countries, including Italy, Germany, Austria, Hungary and Spain. In contrast, Southern Hemisphere suppliers, such as Chile, were not able to capitalize on the reduced Chinese supplies because of reductions in their apple crops.

However, Chinese supplies to the U.S. market rebounded by almost one third in 2016 at the lowest average prices since 2010. The total volume from Europe fell by 37 percent, and that from Poland by over 56 percent. Southern Hemisphere supplies fell by over 26 percent. China further asserted its dominance of the U.S. AJC import market in 2017, at even lower prices than in 2016. Thus, it has become clear that the U.S. market will not provide European suppliers with the relief they need because of the Russian embargo.

## United States: Imports of AJC, by Major Suppliers, Calendar Years, 2014-2017

(Volume in 1,000 liters, Prices in cents per liter)

Supplier	2014		2015		2016		2017	
	Quantity (1,000 l)	Price (cents/l)	Quantity (1,000 l)	Price (cents/l)	Quantity (1,000 l)	Price (cents/l)	Quantity (1,000 l)	Price (cents/l)
China	918,166	34.3	834,534	27.1	1,107,437	22.2	1,155,786	20.1
Chile	258,821	29.8	232,766	26.2	185,201	23.5	154,161	22.2
Argentina	87,579	26.4	119,800	24.3	79,033	25.4	37,679	30.3
Italy	23,347	91.4	46,275	38.9	39,958	45.4	19,601	61.9
Turkey	25,589	39.5	79,745	38.5	69,939	34.4	81,517	26.9
France	3,175	29.3	3,075	27.6	2,755	29.1	1,355	323.3
Poland	14,883	28.6	132,217	22.9	58,104	22.2	55,266	20.7
Germany	11,342	31.8	28,528	25.1	695	47.9	110	15.4
Austria	10,766	24.0	18,976	23.4	17,072	24.1	4,310	26.7
S Africa	8,996	27.5	6,711	25.9	3,957	26.7	1,848	26.2
Hungary	8,184	29.9	12,894	20.9	1,006	26.8	27,524	21.9
Spain	8,989	27.2	11,147	24.0	13,403	33.8	3,541	58.5
All Other	8,048	116.6	48,295	35.7	41,964	30.0	17,992	15.8
TOTAL	1,387,885	34.7	1,571,706	27.9	1,620,556	24.4	1,560,692	22.0
Asia	945,127	28.9	917,273	28.2	1,177,473	23.0	1,237,440	20.6
Europe	81,594	46.6	264,906	29.5	166,924	34.1	128,354	32.3
S Hemisphere	358,688	29.0	373,995	26.8	275,573	24.4	194,519	24.0

Turkey was the only country outside China that was able to increase its exports to the U.S. in 2017. Other countries not listed separately in the table above, like the Ukraine, Macedonia, Moldova and Brazil, failed to increase their sales. Some European countries continued to be able to supply specialty AJC products to the U.S. market at premium prices. However, higher transportation costs from Europe to North America remain an impediment to competing with China in that arena.

In contrast to the situation in the United States, EU-28 imports of AJC continue to be dominated by European suppliers, or by close neighbors like Turkey. In general, China and Southern Hemisphere suppliers have claimed only a modest share of the EU-28 market. Poland, Germany and Austria have been the largest suppliers, although the volume from Poland was one third lower in 2017 than in 2016. Average prices have been relatively stable from year to year, but prices have varied substantially between suppliers, probably reflecting quality differences.

**EU-28: Imports of AJC, by Major Suppliers,  
Calendar Years, 2014-2017**  
(Volume in metric tons, Prices in euros per metric ton)

	2014		2015		2016		2017	
Supplier	Quantity (mt)	Price (euro/mt)	Quantity (mt)	Price (euro/mt)	Quantity (mt)	Price (euro/mt)	Quantity (mt)	Price (euro/mt)
Argentina	31	1,531	0	0	0	0	17	1,722
Brazil	82	634	126	846	47	1,064	9	1,227
Chile	6,253	1,180	4,698	1,249	2,733	1,131	3,070	1,129
S Africa	905	1,301	549	1,522	378	1,223	831	1,120
Austria	82,853	1,162	75,147	854	72,833	1,122	78,279	966
Belgium	3,762	1,106	3,508	1,277	3,613	1,017	4,826	1,098
France	9,160	2,013	7,960	2,052	5,501	2,033	6,153	1,302
Germany	44,083	985	62,552	735	78,069	693	78,260	765
Italy	46,153	854	39,719	738	34,257	799	42,611	895
Netherlands	28,074	1,141	27,976	1,031	29,428	1,238	33,584	1,168
Spain	18,736	968	14,886	867	7,686	826	16,868	1,071
Czechia	2,141	737	2,110	1,024	2,045	993	1,691	1,118
Hungary	38,924	1,016	25,066	835	25,286	1,048	32,973	1,014
Poland	181,863	972	189,647	899	201,069	1,047	134,424	1,048
Moldova	40,225	703	36,386	783	31,806	677	38,372	1,184
Ukraine	83,699	448	73,052	531	44,461	844	40,024	989
China	11,204	1,034	20,540	1,052	19,066	994	36,905	909
Turkey	48,421	1,220	45,266	1,192	35,789	1,213	48,725	1,171
All Other	42,832	962	51,450	1,341	42,095	935	57,528	1,011
TOTAL	689,399	950	680,617	873	636,162	981	655,150	1,005
Asia	59,625	1,185	65,806	1,148	54,855	1,137	85,630	1,058
S Hemisphere	7,271	1,190	5,373	1,267	4,195	875	4,014	1,142

Since the data in the table above are for calendar years, the 2017 entries do not show the full extent of the reduced 2017 apple crops in many European countries. As the 2017-18 season progresses, there may be greater opportunities for suppliers from China, Turkey and the Southern Hemisphere to increase their sales in the EU-28 markets. One would also expect average prices to strengthen. However, the large number of potential suppliers suggests that competition for a share of the EU-28 AJC market will continue to be intense.

## The Export Challenge for AJC

As the previous section has shown, exporters of AJC have experienced problems with market access that has increased already intense competition, and driven down prices. The table below shows recent trends in exports of AJC by the major exporters. The data cover selected years between 2007-08, the year of the most recent peak in exports, and estimates for the current year, 2017-18. Many of these estimates are tentative because there is much intra-European trade in single strength, semi-processed and finished AJC that may not be accurately recorded.

The most notable feature of the table is how much China and Poland now dominate the export market for AJC. Trends in their exports for the last decade are shown on the next page. They were the only two countries that exported more than 100,000 metric tons in any season. While their combined share of AJC exports has varied, they have consistently supplied over 70 percent of AJC exports by the top ten exporters. Their dominance has probably discouraged many other countries from increasing their AJC exports. Another notable feature is that there has been little or no growth in total exports of AJC since 2007-08. Only Poland, Hungary and Chile reported greater AJC exports in 2017-18 than in 2007-08. The table also shows that if all major exporters operated at full capacity, world exports could be increased substantially.

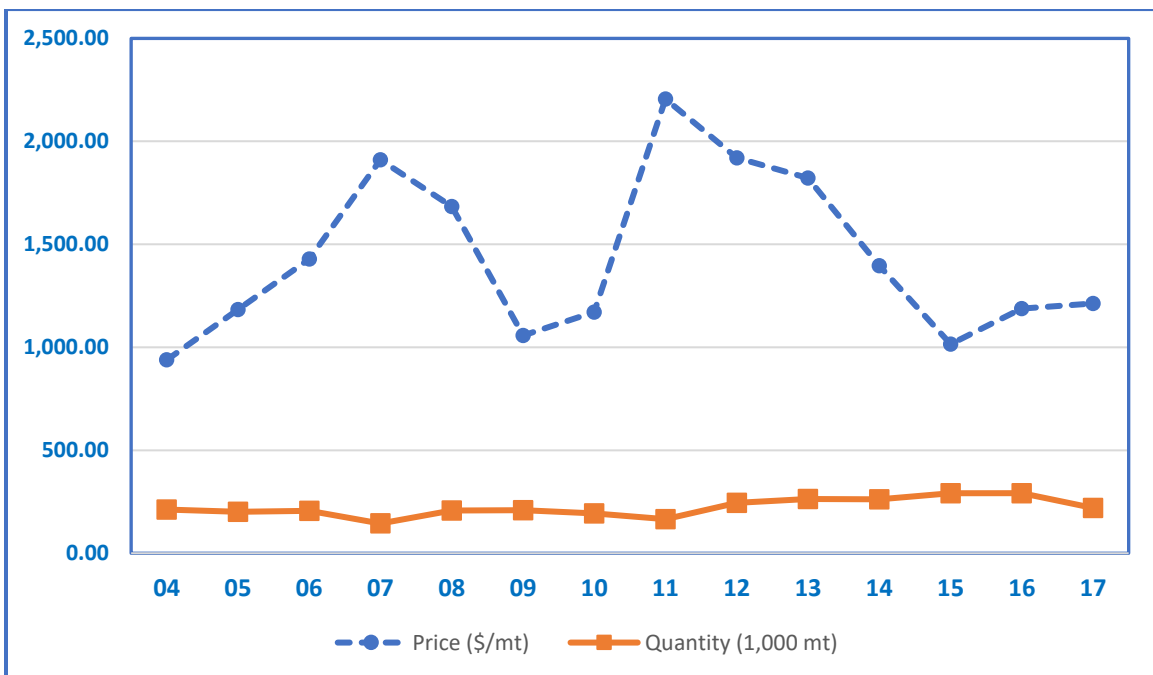
### Top Ten AJC Exporting Countries, 2007-08 to 2017-18 (1,000 metric tons)

Rank	Country	2007-08	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
1	China	893.7	597.4	540.0	440.0	474.0	530.0	670.0
2	Poland	186.5	232.0	233.0	327.5	279.5	269.6	230.0
3	Austria	77.4	65.0	75.0	75.3	74.6	65.1	60.4
4	Hungary	19.2	48.0	50.7	51.0	36.9	54.1	56.8
5	Germany	115.0	57.0	34.0	48.0	39.2	33.3	43.8
6	Chile	38.7	38.7	35.0	40.1	43.3	42.2	43.2
7	Italy	70.0	47.5	47.0	42.1	33.1	34.8	34.0
8	Turkey	39.9	32.0	34.0	34.0	33.5	36.8	36.8
9	Argentina	43.0	25.7	23.7	21.0	39.0	34.7	35.7
10	Netherlands	28.4	22.5	20.0	17.5	16.5	15.0	25.2
-	TOP TEN	1,521.8	1,165.8	1,092.4	1,096.5	1,069.6	1,115.6	1,235.9
-	% of Total	91.4	89.0	88.3	87.6	86.0	87.4	89.3

### China: Exports of Apple Juice Concentrate, 2003-2017 (Quantity, metric tons, Price, US\$ per metric ton)



### Poland: Exports of Apple Juice Concentrate, 2004-2017 (Quantity, metric tons, Price, US\$ per metric ton)



The charts on the previous page show annual exports of AJC and average prices for calendar years between 2003 or 2004 and 2017. While the volume of exports from Poland have reached a new plateau since 2012, those from China peaked in 2007 and had a long downward trend before rebounding in 2017. China and Poland have had similar wide fluctuations in average export prices of AJC, although the timing has not always been in sync. For example, average Chinese prices fell in 2016 and 2017, while prices of Poland's exports rose in those two years.

The table below shows how Chinese exports of AJC have varied over time both in total and to major destinations. The most dramatic increase in total exports was between 2000 and 2005, especially to North America and Western Europe. Total exports increased further by 2010, especially to the United States. Exports to Western Europe and to Asia fell in that period. The United States, Russia and Japan were the top three destinations in 2010. This still held true in 2017. Exports to Western Europe, especially to Germany and the Netherlands, staged a comeback in 2017.

### **China: Exports of AJC, by Volume and Destination, 2000-2017** (metric tons)

Destination	2000	2005	2010	2014	2015	2016	2017
Germany	9,710	91,219	40,039	2,594	16,664	7,121	26,620
Italy	2,237	550	62	0	0	0	1,140
Netherlands	14,000	73,430	58,977	3,593	4,218	3,290	22,542
Spain	342	6,630	626	0	308	990	555
Russia	4,288	62,031	76,441	57,031	35,925	50,700	56,624
United States	39,747	227,206	387,578	215,939	239,840	256,883	300,231
Canada	7,190	27,164	40,632	22,359	23,131	24,262	35,653
Japan	19,435	63,468	52,101	59,167	60,881	49,237	46,821
Taiwan	1,981	3,022	3,643	3,382	3,701	3,884	4,040
South Korea	837	3,954	2,908	3,297	2,898	2,975	2,227
Australia	11,519	29,616	33,266	25,407	25,400	23,814	24,341
South Africa	4,912	9,669	30,149	25,561	16,086	37,857	43,179
Others	16,117	51,504	57,722	37,470	44,777	45,538	90,759
<b>TOTAL</b>	<b>142,315</b>	<b>649,463</b>	<b>784,144</b>	<b>455,800</b>	<b>473,829</b>	<b>506,551</b>	<b>654,732</b>
North America	46,937	254,369	428,210	238,299	262,971	281,395	336,126
Western Europe	41,988	197,288	110,178	8,369	18,692	10,685	63,310
Asia	30,504	74,949	70,546	91,864	102,056	89,236	98,697

The table below shows similar information on Poland's AJC exports. Poland's exports have been consistently focused on the richer member countries of the European Union, usually referred to as the EU-15. Within the EU-15, Germany has been the major market, followed by the United Kingdom and the Netherlands. However, it is not known how much of imports by the Netherlands are intended for re-export to other European countries. Despite the Russian embargo, modest levels of Polish AJC exports to Russia have continued to be reported.

### **Poland: Exports of AJC, by Volume and Destination, 2005-2017 (metric tons)**

Destination	2005	2010	2013	2014	2015	2016	2017
Austria	14,904	10,975	7,893	13,482	14,710	26,841	6,448
Belgium	1,247	2,202	2,590	2,563	1,985	1,579	2,017
Denmark	242	4,803	4,071	5,341	4,856	5,605	7,182
France	788	4,461	7,158	3,680	6,362	10,225	9,076
Germany	142,339	126,056	154,788	138,446	144,354	140,974	90,939
Italy	726	296	540	845	470	591	356
Netherlands	8,241	7,051	18,975	27,457	18,299	26,935	21,910
Spain	1,202	1,102	4,785	2,165	2,958	5,257	2,898
Sweden	1,826	3,178	4,765	4,504	4,901	5,450	5,609
United Kingdom	18,106	20,419	41,245	23,034	28,848	23,865	26,899
Other EU-15	2,872	4,762	3,895	7,302	8,146	6,028	5,516
Subtotal EU-15	192,493	185,305	251,228	228,819	233,226	253,350	178,850
Russia	1,285	3,178	458	11,971	14,911	9,806	8,336
United States	122	43	65	8,727	24,918	7,158	12,026
Canada	183	4	0	2,761	5,708	81	2
All Other	8,795	4,815	11,705	9,654	17,325	21,371	20,443
TOTAL	202,878	193,345	263,456	261,932	290,888	291,766	219,657

While the tables included in this chapter only provide details on export origins and destinations for the major exporters and importers, they do give a flavor of the level of competition that exists in world trade in AJC. Major export and import flows tend to be fairly consistent over time. However, there is evidence of considerable opportunism among both exporters and importers. The tables also show that the supply-demand balance in any year has a significant effect on AJC prices. In many cases, prices have been driven below break-even. Only China appears to have been able to maintain its AJC exports regardless of the price achieved.

## **Future Prospects for the Processing Sector**

Projections suggest that the total world apple crop will continue to grow in the next decade. This means that the supply of apples for processing from rejects off fresh packing lines is likely to continue to grow. The market for a wide array of processed apple products is either static or declining. It appears that the investment in innovation that would be necessary to reverse this decline is not taking place. As a result, the path of least resistance for the apple industry in many countries is to divert increasing volumes of processing grade apples to juice processing. This is particularly true for the dominant players in the AJC sector, China and Poland. Competition between these two giants is likely to keep downward pressure on AJC prices. That, in turn, tends to put downward pressure on the prices of all apple raw materials.

On the other hand, lower prices for apple raw materials should allow apple processors to become more innovative in designing new apple products to meet changing consumer tastes. Emerging food technologies could also provide opportunities for new processed apple products. However, unless the apple processing industry is ready to seize these opportunities, the industry is likely to continue to slowly shrink.

## 7. Critical Issues Facing the World Apple Industry

### Critical Issues Summary

Consumers, distribution systems, economic environments, international relations and technologies in production, packing, processing and marketing normally change very slowly. However, it appears that the pace of change has picked up in recent years, and that the apple industry is being forced into adapting more rapidly than ever to these changes.

Among the critical issues that will be discussed in this chapter are:

1. The need for increased efficiency at every level of the apple industry.
2. The need to increase value added in the products produced.
3. Changing consumer profiles.
4. Changes in the food distribution system.
5. Changes in international relations among trading nations.
6. China, how much will it figure in your firm's plans?

Items 1 and 2 above are being driven by the increased intensity of competition in the retail food arena. In most major markets, powerful indigenous firms are being challenged by well-financed competitors from other countries. In addition to increased competition between bricks and mortar stores, online giants like Amazon and Alibaba have increased their penetration of the food sector and are presenting new challenges for existing firms. The net effect has been increased pressure on produce suppliers to both reduce the prices they charge for their standard products, and to provide increments of added value and additional marketing services that can make their retail customers more competitive.

The profile of consumers of fresh apples is changing. In the developed world, there are smaller families, fewer children, later marriages, and more older people. Populations (and with them physical demand for food) are either stagnant or shrinking, so consumers have become more discriminating. The relationships between countries are changing, including common understanding of how trade should operate, and disagreement over what the global agenda on many other issues should be. Finally, a central key to any future global scenario is what role China will play in different arenas. That role will continue to have a major influence on the global apple industry.

## Measuring International Competitiveness

No single measure can adequately describe the competitive strength of any firm, district or country in the global apple business. However, for many years, Belrose, Inc. has developed rankings of international competitiveness for all the major apple producing countries for which adequate data were available. The 33 countries included in the 2018 rankings include all the top apple producing countries, except Iran, and many minor apple producing countries that are actively involved in trade with their neighbors.

The rankings are based on 23 separate criteria, 6 measures of production efficiency, 9 of industry infrastructure and inputs and 8 of financial and market factors. The definitions of each criterion for the 2018 rankings are shown in the table below. The latest data available were used. In some cases, three-year average data were used to avoid distortions due to unusual conditions in any single year. Each producing country was scored on each criterion on a scale from 1 point (lowest) to 10 points (highest), and the scores added for all criteria. Thus, the maximum score any country could achieve was 230 points and the minimum was 23 points.

### Apples: Comparative Performance Measures, 2018

Production Efficiency	Industry Infrastructure & Inputs	Financial & Market Factors
1. Percent change in production, 2009-11 to 2015-17	7. Adequacy of storage.	16. Long-term interest rates, 2018.
2. Relative variability of production, 2007-2017.	8. Modern packing facilities.	17. Inflation rate, 2018.
3. Percent of Acreage non-bearing, 2017.	9. Efficiency of distribution.	18. Exchange rate in 2017, relative to 2001-05 average.
4. Percent of production that is new varieties.	10. Marketing system quality.	19. Security of property rights.
5. Planting density, trees per hectare.	11. Land availability.	20. Product quality covered.
6. Average yield per hectare, 2015-17, metric tons	12. Water availability.	21. Percent of production exported, 2015-17.
	13. Labor availability.	22. Average export price, 2015-17, US\$ per metric ton.
	14. Capital availability.	23. Average distance to market, miles.
	15. Input costs.	

Whenever possible, the scores were based on objective data reported by international or national statistical agencies. However, for criteria like “security of property rights”, information from other reputable, non-governmental rating agencies was used. In general, the criteria on production efficiency are influenced primarily by the decisions of individual apple investors, owners or managers. In contrast, criteria on infrastructure and inputs are influenced by public agencies like irrigation districts, while financial and market factors are often heavily influenced by national and international government decisions.

The raw data on production efficiency criteria is summarized in the table on the next page. It provides individual data points for the 33 countries, and overall averages with and without China. The data for any individual country can be compared with that of every other individual country and with the overall average. The measures show wide variations between countries. For example, the percentage increase in production between 2009-11 and 2015-17 varied from a decline of 55.4 percent for Slovenia to an increase of 72 percent for Serbia. In contrast, the average increase was 18.5 percent, in line with UN,FAO estimates of the change in world apple production. The results for several European countries were affected by the severe losses of apple production due to adverse weather in the 2017 growing season.

The relative variability of production between 2007 and 2017 is an indicator of the stresses on the packing, storage and marketing system in each country when crop size varies widely from year to year. The average score of 2.37 implies that the largest crop was almost 2.4 times the smallest crop. This means that capacity was seriously underused in low crop years, and stretched to bursting point in large crop years. Countries like Italy, Brazil or Australia, where the variability ratio was between 1.2 and 1.3, were more likely to have investment in infrastructure better matched to their needs from year to year. Countries with variability scores above 3.0 would have had infrastructure investment poorly matched to changing needs.

The percentage of acreage non-bearing is regarded as a good indicator of how well a country is renewing its orchards and preparing for the long term. The average figure of 11.0 is close to what experts consider as the minimum for a sustainable orchard. About half of all countries had percentages above that average, but six countries had scores below half of that average, not promising for the future.

## Major Apple Producing Countries: Comparative Performance Measures of Production Efficiency, Raw Data, 2018

Country	Percent change in production, 2009-11 to 2015-17	Relative Variability of Production, 2007-2017	Percent of Acreage non-bearing, 2017	Percent of New Varieties in Production, 2017	Planting density, trees per hectare, 2017	Average Yield per hectare, 2015-17
	(%)	(ratio)	(%)	(%)	(#)	(mt)
Austria	- 48.6	4.83	13.5	47.9	2,688	21.6
Belgium	- 36.6	4.81	4.3	67.5	3,310	29.2
France	- 6.2	1.45	5.2	39.2	1,610	34.6
Germany	- 16.3	2.08	12.0	52.1	1,942	28.9
Greece	9.6	1.37	15.6	12.8	479	26.4
Italy	- 6.4	1.31	7.0	32.9	2,351	40.0
Netherlands	- 23.1	1.79	11.2	42.7	2,989	35.3
Portugal	14.7	1.49	8.7	26.2	1,591	14.3
Spain	0.2	1.66	6.2	25.8	500	16.2
United Kingdom	- 22.9	1.65	12.5	62.8	1,241	19.3
Russian Fed.	13.7	1.81	24.3	16.2	706	4.8
Hungary	5.9	3.64	8.6	18.9	972	15.9
Poland	56.6	3.67	10.6	23.2	1,147	21.6
Canada	- 8.3	1.63	10.8	28.4	995	23.2
Mexico	23.1	2.14	7.2	5.3	228	13.4
United States	11.8	1.30	11.0	38.8	1,150	35.6
China	29.8	1.77	13.3	74.0	440	21.7
India	15.8	1.78	14.7	0.0	240	9.3
Japan	5.0	1.39	5.2	65.5	1,123	20.7
South Korea	28.8	1.54	28.5	69.4	1,030	24.4
Turkey	17.6	1.56	11.2	4.5	400	16.8
Argentina	- 38.4	2.00	14.3	34.4	1,050	36.1
Australia	9.8	1.20	7.0	54.6	605	16.7
Brazil	- 10.3	1.31	2.0	86.6	875	35.5
Chile	- 19.2	1.36	6.7	65.4	1,159	39.6
New Zealand	16.8	1.32	4.6	78.2	1,200	61.0
South Africa	13.4	1.24	10.4	44.0	1,235	41.3
Bulgaria	- 19.4	2.84	29.4	7.5	1,140	10.5
Czechia	7.1	2.01	12.5	19.9	1,279	17.1
Romania	- 13.6	1.24	14.0	3.1	577	9.3
Slovakia	- 4.6	3.27	7.5	35.2	1,153	4.8
Slovenia	- 55.4	13.77	5.0	16.7	2,539	19.5
Serbia	72.0	1.89	7.0	14.1	900	6.0
AVERAGE	18.5	2.37	11.0	36.8	1,238	23.4
Exc. China	5.3	2.39	10.9	35.6	1,263	23.4

Probably the single, most significant measure of innovation in a country's orchards is the percentage of new varieties in production. Included among new varieties are those introduced since Gala and Fuji began to be planted in the 1990s, so the standard is fairly loose. However, on average for the 33 countries, over one-third of apple area is now planted in such new varieties. Eight countries did much better than the average with over 60 percent new varieties. A further indication of innovation would be a measure of new varieties introduced since 2010. However, much of that data is still proprietary, and impossible to measure accurately.

The fifth criterion shown in the table above is planting density per country. Again, the range is very wide, being lowest in countries with old orchards, and highest in countries like Belgium and the Netherlands where limited land area has encouraged experimentation with ever higher densities. Density is a limiting factor in average productivity per hectare, and also affects the rapidity with which an orchard can become economically viable. The laggards on this criterion were far behind the leaders. For example, the average density in Belgium was more than ten times that in India.

The final criterion in the table above, average yield per hectare, represents how successfully countries have exploited different strategies and technologies to maximize production. The average for all countries was 23.4 metric tons per hectare. New Zealand recorded 2.6 times the average in 2015-17, while the joint last place countries, Russia and Slovakia, recorded only 20 percent of the average. Only seven countries, Italy, the Netherlands, the United States, Argentina, Brazil, Chile and South Africa, achieved yields more than 50 percent above the average.

There were similar differences in the performance of the main apple producing countries in terms of the criteria for infrastructure and inputs and for financial and market criteria. These are not shown separately to conserve space. However, making improvements on most of these criteria require understanding and support from many agencies and government bodies outside the direct control of the apple industry. Effecting change in many of these criteria requires lobbying from apple industry organizations, other agricultural organizations and economic development agencies. Coalitions with these other organizations over long periods of time are necessary to produce beneficial changes. The table on the next page shows the competitive rankings in 2018 for 33 countries both overall and for each major group of criteria.

## Major Apple Producing Countries: International Competitiveness Rankings, 2018

Rank 2018	Rank 2017	Overall Ranking	Production Efficiency	Infrastructure & Inputs	Financial & Markets
1	1	New Zealand	South Korea	Chile	Netherlands
2	3	Chile	New Zealand	United States	Japan
3	2	United States	South Africa	New Zealand	France
4	8	South Korea	Netherlands	Canada	Italy
5	6	Italy	China	South Africa	Belgium
6	4	Netherlands	Italy	France	South Korea
7	10	France	United States	Italy	New Zealand
8	7	Japan	Germany	Brazil	Chile
9	13	South Africa	Chile	Turkey	Austria
10	11	Canada	Japan	Austria	Germany
11	12	Germany	France	Japan	United Kingdom
12	5	Belgium	Brazil	Argentina	Canada
13	9	Austria	United Kingdom	South Korea	United States
14	14	United Kingdom	Portugal	Belgium	Spain
15	15	Australia	Argentina	Germany	Australia
16	21	Brazil	Australia	Netherlands	Serbia
17	19	Argentina	Greece	Australia	Portugal
18	16	Spain	Russian Federation	United Kingdom	Greece
19	18	China	Poland	Spain	South Africa
20	20	Portugal	Canada	China	Slovenia
21	17	Poland	Czechia	Poland	Poland
22	22	Turkey	Belgium	Portugal	Slovakia
23	25	Greece	Austria	Mexico	Mexico
24	23	Mexico	Serbia	Greece	Hungary
25	27	Czechia	Spain	Slovenia	Czechia
26	28	Serbia	Turkey	Hungary	China
27	24	Slovenia	Bulgaria	Slovakia	Bulgaria
28	26	Slovakia	Hungary	Czechia	Argentina
29	28	Hungary	India	India	Russian Federation
30	30	Bulgaria	Romania	Serbia	Brazil
31	32	Russian Federation	Mexico	Bulgaria	Romania
32	33	India	Slovakia	Romania	India
33	31	Romania	Slovenia	Russian Federation	Turkey

The overall rankings for 2018 are also compared with the overall rankings for 2017. New Zealand retained its position as the single most competitive country with 174 points out of a possible 230 points. However, Chile and the United States once again traded second and third places. Chile had 171 points, the United States 166.

Among European countries, those that dropped in the rankings between 2017 and 2018 had generally suffered severe crop losses in 2017, while those that gained in the rankings had been hit less severely by crop losses. This explains much of the decline in rankings for Belgium and Austria. Several countries outside Europe were able to move up four places or more in the rankings because of the European crop losses. These included South Korea, South Africa and Brazil. The same countries in the bottom third of the rankings in 2017 were still there in 2018 because of their low scores on a wide range of criteria.

Of the eleven countries in the top one-third of the overall rankings, four were in Western Europe, three in the Southern Hemisphere and two each in North America and Asia. Of the countries in the middle third of the rankings, five were in Western Europe and one, Poland, in Eastern Europe. Three were from the Southern Hemisphere, and two from Asia. Nine of the countries in the bottom third of the rankings were in Eastern Europe. The average scores by region were as follows: Southern Hemisphere 148.3 points, Western Europe 142.0 points, North America 140.7 points, Asia 128.2 points and Eastern Europe 101.3 points. This gap between major regions has persisted over time. The countries of Eastern Europe are continuing to struggle to remain competitive with countries that have had capitalist systems for many decades.

Of the countries in the top one-third of the overall rankings, all were also in the top third in at least two of the three sub-categories. Five countries, New Zealand, Chile, Italy, France and Japan, were in the top one-third in all three sub-categories. Their competitive performance is widely based. At the bottom of the rankings, Mexico, Hungary, Bulgaria, India and Romania were in the bottom third in all three sub-categories. The other six countries in the bottom third overall, recorded scores in the middle third in at least one of the other sub-categories. This suggests that further improvement in competitiveness may be easier for them than for those firmly mired at the bottom in all sub-categories.

The types of countries in the top one-third in production efficiency varied widely. They included developed countries in Europe, Asia and North America, and mid-level developing countries like South Africa, China and Chile. China, in particular, has made impressive gains, moving up from tenth place in 2017 to fifth place in 2018. However, some developed countries, like the United Kingdom, Portugal and Australia, had allowed their production efficiency to erode.

The countries in the top one-third in the infrastructure and inputs category were all countries that have modernized their apple packing, storage and marketing systems as their industries have grown. In general, they have had the capital and the drive to introduce the best available technology from around the world. In general, off-season exporting countries like New Zealand, Chile and South Africa have been forced to continually upgrade their systems to meet the growing demands of retailers in the Northern Hemisphere. Countries serving domestic or neighboring markets have not faced similar pressure, and have lagged accordingly.

The final sub-category, financial and markets, was the one most affected by a country's past economic, social and political systems. Not surprisingly, all the countries in the top one-third were either fully developed countries, or like South Korea and Chile, close to entering that category. These countries tend to be closely integrated into the global economy, and to move in step in terms of interest rates, inflation, property rights and other economic policies. In contrast, countries like Turkey and Argentina have remained out of the global mainstream for domestic political reasons and have paid the price in terms of interest rates and inflation.

While these international competitiveness rankings are of interest in their own right, their greatest value is in providing guidance on the aspects of the apple industry that need to be improved to enhance a country's competitiveness. While decisions by individual firms in the industry remain important, their competitiveness can be impacted by outside forces such as national policies on exchange rates, taxation, regulation, etc. These can often be tackled only on an industry-wide, or economy-wide, basis. That requires cooperation between industry organizations, government agencies, university research and extension professionals, inspection agencies, and many other bodies with their own agendas.

The bottom line on competitiveness is that it is a moving target. The bar for any firm or industry continually moves upwards, for example, any time that a customer demands higher standards or additional services, or when new technologies emerge that can increase efficiency or add value, or when competitors improve their offerings in any respect. Apple firms, districts and countries need to be continually monitoring how the competitive bar is shifting and need to be willing and able to adapt rapidly so they do not lose out in the competitive race.

## Changing Consumer Profiles

The profile of potential consumers of fresh apples and apple products is changing in unexpected ways. For the last century, populations were rising in almost every country in the world as advances in health care extended life spans despite dramatic slowdowns in fertility rates. While that relationship remains intact in developing countries, especially in muslim-dominated populations, it has begun to reverse in many other countries as new births are no longer replacing deaths. The reversal has been most severe in developed countries and in countries transitioning from capitalism, such as Russia, China and Eastern Europe.

In developing countries, the youth population is continuing to grow. If incomes can also continue to grow, these countries will offer growth opportunities for apple marketers. A 2018 trend report by Fruit Logistica, “Disruption in Fruit and Vegetable Distribution”, forecast that the rapidly developing regions of the Middle East, Africa, Asia and Oceania “are poised to grow their share of the (world) fresh produce market from 60 percent in 2015 to 70 percent in 2013.” The challenge for the apple industry will be winning additional converts to apple consumption in these countries that have a strong tradition of consuming indigenous fruits.

Many other countries that are now relatively heavy consumers of fresh apples, as documented in chapter 4, can expect their total populations to shrink, and the proportion of elderly people to increase. Rising expenses for health care, housing and other services for the elderly will increase the proportion of elderly poor. The number of households, marriages, births and youth are expected to stagnate or decline. Per capita incomes in these countries are already at a relatively high level, so many consumers can afford to buy fresh apples. However, as populations become older and more affluent, they become much more willing to indulge their personal preferences in fruit consumption. They tend to seek a wider range of new taste experiences both in new and exotics fruits, and in new and different apple varieties. In their fruit purchases they will be more likely to take into consideration how their fruits are grown, for example, whether producers have used organic, sustainable, regenerative or other production methods. They will be much more sensitive to how apple suppliers treat their workers, care for the environment, or economize on natural resources, and even what stance any company takes on political, social or economic issues like abortion rights or gender equity.

However, perhaps the most significant change that could affect apple consumption is increased concerns about improving personal health, avoiding serious illnesses like cancer and heart attacks, and extending life spans. These concerns have led to changes in eating behaviors. Unfortunately, few of these changes in behavior have been based on sound science. While apple consumption has for centuries been associated with good health, in the last thirty years, a bewildering array of claims have been made for the general or specific health-giving properties of competing foods. Most of these foods have been heavily promoted by self-anointed health gurus, or by firms with vested interests in increasing sales of these products.

One of the most insidious developments has been claims for so-called “super foods”. These are food or beverage items that have been touted as delivering a powerful health boost for modest amounts of consumption, with high convenience and relatively low cost. A typical example is the humble blueberry. The value of sales of blueberries in the United States has tripled in the last decade. There has been a similar increase in the value of sales of other berry products.

There is general scientific agreement that the health of consumers in affluent countries could be improved by including a higher proportion of fresh fruits and vegetables in their diets. However, there is also agreement that no single food is intrinsically either bad or good, and that humans are best able to ingest the needed nutrients for health if they consume a diverse array of foods. Included in that diverse array should be a mix of different fruits and vegetables. However, there is a widespread perception among consumers that fresh fruits and vegetables are more expensive than more dense, manufactured foods, even though USDA studies have shown the affordability of fresh produce.

These issues present several challenges for apple marketers in the developed world. The first is to persuade more consumers to replace nutrient-dense foods with fresh fruits or vegetables. The second is to persuade more consumers to choose fresh apples or apple products in preference to other fruits and vegetables. A third is to persuade consumers to choose a particular apple variety in competition with all other apple varieties. Success in these efforts will depend heavily on the apple industry’s ability to identify which consumer segments are most likely to favor which apple varieties. That implies that the apple industry will need to devote much more of its resources to identifying consumer preferences and to supplying the variety, or varieties, that best meet those preferences.

## Changes in the Food Distribution System

The biggest burden on every household is how to provide its members with three or more meals per day. When most households were rural, the farm was the primary source of food, and much time and effort by family members was needed to produce, prepare, cook and serve food. As societies became increasingly urbanized, small grocers emerged in every neighborhood to anticipate the needs of the local community. After World War II, as per capita incomes rose, more families moved to city suburbs and used their automobiles for major shopping trips and for occasional trips for supplementary supplies. Between 1950 and 1990, self-service supermarkets replaced full-service grocery stores and increasingly came to dominate the food distribution system. The supermarket chose what items to stock, and what prices to charge. The shopper (usually a full-time housewife) provided her labor free in searching the store for the desired items, assembling purchases in a shopping cart, unloading and reloading purchases at the checkout, loading the purchased items in their car, and unloading the items when they reached home.

As many housewives moved into the workforce, and family incomes increased, the diversity of household wants increased. Shoppers often had to visit several different types of stores to meet all their wants. Traffic congestion became an increasing irritant. The cost of the shopper's time increased. Older consumers found shopping more physically demanding. Over time, more and more shoppers found the standard supermarket system inadequate for their needs.

New retailing formats emerged to meet these changing wants. Superstores, like Walmart and Carrefour, attempted to provide one-stop shopping with a vast array of product choices that allowed consumers to buy food and non-food items on a single trip. Limited assortment stores, like Aldi and Lidl, attempted to reduce the shopping burden by offering fewer choices in no-frill, smaller stores. Upscale chains, like Whole Foods and Trader Joe's, catered to shoppers' rising demands for specialty items, such as organic or natural foods. Warehouse club stores, like Costco, met all three needs with a limited assortment of upscale items at discounted prices. Traditional, self-service supermarkets saw their market share gradually erode. Some adjusted by introducing their own versions of the newer formats, others by merging with or acquiring other supermarket chains. The outcome for food shoppers was a bewildering array of grocery shopping options.

During these years, away-from-home restaurants and cafeterias provided an increasing share of household meals. Food manufacturers developed pre-cooked meals, and canned and frozen foods that needed only to be heated and served. Home delivery of pre-cooked pizzas and other meals in response to telephone orders became widespread. Supermarkets and other food stores fought back by offering in-store delicatessens, sandwiches, pre-cooked entrees, etc.

A different type of competitor for the consumer's food dollar has emerged with the development of the internet and, especially, with the widespread availability of the smart phone. Internet companies can offer an almost limitless array of products, including food products. Shoppers can order food anywhere there is a smart phone connection. In response, many bricks and mortar food stores have added online ordering for their customers. However, several major stumbling blocks have impeded the growth of online sales of food products, especially perishables like fruits, vegetables, meat or dairy products, that are still core categories for bricks and mortar stores. The first impediment is perishability. It has been difficult to guarantee the delivered quality of the items ordered. The second is what is known as the "last mile" problem. There are logistical, cost and security challenges in delivering food items to the homes of shoppers. Food retailers have experimented with the use of specialized delivery companies, with a combination of online ordering and in-store pickup, with lock-boxes in-stores and other storage schemes. Some have worked well in limited geographic areas, but have not yet been feasible across major metropolitan areas.

The latest wrinkle in the competition for the consumer's food dollar was the decision by the leading online retailer, Amazon, to acquire the upscale Whole Foods bricks and mortar grocery chain. Amazon has already added more Whole Foods items to its online food offerings, opened its Amazon Prime service to Whole Foods shoppers, and used Whole Foods stores as a drop-off point for online orders. Amazon has been one of the leaders in mining its records to predict what items its shoppers will want next. In addition, because of Amazon's reputation for aggressive innovation in any field it enters, other retailers remain concerned about what competitive initiatives Amazon might take next in the food distribution system. They are also unsure what sort of competitive reaction that might require, and how such a reaction would alter their investment, staffing and promotional programs. This has brought an unusual level of uncertainty to the food distribution system.

None of these developments have resolved the fundamental problems of the hassle shoppers face in getting to and from bricks and mortar stores, and the costs involved for time-strapped consumers in getting their food through other avenues. The retail food distribution system remains a clumsy mixture of legacy systems that were born in a different era and of new systems that are emerging in the internet and smart phone era. It includes retailers with different geographical strengths, different mixes of formats, different merchandising and pricing strategies, and different requirements from suppliers.

The challenge for the entire apple industry, including producers, packers, marketers and support services, is to decide which parts of the food distribution system they can best currently serve, and what products, packaging, promotion and merchandising systems their retail customers will need. The related challenge is to identify the market segments that are most likely to grow in the future, and that can best sustain their apple businesses.

### **Changes in International Relations**

After World War II ended in 1945, countries split into two large antagonistic blocks. The communist countries included Russia and numerous countries in Eastern Europe and Central Asia, and China and several of its Asian neighbors. The capitalist block was led by the United States and supported by much of Western Europe, Japan, Australia, New Zealand and Canada. A third group of countries refused to commit to either the communist or capitalist philosophies, and were generally known as the “Non-aligned Nations.” The most prominent of these was India.

In general, the communist nations followed a mercantilist philosophy, trading only to earn foreign capital, but were otherwise heavily committed to self-sufficiency. Only ideas acceptable to the communist party were tolerated. In contrast, the capitalist block believed in promoting worldwide democracy (rule by and for the people) and in the free flow of ideas, capital, goods and labor across international borders. In the economic realm, they strongly believed in the law of comparative advantage, that each country could become richer by specializing in those goods and services in which it had a comparative advantage, and trading its surplus for goods and services in which it had a comparative disadvantage.

By the early 1990s, more and more countries embraced the capitalist system because it had delivered both increased wealth and freedom to its adherents. In contrast, the economies of the communist countries, and of many non-aligned nations, had stagnated. The Russian system soon collapsed, China gradually introduced greater economic freedom, and non-aligned nations like India began to liberalize their economies. It appeared that democracy and capitalism had triumphed. By the year 2000, most countries in the world had joined the World Trade Organization. China became a WTO member in 2001 and Russia in 2012.

The Western countries assumed that China and Russia would gradually adopt the democratic systems and free trade philosophy expounded by the WTO. However, the worldwide recession of 2008-2009 disrupted the economies of many countries. When China rebounded more rapidly than many other countries, it attributed its success to its unique brand of state-led capitalism under the control of the Communist Party. It blamed the setbacks in other countries on the flaws of free-market capitalism. In the meantime, President Vladimir Putin brought Russia back to a tightly-controlled authoritarian system. In 2014, Putin launched the first military seizure of territory in Europe since World War II when Russian troops annexed the Crimea and attempted to promote secession in the eastern Ukraine. Xi Jinping became president of China in 2013, and used purges of political opponents to accumulate most of the levers of power in his hands. In 2018, the Communist Party ended time limits on his term in office, essentially permitting Xi to become president of China for life. Under President Xi, China has ramped up China's military strength, militarized a number of shoals in the China Sea, used trade and aid to expand China's influence in other countries, and attempted to clamp down on any form of internal dissent from Xi's policies.

Authoritarian governments have also emerged in many other countries that were once leaning towards democracy. These include Thailand, Malaysia and Vietnam in Asia, Turkey and Egypt in the Middle East, Hungary and Poland in Eastern Europe, and Venezuela in Latin America. They join countries with a long history of authoritarian governments, such as Cuba, Iran, North Korea, Myanmar, Saudi Arabia and Syria. Some of these countries have been openly hostile to western ideas. Others have selectively accepted enough western ideas so as not to become pariah nations. A small number, like Argentina and Iraq, appeared to have moved back towards democracy. However, the general trend has not been good.

The world appears to be again reverting to two antagonistic blocks, each led by one of the world's two largest economies. The United States remains the leader of the capitalist countries, while China under President Xi appears willing to support an alternative world system of trade and international relations, where China would set the agenda. The relationship between these two great powers, and their ability to attract supporters to their cause could shape the world for the next one or two decades. The world apple trade could be intimately affected by how these clashes evolve.

### **China and How to Cope**

How China evolves in the future will have a significant effect on many other parts of the world. On its present trajectory, China will continue to allow its citizens considerable economic freedom, but quash any dissent from the policies of the Communist Party and its dictatorial President. Because of its large population and rising income levels, it will continue to be an attractive market for commodities from around the world, including fresh fruits like apples, pears and sweet cherries.

However, it will continue to be in violation of both the spirit and letter of its WTO commitments. It has continued to favor state-owned industries and firms, and to treat foreign firms less favorably than domestic firms. It has illegally blocked high-tech firms, such as Facebook and Google, from operating freely in China, and demanded that other foreign firms wishing to operate in China have a Chinese partner and provide their intellectual property to that Chinese partner. It has dumped its surplus production in foreign markets, has ploughed state money into emerging industries that it wishes to dominate in the future, and has blatantly pirated intellectual property that would give Chinese firms an advantage.

Many countries have complained privately about China's tactics, but have been unwilling to bring the issue to international forums for fear of being excluded from the Chinese market. However, the U.S. administration under President Trump decided in 2018 to call out China on these and other discriminatory practices, and has threatened a range of punitive tariffs and sanctions. In response, China has accused the Trump administration of fostering protectionism and has sought to win support for its views among U.S. allies. It has threatened punitive tariffs on many U.S. goods, including fresh apples, pears and sweet cherries.

Some in the U.S. apple industry have complained about being dragged into the middle of a trade dispute in which they have no stake. However, there is ample evidence that the Chinese market may be technically open to fruit imports but that China has used subtle tactics to control the volume of fruit from any country that it allows to enter its market. It has also been willing to use temporary trade barriers to punish countries that have opposed Chinese policies in the United Nations or other world forums. In all fairness, it should be added that other countries in Northeast Asia, including Japan and South Korea, have a long history of impeding fresh fruit imports to protect their domestic industries.

At this time, it is unclear whether or not the U.S. and China can come to a working relationship over trade issues, or whether the present spat could escalate into a trade war, or a global power struggle, between the two economic giants. The Trump administration initiative has already faced opposition from representatives of major agricultural commodities, such as soybeans or almonds, that are heavily dependent on the Chinese market. In contrast, the Xi administration in China does not have to fear open dissent from any Chinese industries that might suffer from his policies. It is also likely that alternative suppliers might see any blockage of U.S. imports as an opportunity for their producers to win a larger share of the Chinese markets, an action that would reduce the impact of any punitive U.S. actions. And, it remains unclear, whether governments in influential countries in Europe, or in Japan or Canada, will be willing to face short-term Chinese sanctions for the prospect of long-term opening up of the Chinese market.

The U.S. apple industry will be affected by the outcome of the battle between the two economic titans. The apple industry in other countries may gain short-term advantages in replacing Chinese apples in China. However, if the Trump administration fails, it could embolden the Chinese government to become even more of a bully in world affairs in the future, and that could spell trouble for many other suppliers of many other products and services to China.

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